1977

Washington University School of Medicine bulletin, 1977-1978

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The on-rushing flood of future possibilities brings with it a spirit of adventure; a need for bold, imaginative thinking; a willingness to gamble on provocative new concepts; the courage to break away from the entrenched viewpoint and the aggressiveness to bring them into reality.

Wendell G. Scott
Both the man of science and the man of art live always at the edge of mystery, surrounded by it; both always, as the measure of their creation, have had to do with the harmonization of what is new and what is familiar, with the balance between novelty and synthesis, with the struggle to make partial order in total chaos.

*J. Robert Oppenheimer*
It is a rare blending of learning and humanity, incisiveness of intellect, and sensitiveness of the spirit which occasionally come together in an individual who chooses the calling of Medicine; and then we have the great physician.

Hans Zinsser
The whole point of a university, on its educational side, is to bring the young under the intellectual influence of a band of imaginative scholars.

*Alfred North Whitehead*
Scientific problems are never disposed of by a single worker, however ideal his opportunity, however great his ability, for the questions to be put to nature vary from one generation to another.

Joseph Erlanger
Come, let us work, and in this little time do some new thing that no one on this earth has ever thought to do. Split from the world's eternal truth some atom of the everlasting! Then let us die, and leave for coming generations one bit of knowledge by which we'll be remembered until some later one shall show the truth we found was but a grain gleaned from some vast store we'd hardly touched and we shall be forgot and he remembered—but we, out where the absolute is near, shall smile seeing how little a beach of sand resembles the granite cliff from which it weathered.

Sam M. Clark, Sr.
Medicine is a jealous god expecting to receive from its votaries all of their talent and energy. It lavishes no rewards upon those who are not fully consecrated to its service.

_Evarts A. Graham_
Bulletin of
Washington University
St. Louis

School of Medicine
1977/78
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# Calendar

## 1977

### June
6 *Monday*. Summer quarter begins.
14, 15 *Tuesday, Wednesday*. National Board Examination, Part I.

### July

### August
24 *Wednesday*. Orientation and registration for all new students.
25, 26 *Thursday, Friday*. Registration for upperclass medical students.
27 *Saturday*. Summer quarter ends.
29 *Monday*. First semester classes begin.

### September
7, 8 *Wednesday, Thursday*. National Board Examination, Part I.
27, 28 *Tuesday, Wednesday*. National Board Examination, Part II.

### November
24 *Thursday*. Thanksgiving Day, holiday.
25 *Friday*. Thanksgiving holiday for freshman and sophomore classes.

### December
17 *Saturday*. Christmas recess begins at 1:00 p.m.
23-26 *Friday through Monday*. Christmas holiday.

## 1978

### January
2 *Monday*. New Year, holiday.
3 *Tuesday*. Christmas recess ends at 8:00 a.m.
9 *Monday*. Registration for second semester.
16 *Monday*. Second semester classes begin.

### March
8 *Wednesday*. National Board Examination, Part III.
17 *Friday*. Spring recess begins at 5:00 p.m. for freshman and sophomore classes.
24-26 *Friday through Sunday*. Easter holiday for upperclass medical students.
27 *Monday*. Spring recess ends at 8:00 a.m.

### April
11, 12 *Tuesday, Wednesday*. National Board Examination, Part II.

### May
18 *Thursday*. Academic year ends at 5:00 p.m. for graduating students.
19 *Friday*. Commencement.
20 *Saturday*. Academic year ends for junior class.
26 *Friday*. Academic year ends at 5:00 p.m. for freshman and sophomore classes.
29 *Monday*. Memorial Day, holiday.
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PHILOSOPHY AND OBJECTIVES

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.” The faculty’s mission is to preserve the joy of learning and to foster a spirit of discrimination and creativity, for today’s student is preparing to cope with a changing world; to contribute, in a constructive, considered way, to resolving problems of medicine and of health care. It is hoped that each student may achieve this grounding during his years in the School of Medicine.

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 reevaluated.

The curriculum includes a core experience based upon a sequence of courses that will introduce the student 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 the student select the career best suited to his abilities and goals.

The elective program helps the student to decide where his major interests lie. It also enables him to benefit from the wide range of specialized knowledge and skills found in the faculty. As there is not enough time for each student to be introduced to each of today's areas of specialization, the elective program permits him to select, according to his own desires, the areas he wishes to explore or to study in depth.

Table of Required Hours 1977-78

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 scheduled hours per year of actual lecture and laboratory 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 36-week (September to June) academic year.

Gross Anatomy 198
Biochemistry* 198
  General 93
  (Advanced 77)
Microbiology 180
Social Aspects of Medicine 36
Physiology 144
Microscopic Anatomy 149
Neural Sciences 131
Genetics 36
Topics in Clinical Medicine 36
Biostatistics 18

Total clock hours for the year 1021

Second-year courses are taught during the 36-week (September to June) academic year.

Pathology 303
Pharmacology 180
Pathophysiology 180
Infectious Diseases 58½
Heart, Kidney and Lung 58½
Metabolism, Endocrinology and Gastrointestinal Disorders 60½
Oncology and Hematology 55½
Nervous System Disorders 60
Developmental Biology 60
Introduction to Clinical Medicine 124
Introduction to Clinical Psychiatry 124
Radiology 36
Surgery 36
Ophthalmology 9
Otolaryngology 9

Total clock hours for the year 1099

*Student's course level determined by Department of Biochemistry.
Clinical Clerkship (Third) Year is a 48-week (June to June) academic year.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Clock Hours</th>
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<td>Psychiatry</td>
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<tr>
<td>Neurology</td>
<td>115½</td>
</tr>
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<td>Otolaryngology</td>
<td>77</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>38½</td>
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Total clock hours for the year 1848

Elective (Fourth) Year is a 48-week (June to June) academic year. Students are required to attend only 36 weeks.

At least 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; any exceptions to this must be approved by the Assistant Dean for Curriculum and the standing subcommittee of the Committee on Academic Review and Promotions (CARP)--III. This subcommittee reviews students taking more than twelve weeks at other schools and all individual questions about what merits elective credit. If the faculty or administrator of the elective program has any question about what should receive elective credit, this subcommittee should judge and report to the CARP--III for final action.

Credit may be given for elective work done at any point in the standard four-year Doctor of Medicine degree program so long as the duration of 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 sophomore 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 junior 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.

To qualify for the Doctor of Medicine degree from the Washington University School of Medicine, a student must take a total of at least 36 weeks of type "B" (full-time) courses or approved research. Full academic credit will be granted for any successfully completed elective that fulfills the following criteria:

**Type B (full-time) course electives must:**

1. be approved by a recognized school of medicine and have a designated course-master who will evaluate the student's performance;
2. be taken when the student is enrolled at the Washington University School of Medicine; and
3. be a planned educational program that deals with some aspect of clinical medicine or biological science and encompasses at least three consecutive weeks.
Type B research electives must:

1. be sponsored by a designated investigator who will outline the project, oversee the student’s progress, and evaluate the student’s performance;

2. be accomplished while the student is enrolled at the Washington University School of Medicine; and

3. be a project in which the student has worked full time for a total of at least twelve weeks. Full-time investigative work on such a project prior to enrollment at the Washington University School of Medicine can be used for the twelve-week minimum requirement but will not be credited toward the 36 weeks needed for elective credit.

Students are encouraged to take type “A” electives, lecture-seminar courses, but such offerings are optional.

Total clock hours for the year ......1188
Total clock hours for four years ......5156

DEGREE PROGRAMS

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

The Washington University Graduate School of Arts and Sciences, through the Division of Biology and Biomedical Sciences, offers programs in cellular and developmental biology, evolutionary biology and ecology, molecular biology, neural sciences, and plant biology leading to the Ph.D. degree. Study is organized on an interdepartmental basis using the faculty of the seven preclinical departments of the School of Medicine, as well as the Biology Department of the Graduate School. Additional information and the application for admission may be obtained by writing to:

Office of Graduate Student Affairs
Box 8072
Washington University School of Medicine
660 South Euclid Avenue
St. Louis, Missouri 63110

Doctor of Medicine, Four-Year Program

By conferring the M.D. degree, the School 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 degree of Doctor of Medicine 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 twenty-one years of age and must have completed four entire academic years in the study of medicine.

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

Doctor of Medicine, Five-Year Program

In addition to the regular four-year program leading to the M.D. degree, this program permits the student to spend one additional year in an investigative or research concentration. The program must be arranged subject to the approval of the Committee on Medical Education.

M.D./Ph.D. Medical Scientist Training Program

The School of Medicine offers a combined M.D./Ph.D. program within the Division of Biology and Biomedical Sciences (see p. 148) designed for selected students who are interested in a research career and whose undergraduate education has placed major emphasis on science. The program permits the student to obtain both the M.D. and
The Ph.D. degree, usually within six years of study. The major purpose of the program is to prepare medical scientists, skilled in the study of modern biology, for clinical and preclinical faculties of medicine. Financial support in the form of stipends (currently $3900 a year) and tuition remission will be available for a period of six years to all students admitted to the program. Support is obtained from National Institutes of Health grants and is subject to their policies governing funding.

Eligibility

Applicants must meet the requirements for admission to both the School of Medicine and the Graduate School of Arts and Sciences. In addition to the minimum requirements established for acceptance into both schools, students planning to concentrate in disciplines related to the chemical or physical sciences should have completed mathematics through calculus, physics and physical chemistry (with calculus as a prerequisite), and advanced organic chemistry. A course in differential equations is also recommended. For 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 essential. Although most individuals will enter the program as first-year students, applications will be accepted from students in residence. Only students who have spent the equivalent of one summer in a research laboratory should apply to the program.

The Program

The program consists of three segments: (1) two years of the usual medical curriculum, (2) three or more years of work in preparing a thesis to satisfy requirements for the Ph.D. degree, and (3) a final year which is the usual clinical year of the medical curriculum, individually adjusted to each student's requirements and career goals. This sequence may be modified to fit individual needs. In particular, students who wish to begin their research after the first year of the regular medical curriculum may do so after consultation with the Medical Scientist Training Program Committee. Since the fourth year of medical school is completely elective, the medical scientist will have taken the equivalent of that year while preparing his thesis, and thereby he will have completed the total requirements for the M.D. degree.

While the Medical Scientist Training Program includes all those medical courses required for the M.D. degree, it incorporates a high degree of flexibility for individual students through a wide range of electives and the large number of thesis programs available at Washington University.

The members of the Medical Scientist Training Program Advisory Committee are available to students to help them decide in which elective courses and laboratories they will participate.

Usually the following courses will be taken in the first two years.

Year 1

First Semester: Gross Anatomy, Biochemistry, Microbiology, Social Aspects of Medicine.

Second Semester: Microscopic Anatomy, Physiology, Neural Sciences, Genetics, Topics in Clinical Medicine, Biostatistics.

Year 2

Third Semester: Pathology, Pathophysiology, Pharmacology, Introduction to Clinical Medicine.


Students begin their training on July 1 of the year they enter the School of Medicine. The first two weeks of the summer will be spent visiting the various departments in the School of Medicine and the Department of Biology in order to select a laboratory for
summer research. Students will also spend the summer between their first and second years doing research. The laboratory selected for summer research need not be the same laboratory ultimately chosen for the Ph.D. portion of the program.

A student who passes a qualifying examination in any of the regularly offered preclinical courses will be allowed to substitute either advanced course work or laboratory research in the time made available. In this way many students will have an opportunity to begin supervised research immediately after entry. Research can be continued in free periods during the first two years.

The courses differ from the usual medical courses with respect to the laboratory training periods and the availability of additional electives. As students enrolled in the program will have begun laboratory work during the summer and will receive additional intensive laboratory training, they may elect, with approval of the Medical Scientist Training Program Committee, to omit or to take only selected parts of a laboratory component. The time not utilized in the normal components will be spent in research laboratories and in elective tutorial courses which are offered to supplement in depth the normal course material. These courses include advanced biochemistry, microbial genetics, immunology, neurobiology, biophysics, cell biology and cytology, advanced pharmacology, and pathobiology. In addition, the formal graduate courses are available to the more advanced students.

The performance of each student will be reviewed annually, and he will be expected to maintain a high scholastic standing.

Years 3, 4, 5

The student will spend the third, fourth, and fifth years in satisfying the requirements of the Graduate School of Arts and Sciences for the Ph.D. degree.

The formal requirements for the Ph.D. degree include (1) completion of course work, (2) successful performance in a qualifying examination, usually at the end of the third year, (3) execution of original research suitable for a dissertation, and (4) defense of the thesis. Students are also required to do a teaching assistantship for a semester in one course. Before beginning the third year, the student will select a faculty adviser under whom he will do his thesis research and the training program or department in which he will obtain his Ph.D. degree.

For purposes of graduate training, the Division of Biology and Biomedical Sciences is divided into the following programs: Cellular, Developmental and Systemic Biology, Molecular Biology, Neural Sciences, Plant Biology, and Evolutionary Biology and Ecology. The programs are taught by faculty from all of the preclinical departments of the School of Medicine and from the Department of Biology of the Faculty of Arts and Sciences. These programs provide maximum flexibility for student training and, by providing for interdepartmental teaching, not only avoid duplication but assure that each course is taught by the most qualified faculty, regardless of departmental affiliation. There-
fore, course requirements reflect the student's background and interests rather than a rigid course sequence. Students may also receive their graduate training by special arrangement in other graduate science departments within the University.

A detailed listing of the various courses available in the Division of Biology and Biomedical Sciences can be found on page 148 as well as in the sections describing the various departments of the School of Medicine.

A program of special monthly seminars will be arranged for students during the research years. Conducted by medical scientists of the clinical departments of the School of Medicine, these seminars are aimed at stimulating student interest in clinical medicine and at increasing awareness of major research problems in clinical medicine.

Final Year in Clinical Medicine

The sixth year is the clinical year of the normal medical curriculum. The intensive clinical training provided in this year is the last formal requirement for the M.D. degree. The Ph.D. and M.D. degrees will be granted simultaneously at the end of the final clinical year.

TUTORIALS AND INDIVIDUALIZED PROGRAMS

The educational program is designed to meet the needs of all medical students in an individual and a personalized way. To help students who may be having academic difficulty or who may wish to reinforce their studies, individual tutorials are offered. The School's experience is that tutorials enable students to handle course work with improved proficiency. Students who are found to have difficulties in handling the normal academic course load will be asked to take an individualized program which would require five rather than four years to complete.

GRADES

In order to assist the student in evaluating his progress, he is graded in each course by the faculty. In the clinical and elective years, grades are accompanied by detailed descriptive comments characterizing each student's performance. This type of evaluative data is of considerable assistance to the student when applying for internship or residency training, since it permits the Assistant Dean for Post-Graduate Training to give each hospital to which the student has applied a meaningful, comprehensive summary of the student's attributes, abilities, and performance.

A Pass/Fail grading system is employed for the first semester of the freshman year. At the end of every academic year each student receives a grade report that indicates achievement in each course taken. The official transcript, in addition to listing courses and grades achieved, gives the grade distribution in each course with the exception of elective courses.

Grades are:

- H = Honors
- HP = High Pass
- P = Pass
- F = Fail
- DF = Deferred
- INC = Incomplete

"Honors" is given for a truly outstanding performance, "High Pass" for very good work, and "Pass" for satisfactory work. "Fail" signifies clearly unsatisfactory performance, "Deferred" indicates a marginal performance with some deficiency that must be removed, and "Incomplete" denotes that course work has not been completed.

If a departmental coursemaster submits a grade of "Incomplete," "Deferred," or "Fail" for a medical student duly enrolled in any medical school course, the coursemaster will include an accompanying statement which contains the following information:

1. Student's name.
2. Course title.
3. Inclusive dates of course.
4. Grade.
5. Description of extent of academic encumbrance.
6. Remedial action recommended to remove the academic encumbrance.

This type of statement will be submitted to the Office of the Registrar at the time student grades are reported and prior to the scheduled meetings of the various committees on academic review and promotions.

PROMOTIONS

A faculty Committee on Academic Review and Promotions reviews the records of all students by curriculum level.

First-Year Curriculum

The Committee on Academic Review and Promotions—I meets several times each year, near the middle and at the end of each semester, to review and evaluate the academic performance of all medical students in the first year of the preclinical curriculum and to take appropriate action on individualized programs, reexaminations, repeat of course(s), leave(s) of absence, dismissal from the class, and promotion to second-year class status in accordance with specific rules.

1. All students with failing, deferred or incomplete grades shall be informed, as soon as possible, of the Committee's decision and of the remedial action required. Where necessary, reexaminations will be held in mid-August, following the spring semester of the first year. All grade encumbrances must be changed to a passing or failing level by the beginning of the next fall semester.

2. Students who still have failing grades in two major courses by the beginning of the fall semester will be dropped from the School or, if there are extenuating circumstances, from the class. For this purpose, Biological Chemistry, Microbiology, Gross Anatomy, Physiology, Microscopic Anatomy, and Neural Sciences are considered major courses. In the case of a student who still has one failure in a major course by the beginning of the fall semester, the Committee, on the advice of the department concerned, shall determine when and how the encumbrance must be removed.

3. During or at the end of the first year, the Committee may recommend that a student take an additional year to complete the first year's work. A student who chooses not to accept this recommendation will be permitted to complete the normal course work of the first year and, if necessary, to take reexaminations during the following August in courses failed. However, if such student, after reexamination, still has failing grades in two or more major subjects, he will be dropped from the School. A student who has taken two years to complete the first year's work and still has a failing grade in any major subject at the beginning of the fall semester will be dropped from the School.

Second-Year Curriculum

The Committee on Academic Review and Promotions—II meets approximately every twelve weeks during the academic year to review and evaluate the progress of students within its curricular aegis and to take appropriate action on individualized programs, reexaminations, repeat of course(s), leave(s) of absence, dismissal from the class, and promotion to the status of Candidate for M.D. Degree (signifies that the student has completed all requirements in the preclinical curriculum in the School of Medicine and is qualified to begin the clinical teaching period) in accordance with specific rules.

1. In major courses all grades below passing (fail, deferred, or incomplete) shall be accompanied by a written statement from the coursemaster indicating the amount and kind of remedial action that is considered necessary in order to bring the student's knowledge of the subject to an acceptable level.

2. All students with grades below passing shall be informed as quickly as possible of the Committee's decision and the remedial action required. The Committee may require a student with fail, deferred, or incomplete grades to take reexamination(s) at the end of the first six or twelve weeks of the summer term following the second year, postponing the start of the third year until
Promotions—III meets at least twice each year to review the academic progress of all students who have been promoted or admitted to the status of Candidate for M.D. Degree. This includes students in the regular four-year degree program, students taking a five-year degree program, students in the clinical portion of the Medical Scientist Training Program, those selected students with a prior Ph.D. degree who have been approved by the Medical Science Training Placement Curriculum Committee for individualized curricula and are now in the clinical training period of their program (having previously been promoted to the status of Candidate for M.D. Degree), and all others who have successfully completed all aspects of the School's preclinical curriculum. Just prior to the end of each academic year, the Committee meets and recommends to the Executive Faculty those students who, in the opinion of the Committee, are qualified to receive the degree of Doctor of Medicine. Specific rules are as follows:

1. All academic encumbrances must be removed in order for a student to be recommended for graduation.

2. A candidate having failures in two subjects may, at the discretion of the Committee, be dropped from the School or may continue with an individualized program.

STUDENT RESEARCH FELLOWSHIPS

No matter what medical career an individual chooses, it will be essential for him to evaluate and use fresh knowledge as he moves through his professional life. Student Research Fellowships, awarded each year to selected students who undertake research projects under the direction of faculty members, are an important part of the educational program. These fellowships offer students an opportunity to attempt original work, thus adding another dimension to their experience as investigators. This research allows students to discover at first hand the problems of obtaining and assessing new information. Selected faculty members serve as advisers to students interested in special research opportunities.

Beyond the Second-Year Curriculum

The Committee on Academic Review and
Fellowships are available to students after admission to the School. They are granted for a minimum of two months. The research must be undertaken during the student's free time or a vacation period. A number of studies conducted by students are significant enough to be reported in scientific journals.

**INTERNSHIPS AND RESIDENCIES**

Although not required by all states for licensure, an internship in an approved hospital is considered essential preparation for the practice of medicine, and most graduates seek additional experience by serving as residents, and perhaps later as fellows, for periods up to five years.

In order to aid students in obtaining desirable intern appointments, an active counseling program is maintained by the Assistant Dean for Post-Graduate Training. Thus, in their junior year, students are provided with general background information about the kinds of internships available. Since many more internships exist than there are candidates in any given year, students are able to exert a considerable degree of selectivity.

The Assistant Dean for Post-Graduate Training maintains an open file of brochures and other descriptive data regarding internships throughout the country. Included are evaluations of their own internships obtained from our recent graduates. The School participates in the National Intern and Resident Matching Program, which offers distinct advantages to applicants.

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.
Admission

The Washington University School of Medicine selects students on the basis of character, attitude, interest, intellectual ability, motivation, and superior scholastic achievement. Applications are reviewed and independently evaluated by members of the Committee on Admissions. Final decisions are made by the sixteen-member faculty committee as a whole. All applicants are interviewed prior to their acceptance.

University policies and programs are nondiscriminatory. Washington University encourages application from and gives full consideration to all applicants for admission and financial aid without respect to sex, race, color, creed, or national origin. The School of Medicine is committed to recruiting, enrolling, and educating an increased number of students from racial minority and educationally deprived groups.

ENTRANCE REQUIREMENTS

Entrance requirements to the School of Medicine are:

1. evidence of superior intellectual ability and achievement;
2. completion of at least 90 semester hours of college courses in an approved college or university;
3. completion of the New Medical College Admission Test of the Association of American Medical Colleges;

4. evidence of character, attitude, and interests 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. A course in physical chemistry (with calculus as a prerequisite) is strongly recommended. 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 college 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 presented as prerequisite because a great variety of courses may prepare the student for the many roles he may play in his medical career.

**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 is a centralized procedure 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 solely by the AMCAS. For this reason, individuals requesting an application and a Bulletin from Washington University will receive an AMCAS Application Request Card and a brochure which describes the School of Medicine. The Bulletin is mailed to candidates upon receipt of their application credentials from AMCAS. Applicants are urged to file their applications as early as possible.

**Early Decision Admission**

This is an optional program for the applicant whose first choice school of medicine is Washington University and who desires an admission decision on his application no later than October 1, 1977. To receive this special consideration, the applicant must agree: (1) to apply only to this School prior to receiving its admission decision; (2) to accept a position in the class if offered; (3) to submit all required credentials to AMCAS by August 1, 1977, and (4) to visit the Medical Center for interviews on a mutually convenient date prior to September 1, 1977. The academic record must show either completion or plans for completion of all courses required for admission, 90 semester hours of course work, and a cumulative grade-point average above 3.70. Scores on the New Medical College Admission Test must document the applicant's strong academic preparation. There is no quota on the maximum number of positions in the class of 120 to be filled by Early Decision applicants. The AMCAS Application for Admission contains complete instructions regarding Early Decision programs.

**Regular Admission**

Other than special handling and processing of Early Decision applicants, all applicants for admission to the Washington University School of Medicine are treated initially with equal consideration. The deadline for receipt of the application at AMCAS is November 1, 1977.
The Committee on Admissions promptly acknowledges receipt of the AMCAS application and forwards to the applicant the materials that must be submitted to complete the application process. At this stage, a non-refundable Application Service Fee of $25 is charged by the University. Selected applicants are strongly encouraged to visit the Washington University Medical Center and to have interviews. Applicants are notified as soon as a final admission decision has been made on their application.

**Personal Interview**

The Committee on Admissions would like to interview every applicant who passes the initial evaluation screening process, but since this involves several thousand applicants, it is physically impossible to accomplish. Therefore, selected applicants are invited to visit the Washington University Medical Center for an interview, as well as a tour of the School of Medicine and its hospitals. This visit will provide 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 entirely appropriate for him to write the Office of Academic Records and Admissions and inquire if an interview will be requested of him. The inquiry should be made at least three weeks in advance of the anticipated travel. From September to June, the Office of Admissions is open on weekdays and until noon on Saturday. During the summer months, the office is closed on Saturday.

During November and December, members of the Committee on Admissions usually visit various parts of the country to interview selected applicants. However, an on-campus interview in St. Louis is deemed highly preferable.

**ADVANCED STANDING**

Applicants who have satisfactorily completed one or two years of study toward the M.D. degree at an approved medical school in the United States may be accepted for admission to the second- or third-year class when vacancies exist, provided that:

1. they comply with the requirements for admission to the first-year class;
2. they have satisfactorily completed courses equivalent in general content and duration to those in this School in the years for which credit is asked;
3. they pass any examinations required by the Committee on Admissions in subjects already covered.

An applicant for admission to an upper class must have studied as a matriculated medical student in an approved medical school for a period equivalent to that already spent by the class to which admission is sought.
TUITION AND FEES

The following fees are applicable to the 1977-78 academic year:

Application (nonrefundable) ........ $ 25
Acceptance deposit (to reserve a place in class; applied to first-semester tuition; refundable upon written request) .......... 100
Tuition (including health fee) .......... 4,400

The University reserves the right to change the fees herein stated at any time without notice. However, if a change is made, it will not become effective until the next academic year.

REFUNDS

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 day withdrawal permission is granted) to the total number of class days in the term for which tuition and fees were paid. 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.

**ESTIMATE OF EXPENSES 1977-78**

An estimate of the expenses of a single student for one academic year is given below. The total of these figures suggests a basic minimum budget of approximately $6,654 for a first-year single student. Allowances for entertainment, travel, clothing, and other miscellaneous items must be added to this estimate.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition (including student health fee)</td>
<td>$4,400</td>
</tr>
<tr>
<td>Microscope rental</td>
<td>90</td>
</tr>
<tr>
<td>Books and supplies</td>
<td>410</td>
</tr>
<tr>
<td>Housing (Olin Residence Hall)</td>
<td>684</td>
</tr>
<tr>
<td>Board (Medical Center Cafeterias)</td>
<td>1,070</td>
</tr>
</tbody>
</table>

**FINANCIAL ASSISTANCE**

The ability to finance a medical education at Washington University does not influence the student selection process. At the time accepted students indicate they will matriculate in the School of Medicine, they may request an application for financial aid. The GAPSFAS Application for Financial Aid will be sent to the student by return mail.

As all students accepted for admission have proven scholastic ability, financial assistance is awarded on a basis of documented financial need which cannot be met by student and family resources. Many students who consider themselves independent of their parents arrange loans from parents with specific terms of repayment and interest.

The Graduate and Professional School Financial Aid Service (GAPSFAS) Application for Financial Aid for the academic year 1977-78 consists of three parts: Part I collects information about the applicant, including a detailed description of resources and liabilities. In addition, it requests information about the income and expenses of the student's spouse (or spouse-to-be). Part II collects information concerning the education and employment history of the student's spouse (or spouse-to-be) and some other financial information. Part III collects parents' financial information. An official copy of the parents' and the applicant's U.S. individual income tax return completes the data required for financial aid consideration.

The School asks that the application be forwarded promptly, hopefully within two weeks from date of receipt, to the GAPSFAS for processing. The Committee makes an award decision normally within two weeks from the date the processed Application for Financial Aid is received from GAPSFAS. All information is evaluated by the Committee on Student Financial Aid and is held in strict confidence. Awards are in the form of scholarships or grants and loans.

All awards are made for a given academic year; however, students may renew financial assistance in succeeding years of medical school 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. Medical students married to schoolmates should submit individual applications, together with financial statements from each student's parents. First- and second-year students are urged not to accept employment during the academic year. A number of third- and fourth-year students find employment in hospitals within the Medical Center. The Personnel Office provides assistance to students' spouses seeking employment.

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

Students are not permitted to travel outside the continental United States during the academic year in which they receive financial aid from the School.
Scholarship Funds

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.

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.

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

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

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.

Insurance Medical Scientist Scholarship Fund. Established for the training of promising scholars intent upon a career in research and academic medicine.

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

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

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

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

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 postgraduate students engaged in study and research in the medical sciences.

Mr. and Mrs. Spencer T. Olin Fellowships for Women. Provides for annual stipend and cost of tuition to women in any of several disciplines. Application deadline is February 1.

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

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

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


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

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

The 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.

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.

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

The 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.

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

Danforth Foundation Loan and Scholarship Fund. Provides financial assistance for medical students.

Danforth Medical Foundation Fund. Created through gifts from the Danforth Foundation and the late William H. Danforth to furnish loans, scholarships, or outright grants to talented and promising young men and women engaged in study or research in basic medical or clinical sciences.

Robert Wood Johnson Foundation Fund. Created in 1972 to provide financial assistance for students who are from rural backgrounds, members of specified minority groups, and women.

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

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

Wilkinson Scholarship Fund. Created in 1968 by the bequest of Anna J. Wilkinson in honor of her husband, Dr. George E. Wilkinson. Medical and postdoctoral students are eligible for Wilkinson scholarships or loans.
Loan Funds

American Medical Association Loan Program. Makes available bank loans without collateral to eligible medical students, interns, or residents who are citizens of the United States. Applications for such loans are made through the Education and Research Foundation of the American Medical Association.

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

Federally Insured Student Loan. Washington University acts as the lender for students awarded loans by the School of Medicine.

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.

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.

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.

Ophelia H. Kooden and Violet G. Sachs Loan Fund. Created in 1970 to provide loans for medical students in memory of the donors’ brother, Jess Klement Goldberg.

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

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

The 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.

The Robert Wood Johnson Foundation Student Loan Guarantee Program. Provides “a last-resort source of funds for educational expenses.”

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 need.

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

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 Microbiology.


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

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

Louis and Dorothy Kovitz Fellowship in Surgical Research. Established in 1970 by an alumnus and his wife to encourage medical students to pursue their interest in surgery.

George W. Merck Memorial Loan Fund. Established in 1959 through the Merck Company Foundation to encourage deserving interns and residents to seek the best possible postdoctoral training.

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

Student Research Fellowships. Awarded each year to students who undertake special research projects under the direction of a
AWARDS AND PRIZES

Alpha Omega Alpha Book Prize. Awarded at the end of the fourth year to a member of that class who has performed outstandingly for the entire medical course.

Alexander Berg Prize. Awarded to the student presenting the best results in research in bacteriology.

The 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.

Dr. Richard Brookings and Dr. Robert Carter Medical School Prizes. Provided for medical students through a bequest of Robert S. Brookings.

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

CIBA Award for Outstanding Community Service. Recognizes a sophomore student who has performed laudable extracurricular activity within the community.

The 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.

Edmund V. Cowdry Prize in Histology. Established in 1969 to honor Dr. Cowdry; awarded to a freshman medical student who has performed meritoriously in microscopic anatomy.

Antoinette Frances Dames Prize in Physiology and Biophysics. Awarded annually to a member of the first-year class who has demonstrated superior scholarship in these fields.

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.

Dr. 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 or research work in diseases of the chest or pulmonary physiology.

Dr. J. E. Kirk Medical Scholastic Award Fund. Established in 1975 and awarded to a graduating student of high scholastic standing.

Louis and Dorothy Kovitz Senior Prize in Surgery. Senior award prize in surgery recognizing a member of the senior class who
has shown the most outstanding ability, zeal, and interest in surgical problems.

*Lange Medical Publications Book Awards.* Given to members of all four classes for high scholastic standing and achievement in research.

**Howard A. McCordock Book Prize.** Awarded at the end of the second year to a member of that class for general excellence in pathology.

**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.

**Medical Center Alumni Scholarship Prize.** Given annually to a student who has shown excellence in his work during the preceding year.

**Medical Fund Society Prizes.** One prize awarded annually to a student of the senior 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.

**Missouri State Medical Association Award.** A scroll and a U. S. Savings Bond presented annually to an honor graduate of the senior class.

**C. V. Mosby Company Book Awards.** Made to five members of the graduating class for high general scholastic standing and research achievement.

**St. Louis Internists Club Book Prize.** Awarded to the graduating senior who has done the most significant research in any area of internal medicine.

**St. Louis Pediatric Society Senior Prize.** Presented to the senior student showing the greatest promise in clinical pediatrics.

**Sandoz Award.** Given annually to a graduating student who has made a meritorious contribution to psychiatric research.

**Sidney I. Schwab Book Prizes.** Awarded at the end of the fourth year for general excellence in neurology and psychiatry.

**Margaret G. Smith Award.** Given to a woman medical student for outstanding achievement in the first two years of medical school.

**Samuel D. Soule Award in Obstetrics and Gynecology.** Presented to a member of the junior or senior class for meritorious achievement in either basic or clinical investigation in obstetrics and gynecology.

**Upjohn Achievement Award.** Given to the senior student who has done the most meritorious work during his medical school career in the field of metabolism.

**Dr. Samson F. Wennerman Prize.** Donated by his wife, Zelda E. Wennerman, and awarded annually to that senior student who has demonstrated promise in surgery.
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.

James Henry Yalem Prize in Dermatology. Established by Charles Yalem in memory of his son and awarded annually to a member of the senior class for outstanding work in dermatology.

AIDS IN ALLIED HEALTH PROFESSIONS

Frank R. Bradley Scholarship Loan Fund. Established in 1958 by the Alumni Association of the Graduate Program in Health Care Administration as a loan fund in honor of Dr. Frank R. Bradley.

W. K. Kellogg Foundation Loan Fund for Graduate Students in Hospital Administration. Established in 1958 and supplemented in 1964.

Mary A. Lennon Memorial Scholarship Loan Fund in Health Care Administration. Established in 1958 by Maureen Lennon Callaghan and Lieutenant Colonel David E. Callaghan to provide loans for students in the Graduate Program in Health Care Administration.

Washington University Health Care Administration Scholarship Fund. Started in 1968 to provide help on the basis of need without interest or expectation of repayment.

Foster G. McGaw Scholarship Fund. Awarded to two students entering the Graduate Program in Health Care Administration. Selection is based on financial need and potential for contribution to the profession.

Bertha Reinhardt Green Memorial Fund. Created in 1954 by a bequest from Bertha Reinhardt Green as a loan fund for students enrolled in the Program in Occupational Therapy.

W. K. Kellogg Foundation Loan Fund for Students in Physical Therapy. Created in 1943 for students in the Program in Physical Therapy.
HOUSING

The Off-Campus Housing Office, located at 6924 Millbrook Boulevard on the West Campus, Box 1059, Washington University, St. Louis, Missouri 63130, telephone (314) 863-0100, extension 4423, maintains listings of housing appropriate for married and single students.

The Spencer T. Olin Residence Hall has accommodations for approximately 300 single men and women. This building, made possible by generous gifts from Spencer T. Olin and alumni and friends of the School of Medicine, is located at 4550 Scott Avenue in the Medical Center. 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 1977-78 are:

- **School Year: September-June (Nine Months)**
  - Two-room suite $900
  - Single room $819
  - Double room $684

- **Summer 1977: for Three Months**
  - Two-room suite $300
  - Single room $273
  - Double room $228
Summer 1977: Weekly Rates for Student Visitor

Two-room suite .................. 36
Single room .................. 30
Double room .................. 24

Daily Rates for Visitors
Two-room suite .................. 14
Single room .................. 13
Single room (prospective student) ........ 11

Each occupant is required to pay a $25 security fee in addition to the room rental charge. This fee will be held by the University until termination of residence to cover losses resulting from possible damage to the room or the furniture. Any portion not so used will be refunded.

PARKING

Parking is available on a lot behind Olin Hall and in other lots located near to and operated by the School of Medicine. The use of the Busch lot is free to students, but a permit is required. An annual permit must be purchased for use of University-owned lots other than the Busch lot.

STUDENT HEALTH SERVICE

Entering students are given a complete medical examination and are provided with medical care as long as they are enrolled in the School of Medicine. Physicians are available at the Student Health Service, and a physician is on call for emergency care at Barnes Hospital or in the student's room when necessary. Essential costs of hospitalization are covered. The student or his family is responsible for meeting the costs of hospital care in excess of those paid by the Health Service. The responsibility of the Student Health Service for hospitalization costs will end thirty days after a hospitalized individual ceases to be an officially enrolled student.

Except in certain emergencies, costs will not be covered for outpatient care that is not arranged through the Student Health Service.

RECREATIONAL AND CULTURAL OPPORTUNITIES

The City of St. Louis offers many cultural and recreational facilities. The St. Louis Symphony Orchestra, second oldest in the nation, presents a series of concerts during the season. Live professional productions flourish in several theaters.

Professional sports are an important part of the St. Louis scene. The football and baseball Cardinals play in the handsome Busch Stadium downtown. The St. Louis Blues hockey team plays at the Arena, not far from the School of Medicine. Francis Field, on the West Campus of the University, is the home of the St. Louis Stars soccer team.

Forest Park, adjacent to the School of Medicine and the Medical Center, contains among its lagoons and forested areas, bike trails, tennis courts, handball courts, golf courses, baseball fields, football fields, a skating rink, soccer fields, the City Art Museum, the McDonnell Planetarium, the City Zoo, the Museum of the Missouri Historical Society, and the Municipal Opera.
Within the University community excellent concerts, theater, lectures, and other cultural activities are open to students in the School of Medicine. Facilities for indoor and outdoor sports, including tennis courts and the Wilson Pool, are available on the West Campus. Olin Residence Hall contains an excellent full-sized gymnasium for student use.

WASHINGTON UNIVERSITY MEDICAL CENTER ALUMNI ASSOCIATION

The Washington University Medical Center Alumni Association plays a significant part in the life of the School. It was organized to promote a spirit of class fellowship among its members, to further the aims and purposes of the School, to stimulate interest in the advancement of medical and collateral sciences, and to support postgraduate studies.

Membership is made up of all graduates of the School of Medicine, all members of the faculty, and all former house officers of the Medical Center. It is governed by an Executive Council.

Each year the Alumni Association sponsors the Annual Clinical Conference held in February, receptions at major medical meetings around the country, a welcoming party for incoming freshmen medical students, a Day at the School of Medicine for Outstanding High School Seniors, a program that permits a freshman medical student to spend time with a local practicing physician who is an alumnus, and an emergency loan fund for qualifying medical students.

Alumni Reunion Days are held in May and feature a scientific program presented by the Office of Continuing Medical Education, a welcoming party, individual class dinners, the Dean's Luncheon, and the Annual Alumni Banquet at which the 50-year reunion class and the graduating seniors are honored guests.
LECTURESHEIPS AND VISITING PROFESSORSHIPS

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

Harry Alexander Visiting Professorship. Established 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.

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

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


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


Graham Colloquium. A gift from Mr. and Mrs. Evarts Graham, Jr., in 1963 enabled the School to establish a series of informal discussions led by outstanding scholars from fields other than medicine and the biological sciences. Mr. and Mrs. Graham's purpose was concordant with that of the School: to encourage opportunities for students to expand their views on social, philosophical, artistic, and political topics. The Graham Colloquia guests, selected by the students, are planned to foster an informal, lively exchange of views.

Evarts A. Graham Memorial Lectureship. Established with a reserve fund left by Dr. Graham for his successors.

Evarts A. Graham Visiting Professorship of Surgery. Established by the Harry Freund Memorial Foundation to support an annual lecture in honor of Dr. Graham's contributions to surgery.

Samuel B. Grant Visiting Professorship. Created to provide annually a visiting professor in the Department of Medicine.

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

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

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

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

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

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

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

St. Louis Football Cardinals Visiting Professorship in Orthopedic Surgery. Made possible by a donation from the St. Louis Football Cardinals.

Robert J. Terry Lectureship. Established by alumni "for the purpose of fostering greater appreciation of the study of human anatomy."

Mildred Trotter Lectureship. Established by friends and former students of Mildred Trotter to bring a distinguished woman scientist to the School of Medicine each year.
The Washington University School of Medicine was formed in 1899 by the union of the first two medical schools established west of the Mississippi River: the Missouri Medical College and the St. Louis Medical College.

Such pioneer colleges set high standards for medical education during the heyday of the medical diploma mills, when there were three times as many medical schools operating in St. Louis as there now are in the entire state of Missouri. They raised their graduation requirements, so that at the time they became associated in 1899, each required its students to complete satisfactorily a four-year graded course for the M.D. degree.

Both colleges were particularly fortunate in attracting men of energy, integrity, and skill. Members of their faculties were well known at home and abroad. Charles A. Pope at thirty-six became the youngest president in the first hundred years of the American Medical Association, and his successor as professor of surgery at the St. Louis Medical College, E. H. Gregory, was elected president in 1886. John T. Hodgen, a graduate of the Missouri Medical College and later dean and professor of surgical anatomy at the St. Louis Medical College,
was president of the American Medical Association in 1880. Hodgen originated the splint which is still used today for hip fractures.

From their beginnings, each college sought university affiliation. The St. Louis Medical College was established as the Medical Department of St. Louis University, became independent in 1855, and affiliated with Washington University in 1891, although it retained its name until the union with the Missouri Medical College in 1899. The Missouri Medical College, first established as the Medical Department of Kemper College, was later the Medical Department of the University of Missouri. It became independent in 1857. In 1899, the Missouri Medical College affiliated with the St. Louis Medical College, and thus formed the Medical Department of Washington 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. A similar survey by the American Medical Association and Flexner's survey, the famous Bulletin Number Four on the state of medical education in the United States and Canada, 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 his report made to Dr. Henry Pritchett, president of the Carnegie Foundation for the Advancement of Teaching and former professor of astronomy at Washington University, Flexner said that "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. Mr. Brookings immediately went to New York to discuss the report with Mr. Flexner.

The meeting in 1909 of Robert S. Brookings and Abraham 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 S.
Brookings accepted the challenge, and with the energy and vision shown in all his enterprises, made the dream a reality.

During the spring of 1912, construction was begun at a new location for the medical school and hospital buildings which form the nucleus of the present Medical 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.

In April of 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 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... and that we will add, through research activities, our fair quota to the sum of the world's knowledge of medicine."

These prophetic words of Mr. Brookings have been realized. Local, national, and international recognition has come to the School and to its faculty. Members of the faculty have received numerous awards; eleven Nobel Laureates have worked in the laboratories of the School's medical science departments.

In the ensuing years, the Medical Center has continued to grow and to provide excellent facilities. With the increase in the physical plant there has also occurred a great increase in the size of the faculty; the expansion has been made without compromise in the standards which marked the early development of the Medical Center. As a result, significant achievements in both research and clinical areas have been consistently recorded, and the School of Medicine has continued to attract students and faculty of the highest caliber.
Teaching Facilities

THE SCHOOL OF MEDICINE

The Washington University School of Medicine and the Medical Center are located along the eastern edge of Forest Park in St. Louis. Along the western edge of the park is the West Campus of the University. A regularly scheduled shuttle bus, operated for the benefit of students and faculty, brings the two campuses within ten minutes of each other. Spread over two city blocks, the School of Medicine is separated by Euclid Avenue, with preclinical departments predominating on the eastern side.

The focal point of teaching facilities is the McDonnell Medical Sciences building. The McDonnell building, with 300,000 square feet of the most technologically advanced research laboratories and classroom space in the country, was made possible by James Smith McDonnell, a generous benefactor of Washington University. Dedicated in the fall of 1970, it is the center of activity for entering medical students. 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 existing basic science departments, as well as for the Division of Biology and Biomedical Sciences and the Department of Genetics,
are located on upper floors. Modern, centralized animal quarters are housed in the basement.

The older structures, the North and South buildings, in which centered the work of several Nobel Laureates, have been extensively renovated. Along with the Cancer Research Building, they continue to provide space for laboratories, offices, the library, and some departmental facilities.

**Biomedical Computer Laboratory**

An outstanding group of computer scientists, engineers and their students are engaged in the development and application of computer technology to biomedical problems.

The Biomedical Computer Laboratory and the Computer Systems Laboratory are located in adjoining buildings at 700 and 724 South Euclid, which also house the Division of Biostatistics of the Department of Preventive Medicine and Public Health.

**The Library**

The School of Medicine Library is one of the largest medical libraries in the Midwest. It contains a collection of more than 150,000 volumes and subscribes to more than 2,000 serials. Special holdings include a rare book collection, the School's historical archives, memorabilia, and manuscript copies of the scientific papers of such outstanding men of medicine as Doctors William Beaumont, Joseph Erlanger, E. V. Cowdry, Evarts Graham, Leo Loeb, Philip Shaffer, Robert J. Terry, Carl V. Moore, and others.

The Library is deeply involved in computer research and use. It runs a serials control system for a number of medical libraries throughout the U.S. at cost, and provides computer-produced indices to private collections of data for medical center faculty. Its cataloging is done in conjunction with the national computer group at the Ohio College Library Center in Columbus as an extension of its own computer cataloging. The Library provides services to local hospitals and is deeply involved in the seven-state Mid-Continental Regional Medical Library (National Library of Medicine).

Two computer terminals are available for computer-assisted instruction and for searching remote computer data bases (including MEDLINE, Toxline, and Chemical Abstracts Condensates). A small collection of audiovisual materials is maintained, and may be viewed in several locations in the Library.

Library hours are 8:30 a.m. to 12 midnight on weekdays; 8:30 a.m. to 6:00 p.m. on Saturdays; and 1:00 p.m. to 10:00 p.m. on Sundays. A student reading room is open twenty-four hours a day. In the summer and on holidays, special hours are maintained.

Further information can be found in the "Library Guide," "Library Notes," and special pamphlets on computer services.

**FACILITIES WEST OF EUCLID AVENUE**

West of Euclid Avenue but connected by a pedestrian bridge are the major clinical departments of the School of Medicine, housed in eight buildings. Here the medical school facilities are closely intertwined physically (and programmatically) with Barnes and Children's Hospitals. Located here are the following facilities owned and operated by Washington University:

Edward Mallinckrodt Institute of Radiology, one of the largest and best-equipped in the world, houses the diagnostic, therapeutic, and research activities of the Department of Radiology. It is connected on most of its floors with the adjoining Barnes and Barnard hospitals, and through them with other hospitals of the group, thus providing easy access for all inpatients.

St. Louis Maternity Hospital houses offices and research laboratories for the Department of Obstetrics and Gynecology. A new Perinatal Center and laboratories for research in the physiology of reproduction are located in this building.
Irene Walter Johnson Institute of Rehabilitation is a center for training personnel in rehabilitation procedures, for treatment of disabled persons in the St. Louis metropolitan area, and for research related to chronic diseases.

Oscar Johnson Institute for Medical Research, occupying the top five floors of the McMillan Hospital, provides office space and research facilities for the Departments of Neurology and Neurological Surgery, Ophthalmology, and Otolaryngology.

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

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

William Greenleaf Eliot Division of Child Psychiatry, located about a mile from the Medical Center at 367 North Taylor Avenue, conducts an advanced teaching program in child psychiatry and is the focus for research and treatment in child psychiatry.

Facilities Owned by Washington University and Shared with Barnes Hospital

The following buildings are owned by the School of Medicine, with all patient care services being operated by Barnes Hospital:

Renard Hospital provides 104 beds for patients with psychiatric disorders and contains laboratories and offices for the Department of Psychiatry.

David P. Wohl, Jr., Memorial Hospital, opened in 1953, contains facilities for 76 medical and surgical patients. Offices and laboratories for the Departments of Medicine and Surgery are also available in Wohl Hospital.

David P. Wohl, Jr., Memorial—Washington University Clinics handle about 150,000 outpatient visits a year. Five floors of the building are devoted to the Clinics and five floors to research, including the Division of Health Care Research.

The Medical Center, Its Hospitals and Institutions

The School of Medicine is part of a medical center of nearly 2,000 beds and 10,000 employees, providing nearly 650,000 days of care and more than 425,000 ambulatory care visits each year. Organized formally in 1962, the umbrella organization now known as the Washington University Medical Center consists of a confederation of six strong, 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.

Over the past fifteen years, with the growing confidence of working together, the Washington University Medical Center has undertaken increasingly complex projects. Evidence of this is the massive redevelopment project under way in the 36-block area surrounding the Medical Center, which is under the aegis of the Washington University Medical Center. Working closely with the neighborhood, the Washington University Medical Center Redevelopment Corporation will, over a nine-year period, provide impetus for new office buildings, laboratories, apartment buildings, commercial areas, renovated single dwellings, and many public improvements. To date, over $30,000,000 worth of construction has been completed or commissioned.

Barnes Hospital is the largest hospital in the Medical Center. It is independently owned but, through a special agreement, operates all inpatient facilities and clinics owned by the University. These contiguous facilities provide the chief source of clinical experience for medical students. The Barnes Group has a capacity of approximately 1,204 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 staff is composed exclusively of members of the Faculty of Medicine. The eighteen-story
Queen Tower has five nursing floors and two self-care floors, plus five floors of doctors' offices. A large central diagnostic laboratory provides modern diagnostic patient services. The East Pavilion is a fourteen-story inpatient hospital owned jointly by Washington University and Barnes Hospital. This multidisciplinary patient-care center contains 64 private and 200 semiprivate rooms, 30 beds for intensive care, obstetrical delivery suites, and 22 operating rooms for neurosurgery, ophthalmology, otolaryngology, and gynecology.

Barnard Free Skin and Cancer Hospital is independently owned but is operated by Barnes Hospital. It is a 44-bed hospital for the care and treatment of patients who suffer from skin diseases and cancer or who are undergoing special tests in the Clinical Research Center.

St. Louis Children's Hospital, from its earliest days governed by its own directors, has been an integral part of the Medical Center and a leader in the development of academic pediatrics. Its professional staff are members of the Faculty of Medicine, and the medical director is also professor and head of the Department of Pediatrics at Washington University. Considerable clinical service and research are conducted at Children's. Of particular interest is the recently created Ranken-Jordan Center for Metabolic Diseases.

Jewish Hospital of St. Louis contains 628 beds. Its departments represent each of the major specialties except Pediatrics. The Aaron Waldheim Outpatient Clinics provide all facets of health care to the community, while the Yalem Research building contains important research facilities for the Hospital and School of Medicine. The new nine-story Sydney M. Shoenberg Pavilion provides inpatient rooms, surgical suites, and facilities for radiology.

Central Institute for the Deaf, a nationally known institution, provides facilities for research into hearing problems, maintains a school for deaf and speech-handicapped children, provides outpatient clinics for children and adults, and engages in a program of professional education for scholars in the fields of audiology and otolaryngology.

**Other Institutions**

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

The four City Hospitals:
- Max C. Starkloff Hospital, with 550 beds.
- Homer G. Phillips Hospital, with 466 beds.
- Robert Koch Hospital, with 778 beds.
- Harry S. Truman Restorative Center, with 440 beds.
- Malcolm Bliss Mental Health Center, with 250 beds.
- Ellis Fischel State Cancer Hospital, Columbia, Missouri, with 113 beds.
- St. John's Mercy Hospital, with 606 beds.
- St. Louis Veterans Administration Hospitals, with 991 beds.
- St. Louis County Hospital, with 991 beds.
- St. Louis Shriners Hospital for Crippled Children, with 100 beds.
- St. Louis State Hospital, with 1,429 beds.
- St. Luke's Hospitals, with 502 beds.
Departments of the School of Medicine
The anatomical sciences are presented in three required courses: gross anatomy, offered in the first semester; and microscopic anatomy and neural science, taught in the second semester. The course in neural science is taught conjointly with the Department of Physiology and Biophysics. In addition, the Department offers a series of graduate courses which may be taken as electives by senior students. Gross anatomy is taught essentially as a laboratory course, but with some lectures dealing with anatomical principles and with human growth and development. The course in microscopic anatomy consists largely of cell and tissue biology, with laboratory sessions paralleling the lectures in these areas. Neural science is taught mainly from an experimental point of view, with particular emphasis upon the development and organization of selected neural systems. Throughout all three courses, attention is paid to the results of recent investigations and to major developments in each field. The Department is well equipped for special work in several areas, including gross anatomy, electron microscopy, tissue culture, neurobiology, cell biology, and developmental and reproductive biology.

**FIRST YEAR**

**Bio 501. Human Anatomy.** The course is based on the dissection of the human body.
An extensive collection of dissected specimens is housed in the dissecting rooms so that students may easily compare their dissections with museum specimens. X-ray films are used to complement the current dissections; cineradiographs are presented regularly. Fresh organs are provided for demonstration and dissection at appropriate times. Occasional attendance at autopsies is recommended. Frequent discussions are held with small groups of students. 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. Each student is required to rent a microscope from the School or have his own. Credit 6 units.

Bio 554. Neural Sciences. This course, taught conjointly by the Departments of Anatomy and Neurobiology and of Physiology and Biophysics, provides a broad introduction to modern neurobiology. The neuroanatomical aspects deal primarily with the tissues of the central nervous system from an experimental point of view. The course occupies approximately one day a week throughout the second semester. Credit 5 units.

RESEARCH

Bio 590. Research opportunities are offered in the following areas:

The cell cycle and cellular differentiation.  (Dr. Bischoff)

The history of medicine.  (Dr. Brodman)

The cytology of neural tissue.  (Dr. M. Bunge)

The growth and maturation of neural tissue in vitro.  (Dr. R. Bunge)

Cutaneous sensibility and electrophysiology of cultured neurons.  (Dr. Burton)

The structure and pharmacology of the retina.  (Dr. Cohen)

Neural growth and development.  (Dr. Cowan)

Growth and differentiation of neuroblastoma and other cultured cell lines.  (Dr. Goldstein)

Cell surface glycoproteins  (Dr. C. Gottlieb)

Cell-cell recognition.  (Dr. D. Gottlieb)

The anatomy of the cerebral cortex and of somatosensory and auditory systems.  (Dr. Jones)

The transport of materials across the placenta.  (Dr. King)

The organization of the mammalian spinal cord.  (Dr. Loewy)

The structure and function of the skin.  (Dr. Menton)

Postnatal growth and development.  (Dr. Peterson)

The organization of the olfactory system.  (Dr. Price)

The physiology of the cerebellum.  (Dr. Price)

Cell growth and radiation effects.  (Dr. Thach)

Muscle differentiation.  (Dr. Waterston)

Axonal transport.  (Dr. Willard)

The organization of the somatosensory cortex.  (Dr. Woolsey)

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


508. Anatomy of Head and Neck. Detailed dissection, with emphasis on maxillo-facial, auditory, and laryngeal structures. Credit variable, maximum credit 7 units.
510. *Special Anatomy of the Head and Neck.* Lectures and dissection, with particular emphasis on the face and oral structures. Credit 3 units.


Bio 455. *Neurocytology.*


Bio 551, 552. *Topics in Neurobiology.*

Professor and Head of Department
W. Maxwell Cowan, B.Sc. (hon.), Witwatersrand University, 1952; Ph.D., Oxford University, 1956; M.B.B.Ch., 1958. (Also Director, Division of Biology and Biomedical Sciences)

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.

Professor Emeritus and Lecturer
Mildred Trotter, A.B., Mount Holyoke College, 1920; Sc.M., Washington University, 1921; Ph.D., 1924; Sc.D. (hon.), Western College, 1956; Sc.D (hon.), Mount Holyoke College, 1960. (See Department of Radiology)

Beaumont-May Institute of Neurology Scholar in Anatomy and Professor

Professors
Estelle Brodman (Medical History in Anatomy), A.B., Cornell University, 1935; B.S., Columbia University, 1936; M.S., 1943; Ph.D., 1953.

Adolph I. Cohen, B.S., City College of New York, 1948; M.A., Columbia University, 1950; Ph.D., 1954. (See Department of Ophthalmology)


Roy R. Peterson, A.B., University of Kansas, 1948; Ph.D., 1952.
Leonard J. Tolmach, B.S., University of Michigan, 1943; Ph.D., University of Chicago, 1951. (See Department of Radiology)

**Associate Professors**


*Mary B. Bunge, B.S., Simmons College, 1953; M.S., University of Wisconsin, 1955; Ph.D., 1960.*

*Harold Burton, B.A., University of Michigan, 1964; Ph.D., University of Wisconsin, 1968. (See Department of Physiology and Biophysics)*

*Theodore J. Cicero, B.S., Villanova University, 1964; M.S., Purdue University, 1966; Ph.D., 1968. (See Department of Psychiatry)*

*Milton N. Goldstein, B.S., Western Reserve University, 1946; M.S., 1947; Ph.D., 1952. (See Department of Pathology)*

*Boyd K. Harrman, A.B., University of Kansas, 1962; M.D., 1966. (See Department of Psychiatry)*

*Barry F. King, A.B., University of Minnesota, 1965; M.A., University of Nevada, 1967; Ph.D., Washington University, 1970.*

*David N. Menton, B.S., Mankato State College, 1959; Ph.D., Brown University, 1966. (See Department of Pathology)*

*Joseph L. Price, B.A., University of the South, 1963; Ph.D., Oxford University, 1969.*

*W. Thomas Thach, Jr., A.B., Princeton University, 1959; M.D., Harvard University, 1964. (See Department of Neurology and Neurological Surgery)*

*Thomas A. Woolsey, B.S., University of Wisconsin, 1952; M.D., Johns Hopkins University, 1969.*

**Assistant Professors**

*William A. Frazier, A.B., Johns Hopkins University, 1969; Ph.D., Washington University, 1973. (See Department of Biological Chemistry)*


*David I. Gottlieb, B.A., State University of New York, Binghamton, 1964; M.A., University of Wisconsin, 1969; Ph.D., Washington University, 1971. (See Department of Biological Chemistry)*

*Joseph Hanaway, B.A., McGill University, 1956; M.D., 1960; C.M., 1960. (See Department of Neurology and Neurological Surgery)*

*Lorraine F. Lake, B.S., Washington University, 1950; M.A., 1954; Ph.D., 1962. (See Irene Walter Johnson Institute of Rehabilitation, Program in Physical Therapy, and Department of Preventive Medicine and Public Health)*

*Arthur D. Loewy, B.A., Lawrence University, 1964; Ph.D., University of Wisconsin, 1969.*

*Robert H. Waterston, B.S.E., Princeton University, 1965; M.D., Ph.D., University of Chicago, 1972.*

*Mark B. Willard, B.A., Oberlin College, 1965; Ph.D., University of Wisconsin, 1971. (See Department of Biological Chemistry)*

**Research Assistant Professors**

*Mary I. Johnson, B.S., Washington State University, 1964; M.D., Johns Hopkins University, 1968. (See Departments of Neurology and Neurological Surgery and Pediatrics)*

*Larry W. Swanson, B.A., Pomona College, 1968; Ph.D., Washington University, 1972.*

**Research Instructors**

*Francis A. Mithen, B.S., Tufts University, 1967; M.D., Columbia University, 1971.*

*Patrick M. Wood, A.B., Centre College of Kentucky, 1961; M.S., Purdue University, 1963; Ph.D., 1968.*

**Research Assistants**


*Rex A. Hess, B.S., University of Missouri, 1971; M.S., 1975.*

According to the American Board of Anesthesiology, this specialty may be described as a practice of medicine which encompasses (1) the management of procedures for rendering a patient insensible to pain during surgical procedures, (2) the support of life functions under the stress of anesthetic and surgical manipulations, (3) the clinical management of the patient, unconscious from whatever cause, (4) the management of problems in pain relief, (5) the management of problems in cardiac and respiratory resuscitation, (6) the application of specific methods of inhalational therapy, and (7) the clinical management of various fluid, electrolyte, and metabolic disturbances.

With these objectives in mind, this department is dedicated to presenting to the student, as opportunities develop, (1) clinical applications of certain anatomic relationships, e.g., regional nerve blocks, (2) applications of principles of respiratory physiology, e.g., mechanics of ventilation under various circumstances, cardiorespiratory resuscitation, (3) application of pharmacologic knowledge related to sedative, narcotic, and anesthetic drugs, and to compounds affecting the autonomic nervous system, (4) clinical problems related to acid-base, fluid, and electrolyte balance in surgical patients, and (5) principles underlying the approaches to the emerging concept of "acute medicine."
After the second year of medical school, preceptorships in anesthesiology are available for eight-week periods by individual application. Each preceptee is assigned to a staff anesthesiologist and gains experience in the performance of clinical anesthesia, participates in conferences and seminars, and joins in ward rounds in the recovery room and intensive care unit.

An elective in clinical anesthesiology is offered every six weeks for up to ten students. The pharmacology of inhalation, intravenous, and local anesthetic drugs is demonstrated by practical application by the student in the operating room. The importance of blood gas determinations in evaluating the efficacy of ventilation is shown.

Opportunities to develop proficiency in techniques such as endotracheal intubation are available. Special sessions on cardiopulmonary resuscitation are conducted and students are expected to attend the regular anesthesia conferences and seminars.

Henry E. Mallinckrodt Professor of Anesthesiology and Head of Department
C. Ronald Stephen, B.Sc., McGill University, 1938; M.D., C.M., 1940.

Professors
Leonard W. Fabian, B.S., University of Arkansas, 1950; M.D., 1951.
Albert Roos, M.D., University of Groningen, 1940. (See Department of Physiology and Biophysics)

Associate Professors
James D. Jones II, B.S., Louisiana State University, 1940; D.D.S., Loyola University of the South, 1945; M.D., University of Alabama, 1957.
Lewis J. Thomas, Jr., B.S., Haverford College, 1953; M.D., Washington University, 1957. (See Department of Physiology and Biophysics and Biomedical Computer Laboratory)
Glenn R. Weygandt, B.S., University of Missouri, 1945; M.D., Washington University, 1947.

Assistant Professors
Nabil Abboud, B.A., Christian Brothers College, 1963; M.D., St. Joseph’s University, 1970. (Jewish Hospital)
Milton L. Cobb, B.A., Baylor University, 1964; M.D., University of Texas (Southwestern) Medical School, 1968.
Isabella S. Collins, B.A., Vassar College, 1944; M.D., Johns Hopkins University, 1950.
Jack R. Collins, A.B., University of Missouri, 1958; M.D., 1965. (Jewish Hospital)
Donald J. Dickler, B.A., New York University, 1942; M.D., 1945. (Jewish Hospital)
James A. Felts, B.S., DePauw University, 1943; M.D., Northwestern University, 1946.
James J. Jenkins, B.A., Duke University, 1966; M.D., University of North Carolina, 1970. (Jewish Hospital)

Sara T. Jones, B.A., University of North Carolina, 1958; M.D., Bowman Gray School of Medicine, 1962.

A. Ercument Kopman, M.D., Istanbul University, 1947.


Necita L. Roa, B.S., University of the Philippines, 1964; M.D., 1969.

Susan L. Wilson, A.B., Washington University, 1967; M.D., University of Louisville, 1972.

Instructors


Spomenko Bauer, M.D., University of Zagreb Faculty of Medicine, 1968.

Louise S. Grove, R.N., St. Mary's Memorial Hospital School of Nursing, 1946; C.R.N.A., Barnes Hospital, 1960; B.A., Webster College, 1976.

Robert B. Holloway, B.S., LeMoyne College, 1952; M.D., Meharry Medical College, 1956. (St. Louis V.A. Hospitals)

Akira Iwane, M.D., Nihon University, 1966.

Barbara R. Krupin, B.S., University of Minnesota, 1966; M.D., 1968. (Jewish Hospital)

Instructors (Clinical)


Francis G. Duffy, M.D., B.Ch., B.A.O., University College of Dublin, 1951.

Robert C. Engelhardt, B.S., University of South Carolina, 1946; M.D., University of Missouri, 1950.

Paul L. Friedman, A.B., Washington University, 1953; M.D., 1957.


George E. Lucas, B.S., John Carroll University, 1953; M.D., St. Louis University, 1958.

Daniel W. Platt, M.D., Chicago Medical College, 1949.

The Department offers a general introductory course, an advanced course relating the subject to biology and medicine, and several specialized courses in the major aspects of biochemistry. Students of medicine and in the Graduate School of Arts and Sciences may enroll in the courses or pursue research work under the direction of the staff. Facilities in research are provided in carbohydrate, lipid, nucleic acid, protein, and steroid biochemistry, with varying emphasis on enzymology, metabolism, physical chemistry, structural studies, or biochemical genetics. Some summer research scholarships are offered to students of medicine.

**FIRST YEAR**

**Bio 451. General Biochemistry.** Involves the basic concepts of biochemistry. Designed for qualified undergraduates, medical, and graduate students, the course is required of all graduate students in the Department, and either this course or an equivalent course is a prerequisite for advanced courses. Lectures only. Credit 4 units.

**Bio 531. Advanced Biochemistry.** A discussion of the biochemistry of organized systems, with special emphasis on problems relevant to medicine. Extensive reading of original literature will be required. The
course will consist of four parts: (1) metabolic regulation, including a study of hormonal control; (2) structure and function of membranes and organelle biogenesis; (3) gene expression in higher organisms, including malignant transformation; (4) biochemistry of specialized organs or tissues, for example, connective tissue, bone, blood clotting, etc. Credit 4 units.

RESEARCH

Bio 590. Research opportunities are offered in the following general areas of biochemistry:
X-ray analysis of protein structure; structure and mechanism of enzymes, lipoproteins.  (Dr. Banaszak)
Structure-function relationships in proteins and enzymes.  (Dr. Bradshaw)
Biochemical investigation of metabolic disorders of carbohydrate metabolism.  (Dr. B. Brown)
Studies of pathways of carbohydrate metabolism in mammalian tissues.  (Dr. D. Brown)
Comparative enzymology of purine metabolism in developing muscle and erythrocytes.  (Dr. Chilson)
Mechanism of enzyme reactions.  (Dr. Drysdale)
Structure, function, and topography of cell-surface macromolecules which regulate morphogenesis.  (Dr. Frazier)
Relationship of protein structure and enzyme activity. Kinetic theory and applications to enzyme reactions.  (Dr. Frieden)
Cell-cell recognition in normal and malignant cells. Mechanism of cell wall biosynthesis.  (Dr. Glaser)
Molecular basis of cell-cell recognition in the nervous system.  (Dr. D. Gottlieb)
Computer methods in biochemistry and mass spectrometry.  (Dr. Holmes)
Biochemical studies of protein-lipid interactions; mechanism of blood clotting.  (Dr. Jackson)
Biochemistry of collagen.  (Dr. Jeffrey)

Immune damage to and immunogenicity of natural and model cell membranes.  (Dr. Kinsky)
Research on the structure, function, and biosynthesis of complex oligosaccharides present on mammalian cell surfaces and in serum glycoproteins.  (Dr. S. Kornfeld)
Biochemistry and physiology of blood platelets and coagulation.  (Dr. Majerus)
Conformation and chemistry of polypeptide hormones.  (Dr. Marshall)
Crystal structure and conformation of proteins.  (Dr. Mathews)
Studies of proteins specific to the nervous system; their localization, physical and chemical properties.  (Dr. B. Moore)
Protein nucleic acid interactions associated with DNA replication.  (Dr. Morris)
Nucleic acid biochemistry of eukaryotes. Regulation of transcription during cell differentiation and during viral oncogenesis.  (Dr. Roeder)
Relationship of inositol metabolism to secretory events.  (Dr. Sherman)
Membrane biochemistry of prokaryotes and eukaryotes.  (Dr. Silbert)
Regulation of protein synthesis; replication of virulent and oncogenic viruses and their effects on host cells.  (Dr. Thach)
Steroid metabolism and action.  (Dr. Warren)
Enzyme mechanism, structure and function of serum lipoprotein.  (Dr. Weidman)
Biochemical transformations of steroid hormones; hormone effects at the cellular level.  (Dr. Wiest)
The function and regulation of intra-axonally transported proteins.  (Dr. Willard)

ELECTIVES

Descriptions of the following courses are listed under the Division of Biology and Biomedical Sciences.

Bio 532. Mechanism and Regulation of Protein Synthesis.

Bio 534. Gene Expression and Differentiation in Eukaryotic Cells.


Bio 545. Conformational Analysis.


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

Professor and Head of Department

Luis Glaser, B.A., University of Toronto, 1953; Ph.D., Washington University, 1956.

Distinguished Service Professor Emeritus


Professors

Leonard J. Banaszak, B.S., University of Wisconsin, 1955; M.S., Loyola University, 1960; Ph.D., 1961. (See Department of Physiology and Biophysics)


David H. Brown, B.S., California Institute of Technology, 1942; Ph.D., 1948. (See Administration)

George R. Drysdale, B.S., Birmingham-Southern College, 1948; M.S., University of Wisconsin, 1950; Ph.D., 1952.

Carl Frieden, B.A., Carleton College, 1951; Ph.D., University of Wisconsin, 1955.

Craig M. Jackson, B.S., Washington State University, 1963; Ph.D., University of Washington, 1967.

Stephen C. Kinsky, A.B., University of Chicago, 1951; Ph.D., Johns Hopkins University, 1957. (See Department of Pharmacology)

Stuart A. Kornfeld, A.B., Dartmouth College, 1958; M.D., Washington University, 1962. (See Department of Medicine)

Philip W. Majerus, M.D., Washington University, 1961. (See Department of Medicine)

Garland R. Marshall, B.S., California Institute of Technology, 1962; Ph.D., Rockefeller University, 1966. (See Department of Physiology and Biophysics)


James C. Warren, A.B., University of Wichita, 1950; M.D., University of Kansas, 1954; Ph.D., University of Nebraska, 1961. (See Department of Obstetrics and Gynecology)

Associate Professors

Oscar P. Chilson, B.S., Arkansas State Teachers College, 1955; M.S., University of Arkansas, 1958; Ph.D., Florida State University, 1963. (Also Faculty of Arts and Sciences)

William F. Holmes, A.B., Princeton University, 1953; Ph.D., University of Pennsylvania, 1960. (See Biomedical Computer Laboratory)

Blake W. Moore, B.S., University of Akron, 1948; Ph.D., Northwestern University, 1952. (See Department of Psychiatry)

William R. Sherman, A.B., Columbia University, 1951; Ph.D., University of Illinois, 1955. (See Department of Psychiatry)

Assistant Professors

Wayne M. Barnes, A.B., University of California, 1969; Ph.D., University of Wisconsin, 1974.

William A. Frazier, A.B., Johns Hopkins University, 1969; Ph.D., Washington University, 1973. (See Department of Anatomy and Neurobiology)

David I. Gottlieb, B.A., State University of New York-Binghamton, 1964; M.A., University of Wisconsin, 1969; Ph.D., Washington University, 1971. (See Department of Anatomy and Neurobiology)

John J. Jeffrey, Jr., B.S., College of the Holy Cross, 1958; Ph.D., Georgetown University, 1965. (See Department of Medicine)

F. Scott Mathews, B.S., University of California, 1955; Ph.D., University of Minnesota, 1959. (See Department of Physiology and Biophysics)

Charles F. Morris, B.S., Baylor University, 1968; Ph.D., University of Wisconsin, 1973.

Stuart W. Weidman, A.B., Oberlin College, 1965; Ph.D., University of Wisconsin, 1971. (See Department of Anatomy and Neurobiology)

Research Assistant Professor


Instructors

William H. Holland, A.B., Washington University, 1950. (See Department of Psychiatry)


Lecturer

Walter G. Wiest, A.B., Brigham Young University, 1948; Ph.D., University of Wisconsin, 1952. (See Department of Obstetrics and Gynecology)
The James S. McDonnell Department of Genetics was formed in the fall of 1975 to offer a program of preclinical and graduate instruction in genetics. A medical genetics course in the second semester of the first year is designed to provide the student with a background in the basic principles of genetics and to introduce more advanced aspects of human and medical genetics. (Clinical training in genetics is offered in the fourth year by the Division of Medical Genetics of the Departments of Medicine and Pediatrics.)

The faculty of this new Department is still small. Currently its research and graduate training programs are concentrated primarily in the areas of immunogenetics and mammalian biochemical genetics. However, a substantial future growth of the Department is planned. As the Department expands, other areas of active genetic investigation and interest will be represented and a broader and more comprehensive program of research and graduate training opportunities will be developed. An advanced course in immunogenetics will be offered for the first time in the second semester. Additional courses will be developed in the future. Opportunities for research training and experience are available at all levels.
FIRST YEAR

Medical Genetics. An initial segment covers the fundamental principles of genetics. Later segments introduce more advanced topics, including population and quantitative genetics, clinical cytogenetics, biochemical genetics and metabolic defects, counseling, and immunogenetics. Lectures only. Credit 2 units.

RESEARCH

Bio 590. Research opportunities are offered in the following areas of genetics:

Structure and genetic control of cell membrane alloantigens. (Dr. Cullen)

Immunogenetics of products of the major histocompatibility complex. (Dr. David)

Biochemical population genetics. Kinetic analysis of isozymes. (Dr. Johnson)

Genetics of immune response. Mammalian biochemical genetics. (Dr. Shreffler)

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

ELECTIVE

Immunogenetics. Genetic and immunologic aspects of variant systems detected by immunologic methods: blood groups, allotypes, histocompatibility antigens. Genetic dissection of immunologic mechanisms.

Professor and Acting Head of Department

Associate Professors
Chella S. David, B.S., Berea College, 1961; M.S., University of Kentucky, 1962; Ph.D., Iowa State University, 1966.
George B. Johnson, B.A., Dartmouth College, 1964; M.A., 1966; Ph.D., Stanford University, 1972. (Also Faculty of Arts and Sciences)

Assistant Professor
Susan E. Cullen, B.S., College of Mount St. Vincent, 1965; Ph.D., Albert Einstein College of Medicine, 1971. (See Department of Microbiology and Immunology)

Research Assistant Professors
Miroslav Hauptfeld, M.D., University of Zagreb, 1963.
Vera Hauptfeld, Ph.D., Charles University, 1968.
The general medicine teaching services of the Department are located at Barnes Hospital, Jewish Hospital, St. Louis City Hospital (Starkloff Division), and Veterans Hospital (John Cochran Division) under the following directors:

Barnes Hospital
Dr. Kipnis
House Staff Training Program
Dr. Aach
Jewish Hospital
Dr. Peck
St. Louis City Hospital
Dr. Vavra

Veterans Hospital
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:

Bone and Mineral Diseases
Dr. Avioli
Cardiovascular Diseases
Drs. Sobel, Oliver
Dermatology
Dr. Eisen
Endocrinology and Metabolism  
*Dr. Daughaday*

Gastroenterology  
*Dr. Alpers*

Hematology-Oncology  
*Drs. Majerus, S. Kornfeld, Reinhard*

Immunology and Allergy Diseases  
*Drs. C. Parker, Little*

Infectious Diseases  
*Drs. Medoff, Liebhaber*

Laboratory Medicine  
*Dr. Jarett*

Medical Genetics  
*Dr. Sly*

Pulmonary Diseases  
*Drs. Pierce, Senior*

Renal Diseases  
*Drs. Klahr, Lubowitz*

Rheumatology  
*Dr. Atkinson*

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 the 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 prepared for supervised clinical study of individual patients. A junior clerkship of twelve weeks, divided into two six-week periods, is served on one of the medical services supervised by the Department. In the final year, students may elect a sub-internship in general medicine or select any of a series of elective courses offered in the various medical subspecialties.

**FIRST YEAR**

*Topics in Clinical Medicine.* This interdepartmental course is designed to stimulate student interest in clinical medicine through carefully selected and presented discussions of both the clinical and basic science features of a number of illnesses. The course director involves faculty from the several clinical departments in structuring the direction, content, and presentation of the subject. 

*(Dr. Kipnis and Staff)*

**SECOND YEAR**

Teaching by the Department of Medicine is designed to (a) prepare the student for the transition from the preclinical sciences to the study of the sick patient at the bedside, (b) help him analyze the manifestations of disease in terms of the altered mechanisms responsible for these manifestations, and (c) introduce him to the techniques of examination which are used regularly on all clinical services with the beginning of junior clerkships. This instruction is at times undertaken jointly with members of other clinical departments, and is coordinated when practicable with subject matter presented by the Department of Pathology.

(a) *Pathophysiology.* Selected topics in clinical medicine are discussed in detail to illustrate the application of biochemical, physiological, and anatomical information in the understanding of pathological states. Infectious, cardiovascular and renal, neurological, gastrointestinal, hematological, metabolic, nutritional, and developmental diseases are reviewed by an interdepartmental faculty. Emphasis is placed on the use of fundamental information in approaching clinical problems as a way of thinking in preparation for a lifetime of medicine, during which much new information will constantly be acquired. *(Department of Medicine Staff)*

(b) *Introduction to Clinical Medicine.* Directed toward the development of skills in the bedside data collection process, learning sessions in the format of lectures, smaller supervised self-examination laboratories, and small group bedside sessions are employed. Emphasis is given to the understanding of the patient, his interaction with disease, and the importance of the physician-patient
relationship. At the completion of the course the student is expected to have the skills necessary to participate profitably in the third-year activities as a member of the health care team. (Dr. Tuteur and Staff)

THIRD YEAR

General Medicine. Supervised study of patients on the medical nursing divisions of Barnes Hospital (both Blue and Red), Jewish Hospital, Starkloff City Hospital, and St. Louis Veterans Administration Hospital. Students are assigned in rotation as clinical clerks to the patients admitted to these services. Teaching is provided by attending physicians, house officers, consultants, and at regularly scheduled conferences. Formal instruction will be given in medical therapeutics during the junior clerkship. Students serve for six weeks on two of the five services. (Drs. Aach, Chase, Kipnis, Peck, Vavra, and Staff)

(a) Friday Noon Medical Clinics. Patients who have been studied by students working in the wards of Barnes Hospital are presented before the third- and fourth-year classes to illustrate medical problems of particular interest. (Dr. Kipnis and Staff)

(b) Clinical Pathological Conference. Abstracts of the clinical records of patients upon whom postmortem examinations have been performed are presented in advance to members of the third- and fourth-year classes and to members of the medical staff. At each conference the diagnosis is discussed in detail by the clinical staff before the anatomical findings are presented by the pathologists. (Dr. Kipnis and Medical Staff, Dr. Kissane and Pathology Staff)

FOURTH YEAR

Electives

Medical Sub-Internship. Medical sub-internships, in multiples of six weeks, are offered to a limited number of students on the following medical services: Barnes Hospital Blue Service, Jewish Hospital, Starkloff City Hospital, St. Louis Veterans Administration Hospital, and St. Luke's Hospital. Duties and responsibilities, including nights on call, will be 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 work load will be lighter than that for interns to insure ample time for reading about patients. 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 sub-internship should be especially valuable to students who plan to take straight medical internships and to those who plan to go directly into a specialty residency program without first serving an internship of any kind (e.g., neurology, psychiatry, etc.). (Drs. Aach, Chase, Kipnis, Peake, Vavra, and Staff)

Friday Noon Medical Clinics. Medical problems of particular interest. (Dr. Kipnis and Staff)

Clinical Pathological Conference. Thursdays, 12-1 p.m., September to June. (Dr. Kipnis and Medical Staff, Dr. Kissane and Pathology Staff)

Arthritic and Rheumatic Diseases. Clinical rheumatology. Students will participate in consultations, clinic, and inpatient practice. Laboratory experience also available. (Dr. Atkinson and Staff)

Cardiovascular Disease

(a) Clinical Cardiology. Barnes Hospital, six weeks, all day. Students are assigned to cardiac consultation service, coronary care unit, and heart station. (Dr. Ruwitch and Staff)

(b) Clinical Cardiology. St. Luke's Hospital, six weeks, all day. Students are assigned to intensive care service, the heart station, and the Radiology Department. (Dr. Paine)

(c) Clinical Cardiology. Jewish Hospital, six weeks, all day. Students have experience in seeing patients in consultation, reading electrocardiograms, and participating in activi-
ties of the Coronary Care Unit and the Graphics Laboratory. In addition, students may observe procedures in the cardiac catheterization laboratory.

(Drs. Kleiger, Krone, Oliver, and Staff)

(d) Research. Minimum of 12 weeks, all day.

1. Myocardial contractile proteins and assessment of metabolism and function in anoxic and ischemic isolated perfused hearts. (Dr. Henry)

2. Hemodynamics, myocardial mechanics, and ventricular function (cardiac catheterization). (Dr. Ludbrook)

3. Protection of ischemic myocardium in the experimental and clinical setting. (Dr. Roberts)

4. Detection, quantification, and assessment of the mediation of myocardial ischemic injury. (Dr. Sobel)

5. Ultrasonic assessment of cardiac metabolism. (Dr. Mimbs)

6. Assessment of myocardial metabolism with short-lived positron emitting isotopes. (Dr. Sobel)

7. Biochemistry and measurement of cardiac glycosides; studies of the enterohepatic circulation of digitoxin. Applications of radioimmunoassays to cardiology. (Dr. Oliver)

8. Application of digital computers for measuring left ventricular function and contractility. (Drs. Hieb, Krone, Oliver)

9. Experimental analysis of mechanisms of arrhythmia. (Dr. Corr)

Dermatology

(a) Clinical Clerkship. Students participate in both inpatient and 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. Connective tissue, macromolecular organization, degradation, and related problems. (Drs. Bauer, Eisen, Jeffrey, Seltzer)

2. Physiology and immunology of pathogenic fungi; molecular basis of morphogenesis and cellular differentiation in Histoplasma capsulatum; host-parasite interaction and experimental therapeutics in the systemic mycotic infections. (Dr. Kobayashi)

3. Inherited disorders of collagen metabolism. (Dr. Lichtenstein)
Gastroenterology
(a) Clinical Gastroenterology. Six weeks, all day. Students participate in the study of patients on whom consultations have been requested, receive instruction in specialized diagnostic techniques, and participate in the conferences and clinics run by the Division. (Dr. Zuckerman)

(b) Research. Minimum of 12 weeks, all day.
1. Clinically applied research on the hepatitis-associated antigen (HAA). (Drs. Aach, Perrillo)
2. Research on intestinal protein metabolism. (Dr. Alpers)
3. Research on lymphocyte function in intestinal disease. (Dr. R. MacDermott)

Genetics
(a) Clinical Genetics. Six weeks, all day. Students participate in evaluation of patients on whom consultations are requested, receive instructions in interpreting cytogenetics and other specialized laboratory information, and in techniques used in genetic counseling. (Dr. Sly and Staff)

(b) Research. Minimum of 12 weeks, all day.
1. Investigation of inherited amino acid transport defects. (Dr. Hillman)
2. Enzyme replacement therapy and lysosomal storage diseases. (Dr. Sly)
3. Chromosome disorders. (Dr. Sekhon)

Hematology and Oncology
(a) Clinical Hematology and Oncology. Six weeks, all day. Students receive intensive instruction in morphology, specialized diagnostic techniques, management of patients with hematologic and oncologic disorders. Two separate clerkships are offered. (Drs. S. Kornfeld, Majerus, Reinhard)

(b) Hemostasis, thrombosis, blood coagulation, and fibrinolysis. An “A” elective, sixth period. (Dr. Fletcher)

(c) Research. Minimum of 12 weeks, all day.
1. Biochemical studies of vitamin B₆ binding proteins. (Dr. Allen)
2. Biochemical studies of the regulation of DNA synthesis in normal and transformed mammalian cells. (Dr. Berger)
3. Normal and deranged iron metabolism. (Dr. Brown)
4. Investigation in fields of coagulation, thrombosis, fibrinolysis and hemostasis. (Dr. Fletcher)
5. Biochemistry of mammalian cell membranes. (Drs. R. Kornfeld, S. Kornfeld)
6. Biochemistry of platelets, regulation of lipid metabolism in tissue culture; mechanism of platelet thrombus formation. (Dr. Majerus)

Hypertension
Research. Individualized research project and/or participation in a community hypertension program. (Dr. Perry)

Immunology
Research. Minimum of 12 weeks, all day.
1. Research in areas of experimental immunotherapy of murine leukemias or detection and quantitation of cell membrane antigens by radioimmunoassay. (Dr. Little)
2. Research in clinical or basic immunology (cellular immunity, tumor immunity, lymphocyte and mast cell biochemistry). (Dr. C. Parker)

Infectious Disease
(a) Clinical Infectious Diseases. Study of ward and private patients. Barnes Hospital; six weeks, all day. (Drs. Gelb, Medoff)

(b) Research.
1. Integration-function of oncogenic virus DNA. Properties/localization of hepa-
titis B specific nucleic acids. Properties of varicella-zoster virus DNA and detection in latent infections. (Dr. Gelb)

2. Effective therapy for fungal infections, control of membrane permeability of fungi, normal and transformed animal cells, alteration and control of immunologic response to infection and tumors, drug studies on bacterial pathogens. (Dr. Medoff)

Laboratory Medicine

(a) Topics in Laboratory Medicine. An "A" elective, second period. A series of 12 seminars over a six-week period covering topics intended to demonstrate the role of laboratory medicine in the diagnosis and therapeutic management of disease. (Dr. Jarett and Staff)

(b) Clinical Laboratory Medicine. A "B" elective, periods four and six. Designed to acquaint the student with the proper use of the laboratory in clinical medicine and to expose the student to the basic operation of each area of the laboratory. (Dr. Jarett and Staff)

(c) Research.

1. Mechanism of insulin action particularly as it relates to the adipocyte. (Dr. Jarett)

2. Identification of lung cancer plasma membrane antigens absent from normal adult tissue. Further purification of a plasma membrane antigen highly associated with oat cell carcinoma of the lung. (Dr. Bell)

3. Clinical and analytical enzymology and computerized instrumentation. (Dr. Davis)

4. Research interests, both basic and clinical, involving studies of platelets and platelet function in hemostasis and thrombosis. (Dr. Joist)

5. Elaboration of physiological rationale for differences between activity and concentration of electrolytes, particularly calcium. (Dr. Ladenson)

6. Application of computer technology to Laboratory Medicine. (Dr. J. Lewis)

7. Purification of RNA polymerase I from resting and serum stimulated cells to determine if increased activity is due to changes in concentration of enzyme and/or change in its catalytic efficiency. (Dr. Mauck)


9. Research directed at mechanism of insulin action at the cellular level and application of cellular research in diagnostic and treatment of diabetics. (Dr. McDonald)

10. Metabolism of coagulation moieties, in particular fibrinogen and platelets of thrombus localization and of applied blood banking. (Dr. L. Sherman)

Metabolism and Endocrinology

(a) Clinical clerkship. Students see patients with endocrine and metabolic disease in the out-patient Metabolism Clinic and Barnes and Jewish Hospitals. Six weeks, all day. (Drs. Avioli, Daughaday, and Staff)

(b) Research. Minimum of 12 weeks, all day.

1. Mineral homeostasis: calcitonin, parathyroid and vitamin D. (Drs. Avioli, Birge, Haddad, Hahn)

2. Pituitary physiology; growth hormone, prolactin. (Drs. Daughaday, Jacobs)

3. Quantitation of vitamin D metabolites, calcitonin radioimmunoassay and isolation and quantitation of serum and tissue binding proteins for vitamin D and its metabolites. (Dr. Haddad)

4. Relationship of contractile proteins to hormone secretion. (Dr. Ostlund)
5. Clinical research in disorders of carbohydrate metabolism, studying patients with reactive hypoglycemia, and laboratory research in insulin biosynthesis—cell-free synthesis, isolation of pro-insulin messenger RNA.

(Dr. Permutt)

(c) Atherosclerosis and Hyperlipoproteinemia. An "A" elective, periods one, three, five, six and seven. Six lectures followed by discussions on concepts of atherogenesis, lipoprotein structure and production, lipoprotein catabolism and interactions with tissues, pathophysiology of dyslipoproteinemias, and diagnosis and treatment of hyperlipoproteinemia, coronary prevention programs.

(Dr. Schonfeld and Staff)

Pulmonary Disease and Function

(a) Medical Aspects of Pulmonary Disease. A "B" elective, periods three through eight. Elective offered at both Barnes and Cochran VA Hospital. (Drs. Pierce, Tuteur and Staff)

(b) Pulmonary Medicine. Six weeks. Students will work up patients and participate in teaching conferences and work rounds, Jewish Hospital.

(Dr. Senior)

(c) A "B" elective in Intensive Care Medicine offered in the MICU at Jewish Hospital, periods one through eight.

(Dr. Lefrak and Staff)

(d) Research.

1. Clinical research in various aspects of chronic obstructive pulmonary disease.

(Dr. Pierce)

2. Mechanisms of destruction and synthesis of pulmonary connective tissue.

(Dr. Senior)

Renal Disease

(a) Clinical Nephrology. Six weeks, all day. Study of patients with renal disease and electrolyte disorders.

(Drs. Klahr, Slatopolsky, and Staff)

(b) Renal and Electrolyte Disorders. Jewish Hospital, six weeks, all day.

(Dr. Lubowitz and Staff)

(c) Clinical Nephrology. City Hospital, six weeks, all day, periods two, three, five and seven. Emphasis placed on clinical nephrology and renal pathophysiology.

(Dr. Blondin)

(d) Mixed clinical and research electives.

1. Effects of phosphate depletion on glucose utilization, effects of PTH on carbohydrate intolerance of uremia, effects of PTH and phosphate depletion on peripheral glucose utilization, effect of uremia and dialysis on plasma catecholamine levels and gastrointestinal abnormalities associated with chronic renal disease, hemodialysis and renal transplantation.

(Dr. Harter)

2. Pathogenesis of glomerulonephritis with emphasis on experimental animal models and prevention of disease.

(Dr. Hoffsten)

3. Effects of parathyroid hormone on glucose metabolism by the liver. Studies on cyclic AMP metabolism by liver and kidney.

(Dr. Hruska)

4. Methodology of ion transport and principles of energy transfer and ion transfer.

(Dr. Klahr)

5. Pathophysiology of renal and electrolyte disorders, 12 weeks, all day.

(Drs. Lubowitz, Mazumdar, Malone)

6. Methodology used in transmission and scanning electron microscopy.

(Dr. Purkerson)

7. Radioimmunoassay for parathyroid hormone. Studies investigate interrelationships between vitamin D metabolites and parathyroid metabolism.

(Dr. Slatopolsky)

Busch Professor and Head of Department
David M. Kipnis, A.B., Johns Hopkins University, 1945; M.A., 1949; M.D., University of Maryland, 1951.

John E. and Adaline Simon Professor
Sydney M. and Stella H. Shoenberg Professor
Louis V. Avioli, B.A., Princeton University, 1953; M.D., Yale University, 1957.

Professor Emeritus
Carl G. Harford, A.B., Amherst College, 1928; M.D., Washington University, 1933. (Also Lecturer)

Professors
Elmer B. Brown, Jr., A.B., Oberlin College, 1946; M.D., Washington University, 1950. (See Administration)
Hugh Chaplin, Jr., A.B., Princeton University, 1943; M.D., Columbia University, 1947. (See Department of Preventive Medicine and Public Health)
William H. Danforth, A.B., Princeton University, 1947; M.D., Harvard University, 1951. (See Administration)
Arthur Z. Eisen (Dermatology), A.B., University of Buffalo, 1951; Sc.M., Brown University, 1953; M.D., University of Pennsylvania, 1957.
Leonard Jarett, B.A., Rice University, 1958; M.D., Washington University, 1962. (See Department of Pathology) (Director of Diagnostic Laboratories, Barnes Hospital)
M. Kenton King, B.A., University of Oklahoma, 1947; M.D., Vanderbilt University, 1951. (See Administration and Department of Preventive Medicine and Public Health)
Saulo Klahr, B.S., College of Santa Librada, 1954; M.D., Universidad Nacional de Colombia, 1959.
George S. Kobayashi (Microbiology), B.S., University of California, 1952; Ph.D., Tulane University, 1963. (See Department of Microbiology and Immunology)
Stuart A. Kornfeld, A.B., Dartmouth College, 1958; M.D., Washington University, 1962. (See Department of Biological Chemistry)
J. Russell Little, Jr., A.B., Cornell University, 1952; M.D., University of Rochester, 1956. (See Department of Microbiology and Immunology)

Philip W. Majorus, M.D., Washington University, 1961. (See Department of Biological Chemistry)
Gerald Medoff, A.B., Columbia College, 1958; M.D., Washington University, 1962. (See Department of Microbiology and Immunology)
Virginia Minnich, B.S., Ohio State University, 1937; M.S., Iowa State College, 1938.
Charles W. Parker, M.D., Washington University, 1953. (See Department of Microbiology and Immunology)
Gerald T. Perkoff, M.D., Washington University, 1948. (See Department of Preventive Medicine and Public Health and Division of Health Care Research)
H. Mitchell Perry, M.D., Washington University, 1946.
John A. Pierce, M.D., University of Arkansas, 1948.
Edward H. Reinhard, A.B., Washington University, 1935; M.D., 1939. (See Department of Radiology)
Gustav Schonfeld, A.B., Washington University, 1956; M.D., 1960. (See Department of Preventive Medicine and Public Health)
Robert E. Shank, A.B., Westminster College, 1935; M.D., Washington University, 1939. (See Department of Preventive Medicine and Public Health)
Laurence A. Sherman, B.A., B.S., University of Chicago, 1956; M.D., Albany Medical College, 1964. (See Department of Pathology)
Eduardo Slatopolsky, M.D., University of Buenos Aires, 1959.
William S. Sly, M.D., St. Louis University, 1957. (See Department of Pediatrics)
John D. Vavra, B.A., University of Colorado, 1950; M.D., Washington University, 1954. (Chief, Washington University Medical Service, Starkloff Hospital) (See Administration, Department of Preventive Medicine and Public Health, and Division of Health Care Research)
R. Dean Wochner, A.B., Arizona State University, 1956; M.D., Washington University, 1960. (Hospital Commissioner of St. Louis and Director of Health and Hospitals) (See Department of Preventive Medicine and Public Health)
Professor Emeritus (Clinical)
Clinton W. Lane (Dermatology), A.B., St. Mary's College, 1916; M.D., St. Louis University, 1921.

Professors (Clinical)
Michael M. Karl, B.S., University of Wisconsin, 1936; M.D., University of Louisville, 1938.
Edward Massie, A.B., Washington University, 1931; M.D., 1935.
Robert Paine, M.D., Harvard University, 1944.

Associate Professors
Bruce L. Brown, M.D., University of Rochester, 1947. (See Division of Health Care Research)
Lewis R. Chase, A.B., Princeton University, 1960; M.D., Harvard University, 1964. (Chief, Washington University Medical Service, Cochran VA Hospital)
Philip E. Cryer, B.A., Northwestern University, 1962; M.D., 1965. (Also Clinical Research Center)
Thomas F. Deuel, A.B., Princeton University, 1957; M.D., Columbia University, 1961. (See Department of Biological Chemistry)
Anthony P. Fletcher, B.M., University of London, 1943; B.S., 1943; M.D., 1949.
Samuel B. Guze, M.D., Washington University, 1945. (See Administration and Department of Psychiatry)
Craig M. Jackson, B.S., Washington State University, 1963; Ph.D., University of Washington, 1967. (See Department of Biological Chemistry)
John J. Jeffrey, Jr. (Dermatology), B.S., College of the Holy Cross, 1958; Ph.D., Georgetown University, 1965. (See Department of Biological Chemistry)
Ann J. Johanson (Visiting Staff), A.B., Washington University, 1956; M.D., University of Missouri, 1962.

Robert E. Kleiger, B.A., Yale University, 1956; M.D., Harvard University, 1960.
Harvey Liebhaber, A.B., New York University, 1953; M.D., 1957. (See Department of Microbiology and Immunology)
Herbert Lubowitz, A.B., Clark University, 1954; M.D., Washington University, 1958.
Philip R. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Radiology)
William V. Miller (Visiting Staff), A.B., University of Missouri, 1962; M.D., 1966. (See Department of Pathology)
Mabel L. Purkerson, A.B., Erskine College, 1951; M.D., Medical College of South Carolina, 1956. (See Administration and Department of Pediatrics)

Associate Professors Emeriti (Clinical)
Stanley F. Hampton, A.B., Washington and Lee University, 1930; M.D., Washington University, 1934.
William H. Olmsted, B.S., Coe College, 1909; M.D., Johns Hopkins University, 1913.
Harold Scheff, M.D., University of Toronto, 1931.

Associate Professors (Clinical)
Morton A. Binder, B.S., Yale University, 1948; M.D., Columbia University, 1951.
Ralph V. Gieselman, M.D., Washington University, 1947.
Neville Grant, A.B., Yale University, 1950; M.D., Columbia University, 1954.
Paul O. Hagemann, A.B., Washington University, 1930; M.D., 1934.
Marvin E. Levin, A.B., Washington University, 1947; M.D., 1951.
Virgil Loeh, Jr., M.D., Washington University, 1944. (See Department of Pathology)
Morris D. Marcus (Dermatology), M.D., Washington University, 1934.
Mary L. Parker, B.S., Florida State University, 1946; M.S., 1949; M.D., Washington University, 1953. (See Department of Preventive Medicine and Public Health) (University Health Service)
Ernest T. Rouse, B.S., Alabama Polytechnic Institute, 1939; M.D., Washington University, 1943.
Llewellyn Sale, Jr., A.B., Yale University, 1936; M.D., Washington University, 1940.
Burton A. Shatz, A.B., Washington University, 1940; M.D., 1943.
Franz U. Steinberg, M.D., University of Berne, 1938. (See Departments of Preventive Medicine and Public Health and Surgery)
Assistant Professors
John P. Atkinson (Howard Hughes Medical Institute Investigator in Medicine), A.B., Kansas University, 1965; M.D., 1969.
Eugene A. Bauer (Dermatology), B.S., Northwestern University, 1963; M.D., 1967.
C. Elliott Bell, Jr., B.S., Tulane University, 1960; M.D., 1964. (See Department of Pathology)
Dennis M. Bier, B.S., LeMoyne College, 1962; M.D., New Jersey College of Medicine, 1966. (See Department of Pediatrics)
Clifford A. Birge, A.B., Amherst College, 1956; M.D., Washington University, 1961. (See Division of Health Care Research)
Joan Blondin, B.S., Louisiana Polytechnic Institute, 1959; M.S., Cornell University, 1961; M.D., Louisiana State University, 1969.
Robert M. Bruce, A.B., Washington University, 1964; B.S., University of Minnesota, 1968; M.D., 1968.
John E. Buerkert, B.S., University of San Francisco, 1963; M.D., Marquette University, 1968.
Peter B. Corr (Pharmacology), B.S., Union University, 1971; Ph.D., Georgetown University, 1975. (See Department of Pharmacology)
James E. Davis, B.A., Occidental College, 1965; M.S., Duke University, 1969; Ph.D., 1970. (See Department of Pathology)
Ali Akbar Ehsani, M.D., Tehran University, 1965. (See Department of Preventive Medicine and Public Health)
Lawrence D. Gelb (Howard Hughes Medical Institute Investigator in Medicine), B.S., University of Michigan, 1963; M.D., Harvard University, 1967. (See Department of Microbiology and Immunology)
Andrew P. Goldberg, B.A., Clark University, 1965; M.D., State University of New York, Downstate, 1969. (See Department of Preventive Medicine and Public Health)
Bevra H. Hahn, B.Sc., Ohio State University, 1960; M.D., Johns Hopkins University, 1964.
Theodore J. Hahn, Jr., A.B., Princeton University, 1960; M.D., Johns Hopkins University, 1964.
Herschel R. Harter, B.S., Marquette University, 1962; M.D., Georgetown University, 1966.
Philip D. Henry (Established Investigator of the American Heart Association), M.D., University of Berne, 1960.
Geoffrey P. Herzig (Leukemia Society of America Scholar), B.S., University of Cincinnati, 1963; M.D., Western Reserve University, 1967.
John O. Hollaszy, M.D., Washington University, 1957. (See Department of Preventive Medicine and Public Health and Irene Walter Johnson Institute of Rehabilitation)
Keith A. Hruska, B.S., Creighton University, 1965; M.D., 1969.
Johann H. Joist, M.D., University of Cologne, 1962. (See Department of Pathology)
Ronald Krone (John E. Simon Scholar in Medicine), M.D., University of Chicago, 1966.
Anthony Kulczycki, Jr., A.B., Princeton University, 1966; M.D., Harvard University, 1970.
Jack H. Ladenson, B.S., Pennsylvania State University, 1964; Ph.D., University of Maryland, 1971. (See Department of Pathology)
Jack R. Lichtenstein (Howard Hughes Medical Institute Investigator in Medicine), M.D., University of Maryland, 1967.
Richard P. MacDermott (Howard Hughes Medical Institute Investigator in Medicine), B.A., Oberlin College, 1965; M.D., Ohio State University, 1969.
John C. Mauck, B.S., Purdue University, 1967; Ph.D., Washington University, 1971. (See Department of Pathology)
Debesh Mazumdar, M.B., All India Institute of Medical Sciences, 1964; B.S., 1964.
Jay M. McDonald, B.S., Tufts University, 1965; M.D., Wayne State University, 1969. (See Department of Pathology)
Robert C. McKnight, B.S., Florida State University, 1957; M.D., Washington University, 1961. (See Department of Radiology)
James W. Minnins, B.A., Emory University, 1965; M.D., Medical College of Georgia, 1969.
Richard E. Ostlund, Jr., (Elliott P. Joslin Research and Development Award of the American Diabetes Association), B.S., University of Utah, 1966; M.D., 1970.
Cary A. Presant, M.D., State University of New York at Buffalo, 1966. (See Department of Radiology)
Alan M. Robson, M.B.B.S., University of Durham, 1959; M.D., 1964. (See Department of Pediatrics)
John C. Rogers (American Cancer Society Junior Faculty Clinical Fellow in Hematology), B.S., University of Nebraska, 1966; M.S., 1968; M.D., 1968.
Julio V. Santiago, B.S., Manhattan College, 1963; M.D., University of Puerto Rico, 1967. (See Department of Pediatrics)
Michael L. Scher, A.B., Lafayette College, 1967; M.D., State University of New York, Downstate, 1971. (See Division of Health Care Research)
Benjamin D. Schwartz (Howard Hughes Medical Institute Investigator in Medicine), B.A., Columbia College, 1965; Ph.D., Albert Einstein College of Medicine, 1971; M.D., 1972. (See Department of Microbiology and Immunology)
Isaias Spilberg, B.S., University of San Marcos, 1956; M.D., 1963. (See Department of Preventive Medicine and Public Health)
Kongsak Tanphaichitr, M.D., Siriraj Hospital Medical School, 1970. (See Division of Health Care Research)
Peter G. Tuteur, A.B., Johns Hopkins University, 1962; M.D., University of Illinois, 1966.
Joseph L. Witztum, A.B., Vanderbilt University, 1965; M.D., Washington University, 1969. (See Department of Preventive Medicine and Public Health)
Gary R. Zuckerman, B.S., St. Louis College of Pharmacy, 1958; D.O., Kansas City College of Osteopathic Medicine, 1963.

Research Assistant Professor Emeritus
Anna R. Dubach, A.B., Bryn Mawr College, 1919; M.S., University of Colorado, 1935; Ph.D., 1938.

Research Assistant Professors
Elsa Bello-Reuss, B.A., University of Chile, 1957; M.D., 1964 (See Department of Physiology and Biophysics)
Janina M. Brajzburg, M.S., University of Lodz, 1950; Ph.D., 1968.
James G. Miller, A.B., St. Louis University, 1964; M.A., Washington University, 1966; Ph.D., 1969. (Also Faculty of Arts and Sciences)
Doris Rolf, A.B., Harris Teachers College, 1936.
Jean E. Russell, B.A., Cornell University, 1965; Ph.D., Rice University, 1970.
Shiu Y. Yu, B.S., Provincial College, 1951; M.S., Oklahoma State University, 1956; Ph.D., St. Louis University, 1963. Assistant Professors Emeriti (Clinical)
Samuel B. Grant, B.S., Washington University, 1918; M.D., 1920.
Morris Moore (Mycology-Dermatology), S.B., Boston University, 1928; A.M., Harvard University, 1929; Ph.D., Washington University, 1933.
Ray D. Williams, A.B., Hampden-Sydney College, 1930; M.S., Emory University, 1931; M.D., Washington University, 1937.
Keith S. Wilson, A.B., Williams College, 1930; M.D., Washington University, 1934. Assistant Professors (Clinical)
Morris Alex, B.S., University of Missouri, 1942; M.D., Washington University, 1943.
France Alexander, A.B., Indiana University, 1950; M.D., 1953. (Director, Medical Service, Homer G. Phillips Hospital)
Jack Barrow, M.D., Washington University, 1946.
Grace E. Bergner, A.B., Washington University, 1939; M.D., 1943.
John W. Berry, B.S., University of Toledo, 1943; M.D., St. Louis University, 1946.
Benjamin A. Borowsky, M.D., Washington University, 1958.
Francis J. Catanzaro, M.D., Washington University, 1948.
Arnold Dankner, M.D., Washington University, 1947.
John D. Davidson, A.B., Washington University, 1948; M.D., 1952.
Joseph C. Edwards, A.B., University of Oklahoma, 1930; M.D., Harvard University, 1934.
Arthur H. Gale, B.S., Washington University, 1955; M.D., University of Missouri, 1959.

Melvin L. Goldman, A.B., Washington University, 1939; M.D., 1943.


John M. Grant, A.B., Princeton University, 1950; M.D., Washington University, 1954.

William K. Hall (Dermatology), B.S., Yale University, 1939; M.D., Harvard University, 1942.


Bernard Hulbert, B.A., University of Wisconsin, 1938; M.D., 1941.

James H. Hutchinson, Jr., B.S., Arkansas A & M College, 1942; M.D., University of Arkansas, 1945.


Owen S. Kantor, M.D., University of Missouri, 1968.


John J. Kelly, B.S., Rockhurst College, 1959; M.D., St. Louis University, 1963.

Charles Kilo, M.D., Washington University, 1959.

Robert C. Kingsland, A.B., Washington University, 1933; M.D., 1937.

Norman P. Knowlton, Jr., B.S., Harvard University, 1942; M.D., 1945.

Phillip E. Korenblat, M.D., University of Arkansas, 1960.


David M. Lieberman, M.D., Vanderbilt University, 1949.


Warren M. Lonergan, A.B., Westminster College, 1936; M.D., Vanderbilt University, 1940.


Thomas F. Martin, B.S., St. Louis University, 1961; M.D., 1965. (See Biomedical Computer Laboratory)


Edward J. Miller, B.A., St. John's University, 1958; M.D., St. Louis University, 1962.


Gordon Newton, M.D., University of Arkansas, 1958.

James F. Nickel, A.B., University of Oklahoma, 1944; M.D., Washington University, 1948.


M. Norman Orgel, B.S., College of the City of New York, 1929; M.A., Harvard University, 1930; M.D., Washington University, 1934.


Kenneth C. Price, M.D., University of Washington, 1951.


Lester T. Reese (Dermatology), M.D., Tulane University, 1966.

Harold K. Roberts, B.A., Ohio State University, 1935; M.D., 1939.


James C. Sisk (Dermatology), A.B., Washington University, 1943; M.D., 1946.

Ross B. Sommer, A.B., Miami University, 1949; M.D., Cornell University, 1949.

J. Allen Thiel, B.S., Rockhurst College, 1956; M.D., St. Louis University, 1960.

Stanley M. Wald, M.D., Washington University, 1946.
Alvin S. Wenneker, A.B., Washington University, 1949; M.D., 1953.
Herbert B. Zimmerman, M.D., Washington University, 1951.

Instructors
Khwaja S. Ahmed, M.B., Lucknow University, 1953; B.S., 1953; M.D., 1958.
Greta Camel, A.B., University of Wisconsin, 1946; M.D., 1949.
Nicholas V. Costrini, B.S., Georgia State University, 1967; Ph.D., Marquette University, 1970; M.D., Medical College of Wisconsin, 1973.

Diane M. Karl, B.S., Bucknell University, 1966; M.D., Cornell University, 1970.
John H. Kissel, B.S., Georgetown University, 1967; M.D., Harvard University, 1971.
Milton S. Klein, B.S., McGill University, 1968; M.D., University of California, 1972.
Larry Kurz, B.S., Washington University, 1966; M.D., 1970; M.Div., Union Theological Seminary, 1974. (See Division of Health Care Research)
Robert P. Perrillo, B.S., Fordham University, 1966; M.D., Georgetown University, 1970.

Rodolphe Ruffy, M.D., University of Lausanne, 1968.
Frederick J. Schwartz, M.D., Washington University, 1974. (See Division of Health Care Research)
Kathleen B. Schwarz, B.A., Scripps College, 1964; M.A., Northwestern University, 1965; M.D., Washington University, 1972. (See Department of Pediatrics)

Elizabeth A. Stoddard, B.S., Montana State University, 1954; M.D., Washington University, 1957. (See Department of Preventive Medicine and Public Health)
Jouni Uitto, (Dermatology), B.M., University of Helsinki, 1965; M.D., 1970; Ph.D., 1970.

Research Instructor Emeritus
Teofil Kheim, M.D., University of Budapest, 1934.

Research Instructors

Joseph D. Byrne
Elaine M. Carlson, B.A., Northeastern University, 1966; M.S., Massachusetts Institute of Technology, 1968.
Mary C. Johnson, A.B., Washington University, 1938.

Seppo K. Lindy (Visiting Staff, Dermatology), M.D., University of Helsinki, 1968; B.M., 1969; Ph.D., 1970.
Ida K. Mariz, A.B., Washington University, 1940.

Shigeru Okada, M.D., Okayama University, 1964; Ph.D., 1969.
B. Seetharam, B.S., Mysore University, 1961; M.S., Bangalore University, 1965; Ph.D., 1972.
Jo L. Seltzer (Dermatology), A.B., Washington University, 1963; Ph.D., 1969.
Instructors Emeriti (Clinical)

Harry Agress, B.S., Washington University, 1932; M.D., 1932.
Louis F. Aitken, B.S., University of Illinois, 1923; M.D., Washington University, 1927.
James W. Bagby (Dermatology), A.B., University of Missouri, 1930; B.S.Med., 1931; M.D., Washington University, 1933.
Edward W. Cannady, A.B., Washington University, 1927; M.D., 1931.
Julius Ejson, M.D., Washington University, 1928.
Lee B. Harrison, A.B., University of Utah, 1925; M.D., Washington University, 1927.
J. Ted Jean, A.B., Indiana University, 1924; M.D., Washington University, 1928.
John W. Seddon, Ph.B., Yale University, 1931; M.D., Washington University, 1935.

Instructors (Clinical)

Ingrid R. Albert (Dermatology), A.B., Barnard College, 1967; M.D., Albert Einstein College of Medicine, 1971.
Walter M. Baumgarten, Jr., A.B., Washington University, 1935; M.D., 1939.
Frederick D. Bauschard (Dermatology), A.B., Allegheny College, 1964; M.D., University of Pittsburgh, 1968.
Aaron Birenbaum, M.D., Washington University, 1948.
John M. Cary, A.B., Central College, 1954; M.D., St. Louis University, 1958.
Margaret Chieffi, M.D., University of New Zealand, 1937.
Frank Cohen, M.D., University of Toronto, 1939.

Ralph Copp, Jr., A.B., Washington University, 1948; M.D., 1952.
Duane E. Cozart, Ph.B., University of Chicago, 1947; A.B., Washington University, 1949; M.D., Medical College of Virginia, 1959.
Norman W. Drey, A.B., Princeton University, 1932; M.D., Washington University, 1936.
David Feldman, M.D., Washington University, 1943.
Alfred Fleishman, B.S., Washington University, 1935; M.D., 1935.
B. Todd Forsyth, M.D., Washington University, 1947.
Ronald K. Grady, B.S., Purdue University, 1956; M.S., 1957; M.D., Washington University, 1966.
Axel R. Gronau, M.D., University of Naples, 1935.
David R. Haferman, B.A., Purdue University, 1961; M.D., University of Illinois, 1967.
Bruce J. Hookerman (Dermatology), A.B., Dartmouth College, 1964; M.D., St. Louis University, 1968.
Richard F. Huck, B.S., Notre Dame University, 1947; M.D., Washington University, 1948.
Myron H. Jacobs, B.A., Vanderbilt University, 1965; M.D., Louisiana State University, 1969.
David N. Kerr, A.B., University of Colorado, 1936; M.D., Washington University, 1941.
Melvin B. Kirstein, B.S., Indiana University, 1930; M.D., 1933.

Robert E. Koch, A.B., Washington University, 1936; M.D., 1940.


Ralph F. Kuhlman, M.D., University of Illinois, 1964. (Also Student Health Service)

Daniel K. Lane (Dermatology), B.A., Princeton University, 1955; M.D., Washington University, 1959.

Ellis S. Lipsitz, A.B., Yale University, 1940; M.D., St. Louis University, 1943.


Richard W. Maxwell, A.B., Greenville College, 1932; M.D., University of Chicago, 1937.

Oliver A. McKee (Dermatology), L.R.C.P., Royal College of Physicians and Surgeons, 1949; S.M., 1949.

Charles W. Miller (Dermatology), B.S., Trinity College, 1968; M.D., Washington University, 1972.

Austin F. Montgomery, M.D., University of Pittsburgh, 1954.


Lamar H. Ochs, A.B., Washington University, 1941; M.D., 1944.


Robert F. Owen, B.A., Princeton University, 1948; M.D., Yale University, 1952.

John A. Powell (Dermatology), B.S., University of Notre Dame, 1967; M.D., University of Michigan, 1971.

Vincent J. Proskey, B.S., University of Detroit, 1954; M.D., Marquette University, 1964.


Samuel E. Schechter, M.D., Washington University, 1941.

John S. Schoentag (Dermatology), A.B., University of Missouri, 1956; M.D., Washington University, 1960.
John B. Shapleigh II, M.D., Washington University, 1946.
John S. Skinner, M.D., Washington University, 1940.
Alan R. Spivack, A.B., Washington University, 1960; M.D., St. Louis University, 1964.
Paul M. Stein, A.B., University of Rochester, 1967; M.D., St. Louis University, 1971.
Arnold S. Tepper, B.S., St. Louis College of Pharmacy, 1966; M.D., University of Missouri, 1970.
Hugh R. Waters, B.S., Northwestern University, 1942; M.D., Washington University, 1945.
Herbert C. Wiegang, A.B., Washington University, 1940; M.D., 1943.
L. Dwight Wooster III, B.S., Wake Forest University, 1967; M.D., University of Virginia, 1971.

Research Associates
Ehud Ben-Galim, M.D., Hebrew University Hadassah Medical School, 1966.
Anthony S. Hajek, B.A., Lewis College, 1966; M.S., De Paul University, 1969; Ph.D., University of Iowa, 1974.
Buddhiraju V. Kumar, B.S., Osmania University, 1963; M.S., 1965; Ph.D., 1972.
Mary A. Lavin, B.S., St. Louis University, 1964; M.S., 1970; M.S., Harvard University, 1974.
Charles W. Lee, B.S., University of Chicago, 1959; M.S., 1960; Ph.D., Texas A & M University, 1966.
Alice Robinson, A.B., University of California, 1962.

Assistants
Robert L. Fletcher, B.A., University of Kansas, 1974; B.S., Johns Hopkins University, 1976.
(See Division of Health Care Research)
The Department teaches a one-semester introductory course in microbiology for first-year medical students and for graduate students. The course is concerned particularly with principles of microbial physiology and genetics, and of immunology and, through a limited survey of pathogenic bacteria, viruses, and fungi, attempts to prepare medical students for more advanced study of infectious diseases later in the curriculum. The Department also offers a number of advanced elective research activities. A limited number of summer research fellowships are available.

**FIRST YEAR**

*Medical Microbiology. Lectures and laboratory.* This course presents the basic principles relating to the growth and reproduction of bacteria and viruses and to the immune responses of the host to diverse substances, including pathogenic microbes and their metabolic products. The sequence followed is: immunology, microbial physiology and genetics, virology, and a survey of pathogenic bacteria and fungi. The immunology part of the course emphasizes structure, function, and biosynthesis of antibodies, and provides an introduction to cell-mediated
immune responses. In terms of these concepts, specific groups of pathogenic organisms and viruses are considered. The interaction between host and parasite is studied by analyzing wherever possible the molecular basis for the pathogenicity of the microbe and for the immune reactions of man. The factors that make microorganisms vulnerable or resistant to chemotherapeutic agents are emphasized. Credit 6 units.  

Individuals other than medical students may register for limited parts of the course (see listing for the Division of Biology and Biomedical Sciences: under Bio 517, General Immunology, 2 units; Bio 523, Microbial Physiology and Genetics, 1 unit; Bio 529, Virology, 1 unit; Bio 533, Pathogenic Microbiology, 2 units).

**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) Processing and decay of RNA in E. coli and mammalian cells, normal and malignant. Differentiation-activation of unexpressed genes in mammalian cells. (Dr. Apirion) Mechanisms of gene transposition in bacteria. (Dr. Berg) Polymorphism of Ir (immune response) gene products is being studied by chemical means with the aim of relating structure to function. (Dr. Cullen) Lymphocyte receptor molecules; role of T lymphocytes in B cell differentiation. (Dr. Davie) Structure and biosynthesis of antibodies; molecular genetics of antibody formation. (Dr. Fleischman) Biochemistry of tumor viruses, varicella-zoster, and hepatitis B virus. (Dr. Gelb) The genetics and immunology of tissue transplantation. Studies of tumor immunology. (Dr. Graff) Biochemistry and genetics of macromolecule regulation: mRNA metabolism in bacteria; regulation of catabolism in cultured mammalian cells. (Dr. Kennell) Immunology and biochemistry of the medically important fungi; in particular the dimorphic organism, *Histoplasma capsulatum*; host-parasite interaction of opportunistic fungus diseases. (Drs. Kobayashi, Medoff) The structure and biosynthesis of lymphocyte cell surface antigens and lymphocyte triggering mechanisms. The effects as adjuvants in modulating the immune response. (Dr. Little) Differentiation and function of mononuclear phagocytes. (Dr. Lin) Development of therapy for intracellular bacterial and fungal infections. (Drs. Kobayashi, Medoff) Tumor immunotherapy. Establishment of animal models of human malignancy. (Dr. Medoff) Cellular immunology, drug hypersensitivity, immune tolerance, radioimmunoassays, tumor immunology, and immediate hypersensitivity. (Dr. Parker) Molecular biology of defective interfering particles (DI) of vesicular stomatitis virus, with emphasis on the mechanism of DI-mediated virus persistence and virus genome replication. (Dr. Perrault) Mechanisms regulating immune responses in tissue culture systems. (Dr. Pierce) Biochemistry and replication of oncogenic adenoviruses. (Dr. Raskas) Interactions between RNA animal viruses and their host cells. Emphasis on maturation and assembly of viral proteins. The immune response to viruses: formation and properties of infectious viral-antibody complexes. (Dr. M. Schlesinger) Structure and replication of enveloped RNA animal viruses. (Dr. S. Schlesinger) RNA processing and the balance of RNA synthesis and degradation in bacteria and mammalian cells. (Dr. D. Schlessinger)
Structure-function relationships of transplantation antigens and immune response region associated antigens. (Dr. Schwartz)
The structure of the polymeric immunoglobulins, IgA, and IgM. Present emphasis is focused on the structure of J chain and its role in the polymerization of IgA. Effects of acute and chronic viral infections on immunocompetence. (E. Simms)
Clinical microbiology, anaerobes, endogenous infections; enterics and enteric infections. (Dr. Sonnenwirth)

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. In the latter, each student has an opportunity to integrate various disciplines of modern molecular biology into the area of biology or medicine that is of particular interest to him. Those courses most relevant to the field of microbiology are listed under the Division of Biology and Biomedical Sciences.

Bio 521. Cellular Aspects of the Immune Response. The mechanisms of regulation of immune responses by antigen, macrophages, T cells, B cells and their products will be discussed. The material covered will vary in emphasis from year to year and will stress critical analysis of the literature. Credit 2 units.
(Dr. Pierce)

Bio 539. Topics in Animal Virology. Molecular Biology of DNA and RNA animal viruses, with emphasis on viral replication and viral-induced transformation of cells in tissue culture and slow viral diseases in animals. Credit 3 units.
(Drs. M. Schlesinger, S. Schlesinger)

Bio 543. Molecular Biology of Bacterial Viruses. Structure of bacterial viruses and metabolism of the infected cell, with emphasis on the genetics of host and virus controlled functions. Relationships of virus to cell, e.g., lysogeny, immunity, and virulence, with emphasis on Lambda and T-even bacteriophages. Lectures and seminars. Offered in alternate years. Credit 3 units.
(Drs. Berg, Kennell)

Bio 549. Antibodies: Structure, Function, and Formation. The principal features of the structure and function of antibody molecules will be examined in lectures, assigned reading of current research papers, and in student seminar presentations. Emphasis will be placed on the genetic and molecular events which govern the appearance of antibodies during the immune response.
(Drs. Fleischman, Little, Simms)

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

Joseph M. Davie, A.B., Indiana University, 1962; M.A., 1964; Ph.D., 1966; M.D., Washington University, 1968. (See Department of Pathology)

Professors

David E. Kennell, A.B., University of California, 1955; Ph.D., 1959.
J. Russell Little, Jr., A.B., Cornell University, 1952; M.D., University of Rochester, 1956. (See Department of Medicine) (Jewish Hospital)
Charles W. Parker, M.D., Washington University, 1953. (See Department of Medicine)
Carl W. Pierce, A.B., Colgate University, 1962; Ph.D., M.D., University of Chicago, 1966. (See Department of Pathology) (Jewish Hospital)
Milton J. Schlesinger, B.S., Yale University, 1951; M.S., University of Rochester, 1953; Ph.D., University of Michigan, 1959.
Sondra Schlesinger, B.S., University of Michigan, 1956; Ph.D., 1960.
Simon D. Silver, B.A., University of Michigan, 1957; Ph.D., Massachusetts Institute of Technology, 1962. (Also Faculty of Arts and Sciences)
Alexander C. Sonnenwirth, A.B., University of Nebraska, 1950; M.S., Purdue University, 1953; Ph.D., Washington University, 1960. (See Department of Pathology) (Jewish Hospital)

Assistant Professors

Susan E. Cullen, B.S., College of Mt. St. Vincent, 1965; Ph.D., Albert Einstein College, 1971. (See Department of Genetics)
Lawrence D. Gelb, B.S., University of Michigan, 1963; M.D., Harvard University, 1967. (See Department of Medicine)
Ralph J. Graff, A.B., Washington University, 1957; M.D., 1957. (See Department of Surgery)
Judith A. Kapp-Pierce, B.A., Miami University, 1965; M.S., Indiana University, 1969; Ph.D., Harvard University, 1976. (See Department of Pathology) (Jewish Hospital)
Harvey Liebhaber, A.B., New York University, 1953; M.D., 1957. (See Department of Medicine) (Jewish Hospital)
Hsin-san Lin, M.D., Taiwan University, 1960; Ph.D., University of Chicago, 1968. (See Department of Radiology)
Jacques Perrault, B.S., McGill University, 1964; Ph.D., University of California, 1972.
Benjamin D. Schwartz, B.A., Columbia College, 1965; Ph.D., Albert Einstein College, 1971; M.D., 1972. (See Department of Medicine)

Research Assistant Professors

Takashi Kasai, B.S., University of Tokyo, 1959; M.S., 1961; Ph.D., 1964.
David W. Thomas, B.A., University of Kansas, 1969; Ph.D., University of Colorado, 1975. (See Department of Pathology) (Jewish Hospital)

Research Instructor

David E. Briles, B.A., University of Texas, 1967; Ph.D., Rockefeller University, 1973.

Research Associate


Research Assistants

John Courtney, A.B., University of Illinois, 1953.
Richard J. McDonald
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 provided by the Departments of Anatomy and Neurobiology and Physiology and Biophysics. In the second year, the Department is the major contributor to an interdepartmental course in Pathophysiology of Nervous System Disorders. Here are demonstrated the interrelationships between knowledge derived from basic investigative and from clinical sources. In addition, there are lectures and exercises with patients in neurological physical diagnosis. Third-year activities are based on a full-time inpatient and outpatient clerkship in clinical neurology. In the fourth year, there are opportunities for clinical externships and for investigation of nervous system functioning in every aspect.

SECOND YEAR

Neurological Examination in Clinical Diagnosis (part of interdepartmental course in clinical diagnosis). Lectures, demonstrations, and practice examinations of neurological patients. (Dr. Eliasson and Staff)
Pathology of Nervous System Disorders (part of course in pathophysiology). A collaborative sequence with other clinical and basic science departments concerned with diseases of the nervous system. Lectures and seminar-symposia.

(Dr. Eliasson and combined Neurology-Neurosurgery Staff)

THIRD YEAR

Neurology. A full-time, three-week clerkship is provided on the neurology services at Barnes and City Hospital-Starkloff Memorial. Patients are assigned to students, who follow them with the resident staff and discuss them regularly in conferences with the senior staff. Students also work in the neurology clinics under staff supervision.

(Drs. Eliasson, Landau, and Staff)

FOURTH YEAR

Electives

Research. A 12-week elective is available in many areas such as neuroanatomy, including electron microscopy, clinical and experimental neurophysiology, cerebral metabolism and circulation, neurochemistry, 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. Goldring, Landau and combined Neurology-Neurosurgery Staff)

Clinical Neurology. A six-week elective neurology clerkship is offered at Starkloff Hospital. There the student works as a member of the clinical team, assumes responsibility for patients, and works in the clinic. Formal teaching conferences are provided in addition to regular teaching rounds.

(Dr. Chesanow and Staff)

Another six-week elective is offered at Barnes Hospital. The student works directly with the chief resident and senior staff covering consultations at Barnes and Jewish hospitals. Selected reading assignments on current topics in neurology are made.

(Dr. Black 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. Goldring 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 afternoon. The Conference is held in Clopton Amphitheatre at 1:30 p.m. except on the second Wednesday of each month, when it is held at City Hospital-Starkloff Memorial at 1:45 p.m. in the third floor conference room. The format of the conferences includes clinical presentations, symposia, and CPCs. Neurosurgery Grand Rounds are held weekly at 4:00 p.m. on Friday. Neuropathology brain cutting conferences are held in the Pathology Department on Monday at 1:00 p.m. and in the Starkloff Hospital autopsy conference room on Thursday at 12:30 p.m.

Co-Heads of Department
Sidney Goldring, William Landau

NEUROLOGY

Professor and Head

Sear Professor of Clinical Neuropsychology
James A. Ferrendelli, A.B., University of Colorado, 1958; M.D., 1962. (See Department of Pharmacology)

Allen P. and Josephine B. Green Professor of Pediatric Neurology
Arthur L. Prensky, A.B., Cornell University, 1951; M.D., New York University, 1955. (See Department of Pediatrics)

Professors
Michael H. Brooke, M.B., B.Ch., Cambridge University, 1958.
Ronald M. Burde, B.S., Massachusetts Institute of Technology, 1960; M.D., Jefferson Medical College, 1964. (See Department of Ophthalmology)

Margaret H. Clare (Neurophysiology), B.S.Ed., Southeast Missouri State Teachers College, 1940; M.A., Washington University, 1951.

Philip R. Dodge, M.D., University of Rochester, 1948. (See Department of Pediatrics)

Sven G. Eliasson, Ph.D., University of Lund, 1952; M.D., 1954. (See Department of Preventive Medicine and Public Health and Irene Walter Johnson Institute of Rehabilitation)

Edward E. Vastola, B.S., Yale University, 1945; M.D., Columbia College of Physicians and Surgeons, 1947. (Starkloff Hospital)

Professor Emeritus (Clinical)

Irwin Levy, A.B., Cornell University, 1927; M.D., St. Louis University, 1931; D.M.S., Columbia University, 1935.

Professor (Clinical)


Associate Professors

Lawrence A. Cohen, B.S., Western Reserve University, 1948; M.D., 1954; M.A., Northwestern University, 1951.

Darryl C. DeVivo, B.A., Amherst College, 1959; M.D., University of Virginia, 1964. (See Department of Pediatrics)

Marvin A. Fishman, B.S., University of Illinois, 1959; M.D., 1961. (See Departments of Pediatrics and Preventive Medicine and Public Health, and Irene Walter Johnson Institute of Rehabilitation)

Alan L. Pearlman, A.B., State University of Iowa, 1958; M.D., Washington University, 1961. (See Department of Physiology and Biophysics)

Marcus E. Raichle, B.S., University of Washington, 1960; M.D., 1964. (See Department of Radiology)

W. Thomas Thach, Jr., A.B., Princeton University, 1959; M.D., Harvard University, 1964. (See Department of Anatomy and Neurobiology)

Joseph J. Volpe, B.A., Bowdoin College, 1960; M.D., Harvard University, 1964. (See Department of Pediatrics)

Associate Professor Emeritus (Clinical)

Andrew B. Jones, M.D., Vanderbilt University, 1916.

Associate Professors (Clinical)


Earl R. Schultz, A.B., Southeast Missouri State College, 1952; B.S.Med., University of Missouri, 1953; M.D., Washington University, 1955. (See Department of Psychiatry)


Assistant Professors

James E. Carroll, B.S., University of Louisville, 1966; M.D., 1969.

Robert L. Chesnaw, B.S., Union College, 1955; M.D., Albany Medical College, 1960. (Starkloff Hospital)

Robert C. Collins, B.A., University of California-Berkeley, 1964; M.D., Cornell University, 1969. (Starkloff Hospital)

Ruthmary K. Deuel, B.A., Mount Holyoke College, 1956; M.D., Columbia College of Physicians and Surgeons, 1961. (See Department of Pediatrics)

W. Edwin Dodson, A.B., Duke University, 1963; M.D., 1967. (See Department of Pediatrics)

Joseph Hanaway, B.A., McGill University, 1956; M.D., 1960; C.M., 1960. (See Department of Anatomy and Neurobiology)

Charles P. Hughes, B.A., Yale University, 1960; M.D., Case Western Reserve University, 1964.


Research Assistant Professor


Assistant Professor Emeritus (Clinical)

Archie D. Carr, B.S., Washington University, 1918; M.D., 1921.

Assistant Professors (Clinical)

Joseph T. Black, B.A., University of Rochester, 1961; M.D., Upstate Medical Center, Syracuse, 1965.
Joseph M. Dooley, Jr., B.S., St. Louis University, 1954; M.D., 1958.

Instructors
Charles S. C. Chang, B.S., Johns Hopkins University, 1968; M.D., 1972. (See Department of Pediatrics)
Mary I. Johnson, B.S., Washington State University, 1964; M.D., Johns Hopkins University, 1968. (See Departments of Anatomy and Neurobiology and Pediatrics)

Instructor (Clinical)
Robert J. Mueller, M.D., Washington University, 1936; M.S., University of Michigan, 1942.

Research Assistants
Joseph Inukai (See Neurological Surgery)
JoAnne D. Scarpellini
Lloyd N. Simpson (See Neurological Surgery)
Jeanne M. Smith

NEUROLOGICAL SURGERY

Professor and Head
Sidney Goldring, B.S., Washington University, 1943; M.D., 1947.

August A. Busch, Jr., Professor
Henry G. Schwartz, A.B., Princeton University, 1928; M.D., Johns Hopkins University, 1932.

Professor
William S. Coxe, B.S., Hampden-Sydney College, 1945; M.D., Johns Hopkins University, 1948.

Professor Emeritus (Clinical)
Leonard T. Furlow, B.A., Emory University, 1923; M.D., 1925.

Associate Professors
Robert L. Grubb, Jr., A.B., University of North Carolina, 1961; M.D., 1965. (See Department of Radiology)

Assistant Professor
Shi H. Huang, B.M., National Taiwan University, 1946; M.D., 1951.

Instructor

Research Assistants
Isaac A. Edwards
Joseph Inukai (See Neurology)
Carl S. Pieper
Lloyd N. Simpson (See Neurology)
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 pelvic viscera, structural disorders secondary to difficult childbirth, reproductive endocrinopathies and infertility, and gynecologic malignancies. The entire junior clerkship is conducted in the East Pavilion of Barnes Hospital. Senior electives may be taken at Barnes Hospital or in the many affiliated hospitals in St. Louis. Regularly held conferences in reproductive biology, perinatal medicine, ob-gyn pathology, and oncology supplement the student's education.

SECOND YEAR
The sophomore is introduced to Obstetrics and Gynecology with lectures in reproductive biology touching on pelvic anatomy, physiology of tubal transport and ovarian control, myometrial function, placental perfusion, and steroidogenesis.

THIRD YEAR
Students are each assigned to a resident-senior staff team, and the residents and staff
physicians serve as preceptors during the students' six-week stay in the Department. Every woman seen in the office or cared for in the hospital by the team of physicians is considered in her entirety. Attention is paid to the manner in which her social and economic situation has modified her response to disease. Environmental manipulation, in addition to the traditional ways of medical care, is resorted to in attempting to improve her health. The team method ensures that personalized care is given by arranging for the same group of physicians to meet a woman's health needs during each visit. The residents in a team function like a group in obstetrics and gynecology practice, and the student works like an intern in the specialty. He sees patients in the office with his resident group, attends deliveries, assists in surgery, and goes to conferences and night call with them.

FOURTH YEAR

Seniors wishing to take an externship or research elective can choose from a variety of courses:

Ob-Gyn Externships

_Endocrinology-Infertility Externship._ In the office and hospital, the extern participates in the study and treatment of women with reproductive endocrine disorders and infertility. He 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. Warren)

_Pathology Externship._ 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. Askin)

_Gyn Oncology._ 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. Camel)

_Perinatal Medicine._ Electronic and biochemical surveillance of the human fetus and mother before and during parturition. The extern is involved in the care of women with gestations at risk (i.e., diabetes, hypertension, toxemia, renal disease, fetopelvic disproportion, etc.). (Dr. Sauvage)

_Ob-Gyn Preceptorship._ The student spends six weeks with a clinical faculty member who is in private practice. He makes hospital rounds and operates with his preceptor at Barnes and other community hospitals. He becomes familiar with the experiences of the private practitioner. (Dr. Warren)

General Ob-Gyn Externships

_Homer G. Phillips Hospital_ (Dr. Monat)
_Jewish Hospital_ (Drs. Soule, Burstein)
_St. Louis County Hospital_ (Dr. Wulff)

The externship in each of these affiliated hospitals allows the student a greater degree of participation and responsibility in the care of patients. There is a wealth of clinical material in each of these facilities.

Research Electives

_Molecular Aspects of Endocrinology and Population Control._ The research involves the study of the topography of macromolecular steroid binding sites, evaluation of the role of steroid "receptor" proteins in molecular mechanisms of steroid action, and the synthesis of affinity-labeling steroids and anti-steroids and their application to disease states and population control. (Dr. Warren)

_Stereoids in Reproductive Physiology._ The endeavor examines the qualitative and quantitative nature of steroidogenesis in the ovary and the eventual secretion of steroid hormones from the gland. Definition of the
role of progesterone in the establishment and maintenance of pregnancy in human beings and in experimental animals is also attempted.  

(Dr. Wiest)

**Regulation of Placental Hormone Synthesis.**

Our laboratory is concerned with studying the factors regulating the biosynthesis of protein hormones in the placenta, human placental lactogen (hPL), and human chorionic gonadotropin (hCG). The appearance of these hormones in maternal serum differs markedly. For these studies the template mRNAs have been isolated and we are generating complementary DNAs to the corresponding mRNAs. These DNA probes will be used to assay gene activities in normal and pathological tissues. Students will be concerned with the concepts and techniques of molecular biology as applied to the above research.  

(Dr. Boime)

**Sperm Biochemistry and Andrology.**

Research is performed which is aimed at the understanding and control of the molecular events which allow for sperm penetration of the ovum. Investigations into male infertility centering on sperm motility, bacteriological considerations, and freezing of semen are also conducted.  

(Dr. Polakoski)

**Bio-Organic Chemical Endocrinology.**

The mechanism of steroid hormone action at the molecular level is approached by producing new progesterone and estrogen analogs by organic synthesis. The student can work at the organic synthetic or biochemical level. Isolation of uterine estrogen and progesterone receptor proteins by a newly synthesized affinity chromatography system is in progress. Also, new steroids containing alkylating functional groups are synthesized and have a dual research role: to serve as tools with which to probe the steroid-macromolecular binding phenomenon and to produce biologically active steroids with persistent hormone activity or hormone blocking action. Physicochemical methods are used to study steroid-protein interaction.  

(Dr. Sweet)

**Professor and Head of Department**

James C. Warren, A.B., University of Wichita, 1950; M.D., University of Kansas, 1954; Ph.D., University of Nebraska, 1961. (See Department of Biological Chemistry)

**Professor Emeritus**


**Professors**

Arpad I. Csapo, M.D., University of Szeged, 1941.

Walter G. Wiest, A.B., Brigham Young University, 1948; Ph.D., University of Wisconsin, 1952. (See Department of Biological Chemistry)

**Professors Emeriti (Clinical)**

A. Norman Arncson, B.S., Texas Christian University, 1924; M.D., Washington University, 1928. (See Department of Radiology)

John E. Hobbs, A.B., Southwest Missouri State Teachers College, 1923; M.D., Washington University, 1927.

Melvin A. Roblee, B.S., Washington University, 1923; M.D., 1925.

Grandison D. Royston, M.D., Washington University, 1907.

Samuel D. Soule, M.D., Washington University, 1928.

**Professor (Clinical)**

William H. Masters, B.S., Hamilton College, 1938; M.D., University of Rochester, 1943.

**Associate Professors**

Fernando Arias, M.D., National University at Bogota, 1958; Ph.D., Tulane University, 1965.

H. Marvin Camel, M.D., Creighton University, 1950.

Ernst R. Friedrich, M.B., University of Berlin, 1951; M.D., University of Heidelberg, 1954.

James D. Jones II, B.S., Louisiana State University, 1940; D.D.S., Loyola University of the South, 1945; M.D., University of Alabama, 1957.

Jacques Sauvage, B.S., University of Liege, 1953; M.D., 1957.

**Research Associate Professor**

Frederick Sweet, B.S., City University of New York, 1960; Ph.D., University of Alberta, 1968.
Associate Professor Emeritus (Clinical)
George J. L. Wulff, Jr., A.B., Washington University, 1929; M.D., 1933.

Associate Professors (Clinical)
Charles R. Gulick, A.B., Central College, 1940; M.D., St. Louis University, 1943.
David Rothman, B.S., Washington University, 1935; M.D., 1935.

Assistant Professors
Irving Boime, B.S., St. Louis College of Pharmacy, 1964; M.S., Purdue University, 1966; Ph.D., Washington University, 1970. (See Department of Pharmacology)
James P. Crane, A.B., Indiana University, 1966; M.D., 1970.
Ming-Shian Kao, M.D., National Taiwan University Medical College, 1961.
David W. Keller, B.S., Canisius College, 1960; M.D., University of Buffalo, 1964.

Research Assistant Professors
W. Bruce Currie, B.S., Massey University, 1968; M.S., 1970; Ph.D., Macquarie University, 1975.
Kenneth V. Polakoski, B.S., Wisconsin State University, 1966; M.S., University of Georgia, 1971; Ph.D., 1972.

Assistant Professors Emeriti (Clinical)
Kevin C. Morrin, M.B., B.Ch., National University of Ireland, 1921.
Willard C. Scrivner, B.S., Washington University, 1926; M.D., 1930.
Helman C. Wasserman, A.B., Johns Hopkins University, 1928; M.D., Washington University, 1932.

Assistant Professors (Clinical)
Raymond C. Doucette, A.B., Bowdoin College, 1960; M.D., C.P.M., McGill University Faculty of Medicine, 1964.

Arthur T. Esslinger, M.D., Washington University, 1940.
S. Michael Freiman, A.B., Montana State University, 1951; M.D., Washington University, 1955.
Andrew Galakatos, B.S., St. Louis College of Pharmacy, 1960; M.D., University of Missouri, 1965.
A. Herman Hutto, A.B., University of Alabama, 1932; M.D., Washington University, 1935.
Frank B. Long, Jr., M.D., Washington University, 1947.
Laurence E. Maze, M.D., Washington University, 1948.
James Pennoyer, B.S., Hobart College, 1933; M.D., University of Rochester, 1939.
Marvin Remmard, A.B., Washington University, 1947; B.S., University of Missouri, 1950; M.S., 1950; M.D., Washington University, 1952.
Melvin M. Schwartz, A.B., University of Nebraska, 1945; M.D., 1947.
William L. Smiley, A.B., Ohio State University, 1933; M.D., 1937.
M. Bryant Thompson, A.B., Eastern New Mexico University, 1957; M.D., University of California, 1961.


Carol F. Williams, B.A., University of Tennessee, 1952; M.D., 1955.

Seth E. Wissner, A.B., Washington University, 1942; M.D., 1945.

Instructors

George C. Andrinopoulos, M.D., Athens University, 1966.

Michael J. Gast, B.S., University of Illinois, 1970; M.D., Ohio State University, 1973.

Salma Saifee, M.D., University of Sind, 1961.

Chotchai Srisuro, M.D., Faculty of Medical Sciences, 1967.

Research Instructor

Chang-chcn Chin, B.S., National University, 1944; Ph.D., Oklahoma State University, 1967.

Instructors Emeriti (Clinical)

Hubert L. Allen, A.B., University of Kansas, 1932; M.D., Tulane University, 1936.

Paul F. Max, B.S., Washington University, 1932; M.D., 1932.

Frances H. Stewart, M.D., Washington University, 1927.

Instructors (Clinical)


Joe E. Belew, A.B., Central College, 1953; M.D., St. Louis University, 1957.

Bryce H. Bondurant, A.B., Northeast Missouri State Teachers College, 1936; D.O., Kirksville College of Osteopathy and Surgery, 1940; M.D., Washington University, 1943.


Ira C. Gall, B.S., University of Cincinnati, 1948; M.D., 1951.

Gordon M. Goldman, B.S., Toledo University, 1962; M.D., St. Louis University, 1966.


Godofredo M. Herzog, B.S., Louisiana State University, 1953; M.D., Washington University, 1957.

Jacob Klein, B.S., Muhlenberg College, 1964; M.D., Jefferson Medical College, 1968.

Alfred B. Knight, B.S., Massachusetts Institute of Technology, 1968; M.D., Case Western Reserve University, 1972.


Justin F. Kraner, M.D., University of Michigan, 1949.


F. Delbert Moeller, B.S., Muskingum College, 1965; M.D., Ohio State University, 1969.

Sam Montazee, M.D., Shiraz Medical School, 1961.


Gerald Newport, A.B., Washington University, 1948; M.D., 1953.


Jonathan R. Reed, B.A., Fisk University, 1956; M.D., Meharry Medical College, 1965.

Alexander M. Roter, A.B., University of Illinois, 1948; M.D., 1951.

James Sawyer, A.B., Ohio State University, 1949; M.D., 1951.

Arthur A. Smith, B.A., Southwest Missouri State University, 1952; M.S., University of Arkansas, 1954; M.D., St. Louis University, 1958.

Herman Taute, M.D., Phillips University, 1954.

Bernice A. Torin, A.B., Washington University, 1937; M.D., 1941.

Parker H. Word, B.S., Virginia State College, 1941; M.D., Howard Medical School, 1944.

Mitchell Yanow, M.D., Washington University, 1941.
Instruction begins in the second year with methods of examination of the eye. Emphasis is placed on the use of the ophthalmoscope. During the second year a series of nine didactic lectures is given as an introduction to various aspects of ocular disease. During the third year students are assigned to an ophthalmology clerkship for one week. In the fourth year, a six-week ophthalmology elective is offered to senior students, which affords opportunity for work with patients under supervision.

SECOND YEAR

Ophthalmology. Lectures and demonstrations in the basic principles of ophthalmology.

(Staff)

THIRD YEAR

Ophthalmology. All students rotate through the Eye Clinic for a one-week clinical clerkship.

(Staff)

FOURTH YEAR

Electives

Clinical Clerkship in Ophthalmology. One student rotates through the Department of Ophthalmology for six weeks. He is given instruction in the basic principles of an
ophthalmologic examination, including slit lamp biomicroscopy, motility evaluation, neuro-ophthalmologic evaluation, perimetry, ophthalmoscopy, tonometry, etc. He assists in the workup of eye patients at the St. Louis Veterans Administration Hospital and in the East Pavilion and attends all rounds and conferences. This elective is primarily geared to the student who plans to enter the specialty of ophthalmology.

**Research Electives**

Experimental and clinical research in glaucoma.  
(Drs. Kass, Krupin)

Experimental and diagnostic ophthalmic pathology.  
(Dr. M. Smith)

Experimental research in ocular physiology.  
(Dr. Moses)

**Professor and Head of Department**

Bernard Becker, A.B., Princeton University, 1941; M.D., Harvard University, 1944.

**Professors**

Ronald M. Burde, B.S., Massachusetts Institute of Technology, 1960; M.D., Jefferson Medical College, 1964.

Adolph I. Cohen, B.S., City College of New York, 1948; M.A., Columbia University, 1950; Ph.D., 1954. (See Department of Anatomy and Neurobiology)


James E. Miller, B.S., Tulane University, 1946; M.D., The Medical College of Alabama, 1949. (See Department of Pediatrics)

Morton E. Smith, B.S., University of Maryland, 1956; M.D., 1960. (See Department of Pathology)

Stephen R. Waltman, B.S., Massachusetts Institute of Technology, 1961; M.D., Yale University, 1964.

**Research Professor**

Nigel W. Daw, B.A., Trinity College, 1956; M.A., 1961; Ph.D., Johns Hopkins University, 1967. (See Department of Physiology and Biophysics)

**Associate Professors**


Robert A. Moses, A.B., Johns Hopkins University, 1938; M.D., University of Maryland, 1942.

**Associate Professors Emeriti (Clinical)**

Bennett Y. Alvis, B.S., St. Louis University, 1916; M.D., 1918.

Howard R. Hildreth, M.D., Washington University, 1928.

Theodore E. Sanders, B.S., University of Nebraska, 1931; M.D., 1933.

Frederick O. Schwartz, M.D., Washington University, 1910.

**Associate Professors (Clinical)**


Benjamin Milder, M.D., Washington University, 1939.

Edward Okun, B.S., Dartmouth College, 1952; M.D., University of Vermont, 1956.

**Assistant Professors**

Theodore Krupin, A.B., Washington University, 1964; M.D., St. Louis University, 1968.

Paul F. Palmberg, Ph.D., Northwestern University, 1969; M.D., 1970.

Mitchel L. Wolf, B.A., Yeshiva College, 1964, M.D., Albert Einstein College of Medicine, 1968.

**Assistant Professors Emeriti (Clinical)**

Daniel Bisno, B.A., University of Wisconsin, 1927; M.D., Johns Hopkins University, 1931.


**Assistant Professors (Clinical)**

Edmund B. Alvis, M.D., Washington University, 1934.

Neva P. Arribas, M.D., Manila Central University, 1954.


George M. Bohigian, A.B., Washington University, 1961; M.D., St. Louis University, 1965.
Isaac Boniuk, B.S., Dalhousie University, 1958; M.D., 1962.
Samuel A. Canaan, Jr., A.B., State University of Iowa, 1942; M.A., Columbia University, 1948; M.D., Meharry Medical College, 1954.
Jack Hartstein, B.S., University of Missouri, 1953; M.D., University of Cincinnati, 1955.
Glen P. Johnston, A.B., Washington University, 1953; M.D., University of Cincinnati, 1955.
Jack Kayes, B.A., Yale University, 1953; M.D., Washington University, 1957.
Terence G. Klingele, M.D., University of California, 1970.
Matthew Newman, A.B., Vanderbilt University, 1956; M.D., Columbia University, 1959.
Lawrence T. Post, Jr., M.D., Washington University, 1948.
Harry D. Rosenbaum, M.D., Washington University, 1934.
Bernd Silver, B.S., University of Louisville, 1952; M.D., 1956.
H. Phillip Venable, B.S., Wayne State University, 1935; M.D., 1940.
Charles E. Windsor, A.B., Carleton College, 1956; M.D., University of Rochester, 1960.

Instructors
William M. Hart, Jr., Ph.D., University of Maryland, 1970; M.D., 1970.

Research Instructors
Walter J. Grodzki, D.D.S., St. Louis University, 1944.
Elaine Miller, A.B., Judson College, 1944; M.D., Medical College of Alabama, 1949. (See Department of Pediatrics)

Instructors (Clinical)
Ronald C. Bilchik, B.S., University of Toledo, 1963; M.D., Washington University, 1967.
Dean B. Burgess, A.B., Occidental College, 1963; M.D., University of California, 1967.
Richard F. Escoffery, M.B., B.S., University of West Indies Medical School, 1969.
Ruth S. Freedman, A.B., Washington University, 1938; M.D., 1942.
David M. Freeman, A.B., University of Missouri, 1940; B.S.Med., 1941; M.D., Washington University, 1943.
Maxwell Rachlin, M.D., University of Toronto, 1942.
Mickey L. Salmon, M.D., Louisiana State University, 1959.
Arthur W. Stickle, Jr., M.D., University of Oklahoma, 1943.

Assistants
Lisa M. Cibis, M.D., University of Heidelberg, 1939; Certified Orthoptist, Washington University, 1956.
Clemens H. Jacques, B.S., University of California, 1949; O.D., 1949. (See Division of Health Care Research)

Research Assistants
Nels J. Holmberg, B.S., Oklahoma State University, 1963; M.S., 1966.
Gerald S. Hoover
Otolaryngology is presented to students during their sophomore, junior, and senior years. A clinical pathologic correlation lecture series is presented to sophomores. In the junior year, each student spends two weeks on one of the services in East Pavilion, St. Louis Veterans Administration, Max C. Starkloff, or Homer G. Phillips hospitals. 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 Thursdays, and an introduction to audiology as well as to basic ENT research.

The ENT rotation is highlighted by a field trip to an outlying community, where a full-time member of the Department evaluates and treats adults and children with common ENT problems. Senior 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.

SECOND YEAR

Otolaryngology and Physical Diagnosis.
Clinical pathologic correlative lectures in otolaryngology are given to the entire class.

(Dr. Thawley)

THIRD YEAR

Otolaryngology Clerkship. Practical instruction in diagnosis and treatment. Two weeks.

(Dr. Thawley)

FOURTH YEAR

Electives

Structure and Innervation of Labyrinth.

(Dr. Bohne)

Clinical Clerkship. A six-week rotation which stresses outpatient diagnosis and management of ENT problems. Lectures, field trips, office practice, and operating room exposure round out the rotation. Two students are accepted for each rotation.

(Dr. Thawley)

Research Electives

Cytology, neurology, and histochemistry of membranous labyrinth. (Dr. Bohne)

Physiology of larynx. (Drs. Ogura, Harvey)

Nasopulmonary physiology. (Dr. Ogura)

Metabolism of the inner ear. Physiological and biochemical aspects. (Dr. Thalmann)

Otoneurology labs. (Dr. Stroud)

Development of otic capsule and ossicles. (Dr. Bohne)

Audiology. (Dr. Carver)

Lindburg Professor and Head of Department

Joseph H. Ogura, A.B., University of California, 1937; M.D., 1941.

Professors

Donald G. Sessions, A.B., Princeton University, 1958; M.D., Washington University, 1962.

S. Richard Silverman (Audiology), A.B., Cornell University, 1933; M.S., Washington University, 1938; Ph.D., 1942. (Also Central Institute for the Deaf and Faculty of Arts and Sciences)


Ruediger Thalmann, M.D., University of Vienna, 1954.
Hallowell Davis, A.B., Harvard University, 1918; M.D., 1922; Sc.D. (hon.), Colby College, 1954; Sc.D. (hon.), Northwestern University, 1962; Sc.D. (hon.), Washington University, 1973. (See Department of Physiology and Biophysics) (Also Central Institute for the Deaf)

Research Professors
Donald H. Eldridge, S.B., Harvard University, 1943; M.D., 1946. (Also Central Institute for the Deaf and Faculty of Arts and Sciences)
Ira J. Hirsh (Audiology), A.B., New York State College for Teachers (Albany), 1942; M.A., Northwestern University, 1943; M.A., Harvard University, 1947; Ph.D., 1948. (Also Central Institute for the Deaf and Faculty of Arts and Sciences)

Professor (Clinical)

Associate Professors
Joseph E. Harvey (Experimental-Otolaryngology), B.A., University of California, Berkeley, 1954; M.A., 1964; Ph.D., 1968. (See Department of Anatomy and Neurobiology)
James M. Toomey, B.S., College of the Holy Cross, 1951; D.M.D., Harvard University, 1955; M.D., Boston University, 1958.

Associate Professors Emeriti (Clinical)
Harold M. Cutter, A.B., University of Maine, 1930; M.D., Tufts College, 1937.
French K. Hansel, M.D., St. Louis University, 1918; M.S., University of Minnesota, 1923.
Guerdan Hardy, M.D., Washington University, 1929.
Robert E. Votaw, B.S., State University of Iowa, 1927; M.D., 1929.

Associate Professors (Clinical)
Benard C. Adler, B.S., Washington University, 1937; M.D., 1937.
William T. K. Bryan, A.B., Washington University, 1929; M.D., 1933.
Morris Davidson, B.S., Indiana University, 1936; M.D., 1938.
Joseph W. West, M.D., Duke University, 1944.

Assistant Professors

Joseph A. Davidenas (Microbiology), B.S., University of Alberta, 1964; Ph.D., 1970.
Stanley E. Thawley, B.A., University of Texas, 1963; M.D., University of Texas Medical Branch, 1967.

Assistant Professors Emeriti (Clinical)
Alfred J. Cone, B.S., State University of Iowa, 1921; M.D., 1923; M.S., 1927.
Herbert M. Smit, M.D., St. Louis University, 1933.
A. Chesterfield Stutsman, B.S., Roanoke College, 1927; M.D., University of Virginia, 1931.

Assistant Professors (Clinical)
Carl F. Ehrlich, B.S., St. Louis University, 1961; M.D., University of Missouri-Columbia, 1965.
Edward H. Lyman, B.S., Washington University, 1937; M.D., 1937.
Wayne A. Viers, B.S., Phillips University, 1952; M.D., University of Oklahoma, 1956.

Research Instructors
Marion P. Bryan, A.B., Washington University, 1931.
Sakari Paloheimo, B.Sc., University of Turku, 1974; M.Sc., 1974.

Instructor (Clinical)
Arnoldo Kuczer, M.D., Faculty of Medical Sciences of the University of Buenos Aires, 1955. (Jewish Hospital)

Research Associates
Fumihiko Sato, M.D., Osaka Medical School, 1966.

Research Assistants
Charles D. Carr
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 the basic sciences. Pathologists are involved in diagnostic, teaching, and research activities.

In addition to the sophomore 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. Michael Lieberman.
For the purpose of teaching, research, and service, the Department is divided into specialty divisions under the following directors:

Autopsy Pathology  
*Dr. Kissane*

Graduate Programs in Experimental Pathology  
*Dr. Lieberman*

Laboratory Medicine  
*Dr. Jarett*

Neuropathology  
*Dr. Nelson*

Pediatric Pathology  
*Dr. Kissane*

Surgical Pathology  
*Dr. W. Bauer*

**SECOND YEAR**

**Bio 515, 516. General Pathology.** This course is a comprehensive study of the cellular and molecular basis of disease. Lectures, gross and microscopic demonstrations, laboratory work, tutorials, case studies, and experimental pathology seminars are all utilized. The course is divided into six sections, each consisting of a six-week period of study that is correlated with the subject matter concurrently presented in the sophomore pathophysiology course.

The sections consist of (1) general pathology and infectious disease, (2) cardiovascular, pulmonary and renal diseases, (3) metabolic, endocrine, and gastrointestinal disease, (4) hematology and oncology, (5) neuropathology, and (6) developmental, pediatric, obstetric, and gynecologic diseases.

Students working in small groups with a resident pathologist participate in post-mortem examinations and clinico-pathologic correlations.

(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 the students an opportunity to interpret the clinical observations in the light of the post-mortem findings. One hour a week during the year.

(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.** The department encompasses all of the major areas of investigation in experimental pathology. Examples include:

Lung development and pediatric lung disease.  
(Dr. Askin)

Definition of the structure and function of oligosaccharide moieties present on glycoproteins.  
(Dr. Baenziger)

Tumor associated antigens of human lung cancers and immunological studies of human beta-glucuronidase deficiencies and replacement therapy in man.  
(Dr. Bell)

Mechanisms of immune resistance to experimental plasmacytomas.  
(Dr. G. Davis)

Viral infections of the inner ear, environmental pathology.  
(Dr. Bridges)

Clinical and analytical enzymology and computerized instrumentation.  
(Dr. J. Davis)

Experimental analysis of gastrin secretion by rat pyloric antral cells *in vitro*.  
(Dr. DeSchryver)

Structure and function of endocrine cells of the gastrointestinal tract and pancreas.  
(Dr. Greider)

Environmental pathology, renin-erythropoietin-juxtaglomerular cells.  
(Dr. Hartroft)

Mechanism of action of insulin.  
(Dr. Jarett)

Studies of platelets and platelet function.  
(Dr. Joist)
Cellular immunology with particular emphasis on genetic control of antibody responses. (Dr. Kapp)

Surgical pathology of the lung and breast. (Dr. Katzenstein)

Renal pathology, pediatric pathology. (Dr. Kissane)

Experimental pulmonary diseases, environmental pathology. (Dr. Kuhn)

Experimental diabetes mellitus, tissue culture of islets, transplantation of islets. (Dr. Lacy)

Elaboration of physiological rationale for differences between activity and concentration of electrolytes, particularly calcium. (Dr. Ladenson)

Application of computer technology and physical instrumentation to the clinical laboratory. (Dr. Lewis)

Chemical carcinogenesis and enzymology of DNA repair. (Dr. Lieberman)

Tumor immunology and cell biology of experimental myeloma. (Dr. Lynch)

Experimental diabetes: Biochemical studies of insulin release mechanisms in vitro. (Dr. M. McDaniel)

The role of divalent cations and the mechanism of hormone action. (Dr. McDonald)

Biochemical and ultrastructural aspects of anterior pituitary secretion. (Dr. McKeel)

RNA metabolism in cultured fibroblasts. (Dr. Mauck)

Analysis of predictability of clinical laboratory diagnostic tests; the influence of normal respiratory flora on respiratory problems. (Dr. Murray)

Kinetics and hormonal aspects of neoplastic cell growth. (Drs. Bauer, Meyer)

Pathogenesis of cerebral microcirculatory injury: response of the autonomic nervous system to injury; pathology and pathogenesis of lesions associated with vitamin E deficiency; pathogenesis of skeletal muscle injury. (Dr. Nelson)

Mechanisms regulating immune responses in tissue culture systems. (Dr. Pierce)

Immunoelectron microscopy; secretory immunoglobulin system. (Dr. Poger)

Biochemistry of DNA tumor viruses. (Dr. Raskas)

Transplantation immunology. (Dr. Rodey)

Biochemical and ultrastructural aspects of peripheral nerve disease. (Dr. Schlaepfer)

Metabolism of coagulation moieties, in particular fibrogen and platelets of thrombus localization and of applied blood banking. (Dr. Sherman)

Placental transport and surface membrane structure and function. (Dr. C. Smith)

Placental amino acid transfer, composition and function of trophoblast plasma membrane. (Dr. C. Smith)

Clinical microbiology, anaerobes, endogenous infections. (Dr. Sonnenwirth)

Metabolic bone diseases. (Dr. Teitelbaum)

Phagacytosis, physical properties of erythrocyte membranes, permeability, transport, contractility of myocardial vasculature. (Dr. Williamson)

**ELECTIVES**

*Advanced Special Pathology.* A series of seminars discussing timely selected topics in special pathology of human disease aug-
mented by illustrative cases and emphasizing clinicopathologic correlations. Reading lists will be circulated and active discussion is encouraged. If the size of the group makes it practical to do so, each student will prepare and conduct a session on a subject of his choice.

(Dr. Kissane)

Selected Topics in Immunology and Immunopathology. This seminar course emphasizes those areas which are most applicable to the understanding of human disease states. The subject matter can be selected so as to suit the interest of the student, but will include immune deficiency states, the role of the thymus in immune competence, immunoglobulin structure and function, immunological disorders accompanying neoplasia, tumor immunology, and autoimmune disorders.

(Dr. Lynch)

Neuropathology Seminar. 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 of 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. Nelson)

Topics in Laboratory Medicine. A series of twelve seminars over a six-week period covering topics intended to demonstrate the role of laboratory medicine in the diagnosis and therapeutic management of disease.

(Dr. Jarett and Staff)

In addition to the above, the Department offers a number of 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 519. Pathology Research Seminar.


Edward Mallinckrodt Professor and Head of Department
Paul E. Lacy, B.A., Ohio State University, 1945; M.D., 1948; M.S., 1948; Ph.D., University of Minnesota, 1955.

Professors Emeriti
Lauren V. Ackerman (Pathology and Surgical Pathology), A.B., Hamilton College, 1927; M.D., University of Rochester, 1932. (Also Consultant)
Ruth Silberberg, M.D., University of Breslau, 1931. (Also Lecturer)

Professors
Walter C. Bauer, B.S., Ohio State University, 1946; M.D., Washington University, 1954.
Joseph M. Davie, A.B., Indiana University, 1962; M.A., 1964; Ph.D., 1966; M.D., Washington University, 1968. (See Department of Microbiology and Immunology)
Leonard Jarett, B.A., Rice University, 1958; M.D., Washington University, 1962. (See Department of Medicine)
John M. Kissane, A.B., University of Rochester, 1948; M.D., Washington University, 1952. (See Department of Pediatrics)
Charles Kuhn, A.B., Harvard University, 1955; M.D., Washington University, 1959.
James S. Nelson, M.D., St. Louis University, 1957. (See Department of Pediatrics)
Carl W. Pierce, A.B., Colgate University, 1962; M.D., University of Chicago, 1966; Ph.D., 1966. (Jewish Hospital)
Morton E. Smith, B.S., University of Maryland, 1956; M.D., 1960. (See Department of Ophthalmology)
Richard Torack, B.S., Seton Hall University, 1948; M.D., Georgetown University, 1952.

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.
Professor (Visiting Staff)
Frederick G. Germuth, Jr., A.B., Johns Hopkins University, 1942; M.D., 1945.

Associate Professors
Gustavo L. Davis, B.A., Union College, 1959; M.D., State University of New York, Syracuse, 1963. (Jewish Hospital)
Milton N. Goldstein, B.S., Western Reserve University, 1946; M.S., 1947; Ph.D., 1952. (See Department of Anatomy and Neurobiology)
Marie H. Greider, B.S., Ohio State University, 1949; M.S., 1955; Ph.D., 1960. (See Department of Microbiology and Immunology)
Phyllis M. Hartroft, B.S., University of Michigan, 1949; M.A., University of Toronto, 1951; Ph.D., 1954. (Jewish Hospital)
Gerald Kessler, B.S., City College of New York, 1950; M.S., University of Maryland, 1952; Ph.D., 1954. (Jewish Hospital)
Michael Kyriakos, B.S., City College of New York, 1958; M.D., Albert Einstein College of Medicine, 1962. (Jewish Hospital)
Michael W. Lieberman, B.A., Yale University, 1963; M.D., University of Pittsburgh, 1967; Ph.D., 1972. (Jewish Hospital)
John S. Meyer, A.B., Yale University, 1952; M.D., Washington University, 1956. (Jewish Hospital)
John W. Olney, B.A., Iowa University, 1956; M.D., 1963. (See Department of Psychiatry)
Peter A. Pullon, B.A., Albion College, 1960; D.D.S., University of Michigan, 1965; M.S., 1968. (Also School of Dental Medicine)
Heschel J. Ruskas, B.S., Massachusetts Institute of Technology, 1962; Ph.D., Harvard University, 1967. (See Department of Microbiology and Immunology)
Glenn E. Rodey, B.S., Ohio University, 1957; M.D., Ohio State University, 1961. (See Department of Medicine)
William W. Schlappfer, B.A., Princeton University, 1954; M.D., Yale University, 1958. (Jewish Hospital)
Laurence A. Sherman, B.A., B.S., University of Chicago, 1956; M.D., Albany Medical College, 1964. (See Department of Medicine)
Carl H. Smith, B.A., Swarthmore College, 1955; M.D., Yale University, 1959. (See Department of Pediatrics)
Alexander C. Sonnenwirth, A.B., University of Nebraska, 1950; M.S., Purdue University, 1953; Ph.D., Washington University, 1960. (See Department of Microbiology and Immunology)
Steven L. Teitelbaum, B.A., Columbia University, 1960; M.D., Washington University, 1964. (Jewish Hospital)

Associate Professors (Visiting Staff)
Frederick T. Kraus, B.A., College of William and Mary, 1951; M.D., Washington University, 1955.
William V. Miller, A.B., University of Missouri, 1962; M.D., 1966. (See Department of Medicine)
William R. Platt, B.S., University of Maryland, 1936; M.D., 1940. (Jewish Hospital)

Assistant Professors
Luis Alvarez, M.D., University of Santo Domingo, 1958. (Starkloff Hospital)
C. Elliott Bell, Jr., B.S., Tulane University, 1960; M.D., 1964. (See Department of Medicine)
James E. Davis, B.A., Occidental College, 1965; M.S., Duke University, 1969; Ph.D., 1970. (See Department of Medicine)
Luis Q. Del Rosario, M.D., University of Santo Tomas, 1954. (Starkloff Hospital)
Samir K. El-Mofty, B.D.S., Cairo University, 1959; M.Sc., University of Pennsylvania, 1966; Ph.D., Temple University, 1975. (Also School of Dental Medicine)
Kaarle C. Franssila, M.D., University of Helsinki, 1963.
Suleyman Gulmen, D.D.S., Hacettepe University, 1968; M.D.S., University of Minnesota, 1972. (Also School of Dental Medicine)
Enrique Higa, B.A., National College Julio A. Roca, 1956; M.D., Buenos Aires University, 1964. (Jewish Hospital)
Johann H. Joist, M.D., University of Cologne, 1962. (See Department of Medicine)
Jack H. Ladenson, B.S., Pennsylvania State University, 1964; Ph.D., University of Maryland, 1971. (See Department of Medicine)
John W. Lewis III, B.S., Georgia Institute of Technology, 1966; M.S., 1968; Ph.D., 1971. (See Biomedical Computer Laboratory)
John C. Mauck, B.S., Purdue University, 1967; Ph.D., Washington University, 1971. (See Department of Medicine)

Michael L. McDaniel, B.A., Southern Illinois University, 1963; M.S., University of North Dakota, 1966; Ph.D., St. Louis University, 1970.

Robert McDaniel, B.A., Southwestern University, 1964; M.D., University of Texas, 1968. (Starkloff Hospital)

Jay McDonald, B.S., Tufts University, 1965; M.D., Wayne State University, 1969. (See Department of Medicine)

Daniel W. McKeel, B.S., Hampden-Sydney College, 1961; M.D., University of Virginia, 1966.

David N. Menton, B.S., Mankato State College, 1959; Ph.D., Brown University, 1966. (See Department of Anatomy and Neurobiology)

Blanca M. Perez, B.A., Universidad del Valle, 1953; M.D., 1961. (Jewish Hospital)

Marshall Poger, A.B., Washington University, 1961; M.A., Brandeis University, 1963; M.D., University of Tennessee, 1969. (Jewish Hospital)

E. Kaye Smith, B.S., Webster College, 1957; M.S., St. Louis University, 1963; D.V.M., Kansas State University, 1965.

Sue Cassell Stevens, A.B., Goucher College, 1930; M.A., 1931; Ph.D., Columbia University, 1940. (Jewish Hospital)

Research Assistant Professors

Judith A. Kapp-Pierce, B.A., Miami University, 1965; M.S., Indiana University, 1969; Ph.D., Harvard University, 1976. (See Department of Microbiology and Immunology) (Jewish Hospital)

Takushi Tadakuma, M.D., Keio University, 1966; D.M.S., 1972. (Jewish Hospital)

Assistant Professors (Visiting Staff)

Wagih M. Abdel-Bari, B.A., School of Science, 1948; M.D., Ein Shams University, 1953; Ph.D., Washington University, 1965.

John D. Bauer, B.Sc., University of Innsbruck, 1938; L.R.C.P. and S., University of Glasgow, 1944; M.D., Marquette University, 1947.

Valgard Jonsson, B.S., North Dakota State University, 1958; M.S.P.H., University of North Carolina, 1961; Ph.D., 1965.

Nadya Konikov, B.S., Boston University, 1947; M.D., 1950.

Virgil Loeb, Jr., M.D., Washington University, 1944. (See Department of Medicine)
Kathleen S. McLaughlin, B.S., St. Louis University, 1960; M.D., Washington University, 1964.
Manuel F. Menendez, B.S., University of Havana, 1949; M.D., 1956.
Robert W. Ogilvie, B.A., University of Utah, 1943; M.D., 1946.
Luis Tumialan, M.D., University of San Marcos, 1965.
Andrés J. Valdes, B.S., Instituto de Santa Clara, 1949; M.D., University of Havana, 1957.
Mario Velez, M.D., Universidad de Caldas, 1960. (Starkloff Hospital)

Instructors
Madhu Bahl, F.Sc., K. M. V. College, 1958; M.D., Christian Medical College, 1963. (Starkloff Hospital)
Katherine DeSchryver, M.D., University of Louvain, 1971.
Thomas E. Hewitt, B.Sc., University of Alberta, 1970; M.S., Purdue University, 1972; Ph.D., 1974. (Jewish Hospital)
Wei Hsueh, M.B., National Taiwan University, 1968; Ph.D., Indiana University Medical School, 1972.
Kavous Khodadoust, M.D., Tehran University School of Medicine, 1965. (Starkloff Hospital)
John Klaas, B.S., Wofford College, 1967; M.S.P.H., University of North Carolina, 1968; Ph.D., 1974. (Jewish Hospital)

Research Instructor
Sandra Bridges Gurgo, B.A., Vanderbilt University, 1965; Ph.D., Washington University, 1970.

Research Assistants
Maria Chraplyvy, B.S., St. Louis University, 1964; M.S., 1967.
Dorothy J. Fiete, B.S., Marymount College, 1966.
William J. Kraft, B.A., Southern Illinois University, 1969. (Jewish Hospital)
Joan Lee, B.S., Taiwan Christian College, 1960; M.S., Oklahoma State University, 1967.

Instructors (Visiting Staff)
Tomas Aquino, S.B., Santa Clara Institute, 1949; M.D., University of Havana, 1957; Ph.D., University of Chicago, 1967.

Virgilio P. Dumadag, M.D., Far Eastern University Institute of Medicine, 1961.
Richard A. Kahn, A.B., University of Missouri, 1966; M.S., 1968; Ph.D., Georgetown University, 1972.
Rodolfo A. Latorre, M.D., University of the East-Ramon Magsaysay Memorial Medical Center, 1961.
Manuel Marban, A.A., Xavier University, 1959; M.D., University of Santo Tomas, 1964.
Carlos Perez-Mesa, M.D., University of Havana, 1950.

Assistants
Joseph Devine, B.A., Rockhurst College, 1967; M.S., Northeast Louisiana University, 1972; Ph.D., University of Southern Mississippi, 1975. (Starkloff Hospital)
Patrick Murray, B.S., Saint Mary’s College, 1969; Ph.D., University of California, 1974.
The primary aim of the Department of Pediatrics in the teaching program 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 will have an appreciation of pediatric problems regardless of his future choice of a career in medicine.

The major clinical and research facilities are in the St. Louis Children's Hospital and the St. Louis Maternity Hospital. The former has a bed capacity of 180, and accepts children through adolescence with all types of medical problems. Hospital admittances average 6,000 annually. The Pediatric Outpatient Division averages about 70,000 visits a year. In the Medical Center the yearly number of newborn infants averages more than 4,000.

SECOND YEAR

The student is introduced to pediatrics and to the full-time staff through a series of lectures designed to acquaint him with the concepts of human growth and development, genetics, and the effects of age and maturity on reactions to injury and disease. A second series of talks highlights the important disorders commonly encountered in
infants and children. The unique aspects of the physical examination of the infant and child are presented during the course in physical diagnosis. Members of the Department also participate in the sophomore course in pathophysiology.

THIRD YEAR

A clerkship of six weeks is scheduled, where the student participates in the following:

1. Care of inpatients, sharing responsibility with intern or resident.
2. Daily ward rounds and bedside conferences with house staff and attending physician.
3. Special conferences on various facets of pediatrics.
4. Tutorial with junior faculty.
5. Weekly grand rounds.

FOURTH YEAR

This year is devoted to elective time which may be spent according to the individual preferences of the student. He may serve as an intern substitute or in the research laboratory or combine clinical and laboratory work. The following electives are offered:

Pediatric Cardiology

Inpatient Service. Diagnosis and management of patients with acquired and congenital heart disease, including critically ill and post-operative patients in the Intensive Care Unit. Activities will include daily ward rounds, precatheterization critiques once a week, and a weekly conference on catheterization laboratory findings.

Outpatient Service. New patients for consultation, as well as follow-up on past patients. (Dr. Goldring)

Laboratory Diagnostic Procedures. The student will be involved initially as observer and eventually as a participant in the catheterization and angiocardiographic studies. The theory and interpretation of physiologic data will be reviewed in daily sessions. The students may participate in the other activities of the Pediatric Cardiology Division as time permits. (Dr. Hartmann)

Electrocardiography, Vectorcardiography, Echocardiography, Phonocardiography, and Ergometry. In this intensive course, emphasis will be on the electrophysiology and theory as well as interpretation of electrocardiograms, vectorcardiograms, echocardiograms, phonocardiograms, and ergometry on inpatients and outpatients. The student may participate in other activities of the Pediatric Cardiology Division as time permits. (Dr. Hernandez)

Research Opportunities

1. The use of non-invasive means to measure cardiac performance in the infant. (Drs. Goldring, Hernandez)
2. Hypertension in the high school population of the metropolitan area. (Drs. Goldring, Hernandez, Londe)

Pediatric Neurology

Clinical Elective. The student participates as a full member of the neurology ward team and is directly responsible for a proportion of the patients on the service under the direction of the senior resident. He is expected to take night call every third or fourth night, during which time he is responsible for the medical care of the entire ward, as well as for emergency admissions. (Drs. Dodge, Prensky)

Research Elective. The student has an opportunity to learn some of the chromatographic and spectrophotometric techniques frequently used in developmental neurochemistry, while working on a project of his choosing or one that is currently in progress in the laboratory. Prior discussion is necessary. (Drs. Agrawal, DeVivo, Fishman, Prensky)

Research Elective. Effects of experimental lead poisoning in young mice on levels of selected metabolites and enzyme activities in brain, red blood cells, liver, and kidney of young mice. (Dr. Holowach-Thurston)
Pediatric Infectious Diseases

Clinical Elective. The student works as a subintern and is assigned selected patients on the Isolation Division for initial evaluation and continuing care. He attends daily ward rounds and all scheduled conferences. Instruction is given in diagnostic bacteriology and serology.

(Drs. Feigin, Middelkamp, Shackelford)

Research Elective. Laboratory research programs are available in the areas of (1) fetal and neonatal bacterial infections, (2) rapid diagnosis of infections, and (3) metabolic aspects of infectious diseases in man and in a variety of animal models. Prospective studies of Group B streptococcal and Hemophilus influenzae meningitis will be pursued from a clinical and laboratory point of view.

(Drs. Feigin, Middelkamp, Shackelford)

Pediatric Hematology and Oncology

Large numbers of children with diverse hematological and oncological problems are seen. During the six-week rotation the student is expected to acquire sufficient knowledge to interpret the blood smears, bone marrows, and special laboratory studies. Concepts of management and differential diagnosis are reviewed.

(Drs. Land, Mutz, Vietti, Zarkowsky)

Pediatric Allergy and Immunology

Pediatric Clinical Allergy. The student spends six weeks learning the principal clinical expressions of allergic disease: allergic rhinitis, asthma, and eczema. He attends Allergy Clinic two days a week and assists the course master in the management of private patients as well. Emphasis will be placed on environmental control, modern chemotherapy, and specific immunotherapy of allergic disease. The student will be required to make one formal presentation of a subject pertinent to his clinical experience at a division seminar.

(Drs. Shearer, Strominger, Thurston)

Pediatric Immunology. The student spends a minimum of three months of in-depth research in the area of cellular activation by immune mechanisms. The work will explore the phenomenon of immunostimulation of tumor cell growth in vitro whereby membrane antigen-specific antibody acting in concert with activated complement augments nucleoside transport, DNA synthesis, and growth of several cell lines. The student will become acquainted with the fundamentals of cellular immunology and tumor immunology and some techniques of tissue culture. The student may participate in hospital consultations and laboratory investigations pertaining to children with immune deficiency states.

(Dr. Shearer)

Pediatric Renal Disease

The students are responsible for evaluating, following, and presenting children who are on the inpatient and outpatient services and who have renal disease; this includes the patients on chronic hemodialysis and those who are recipients of renal transplants. Discussions and rounds with the attending staff and fellows emphasize the relationship between clinical problems and the pathophysiology of the underlying disease. Organized teaching sessions, held in conjunction with the adult renal division, include renal pathology seminars in which all renal biopsies are reviewed, journal clubs in which renal physiology is emphasized, and informal teaching sessions on selected topics in clinical or research areas of nephrology. The students are expected to review at least two subjects of their own choosing in detail, and are expected to attend other pediatric teaching functions such as grand rounds on clinical case conferences.

(Drs. Cole, Robson)

General Pediatrics

Pediatric Ambulatory Service. A six-week course with participation in all aspects of ambulatory care of children under the direction of St. Louis Children's Hospital staff physicians. Includes diagnosis and treatment of acute and chronic illness in general pediatric service, in private physicians' offices, and in the emergency room. Experi-
ences in subspecialties and in community clinics are also offered.

(Drs. Jones, Middelkamp)

**General Clinical Pediatrics**. The student will participate as an active member of the pediatric care team at the St. Louis County Hospital. Under supervision of faculty and senior resident, he will see patients in the pediatric clinics, the emergency room, the neonatal nursery, and the inpatient service. The elective provides a general pediatric experience, with emphasis on ambulatory care and neonatology.

(Drs. Benoist, Kahn, Ross)

**Pediatric Endocrinology and Metabolism**

This elective is designed to include broad clinical experience in both pediatric and adult endocrine problems. The student has an opportunity to work up all of the pediatric endocrine patients and to see some adult patients during weekly rounds. He attends rounds in pediatric metabolism, pediatric-endocrine and diabetic clinics, and the adult metabolic research seminar and rounds. There is an opportunity to attend pediatric and medical grand rounds and metabolic rounds at Jewish Hospital. A large number of patients with all types of endocrine disorders are studied in depth.

(Drs. Bier, Haymond, Santiago, Weldon)

**Genetics**

**Medical Genetics**. Twelve weeks, all day. Combined clinical and research course.

(Drs. Hillman, Sly)

**Clinical Genetics**. Six weeks, all day. Experience in clinical/laboratory approach to study of genetic problems. Students see all consultations referred to the Division of Medical Genetics. They work in the Medical Genetics Clinic on Monday afternoons, attend daily genetics rounds, and participate in scheduled seminars.

(Drs. Hillman, Sly)

**Neonatology**

**Clinical Neonatology**. The time is spent at St. Louis Children's Hospital in the intensive care nursery learning the care of severely ill newborns and prematures. During the entire six weeks, daily teaching rounds will be held on the intensive care unit at Children's Hospital. Interested students may arrange to spend time at Maternity Hospital learning the examination and care of normal newborn and premature infants, as well as those with less severe illnesses that do not require intensive care. Students will be offered considerable responsibility in patient care and may participate in the transportation of ill patients from other hospitals to St. Louis Children's Hospital. Opportunities are available for clinical research in perinatal medicine.

(Drs. Hillman, Marshall, Thach)

**Research**. Placental amino acid transfer—*in vitro* tissue incubation, regulation, and relation to needs of the fetus. Composition and function of trophoblast plasma membrane.

(Dr. Smith)

**Seminar Elective**

**Developmental Neurobiology**. This course covers selected topics in the development of the nervous system. While emphasis is given to the neurochemical aspects of brain growth and maturation, there are also discussions of the neurophysiological and functional development of the brain. The relationship between chemical, physiological, and functional development and underlying anatom-
ical changes is stressed. The course is conducted as a seminar, with papers assigned prior to each meeting. Members of the Departments of Pediatrics and Neurology and Neurological Surgery are present at these discussions to clarify obscure points and to add additional information when possible.

(Dr. Agrawal)

Clinical Chemistry Laboratory

(1) Development of laboratory procedures in enzymology, gas chromatography, drug analysis and other areas; establishment of normal values in children and clinical-laboratory correlations. (2) The student may participate in studies correlating the fluorometric measurements of in vivo concentrations of allosteric regulators with in vivo measurements of the rates of enzyme activity and performing mathematical analyses of the kinetic data. (Drs. Dietzler, Smith)

Professor and Head of Department

Philip R. Dodge, M.D., University of Rochester, 1948. (See Department of Neurology and Neurological Surgery)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prensky, A.B., Cornell University, 1951; M.D., New York University, 1955. (See Department of Neurology and Neurological Surgery)

Professors

David Goldring, A.B., Washington University, 1936; M.D., 1940.
Alexis F. Hartmann, Jr., B.S., Washington University, 1947; M.D., 1951.
John C. Herweg, B.S., Drury College, 1943; M.D., Washington University, 1945. (See Administration)
John M. Kissane, A.B., University of Rochester, 1948; M.D., Washington University, 1952. (See Department of Pathology)
William H. McAlister, B.S., Wayne State University, 1950; M.D., 1954. (See Department of Radiology)

J. Neal Middelkamp, B.S., University of Missouri, 1946; M.D., Washington University, 1948.
James E. Miller, B.S., Tulane University, 1946; M.D., Medical College of Alabama, 1949. (See Department of Ophthalmology)
James S. Nelson, M.D., St. Louis University, 1957. (See Department of Pathology)
Alan M. Robson, M.B.B.S., University of Durham, 1959; M.D., 1964. (See Department of Medicine)
William S. Sty, M.D., St. Louis University, 1957. (See Department of Medicine)
Jessie L. Ternberg, A.B., Grinnell College, 1946; Ph.D., University of Texas, 1950; M.D., Washington University, 1953. (See Department of Surgery)
Donald L. Thurston, B.S., Vanderbilt University, 1934; M.D., 1937.
Jean H. Thurston, B.A., University of Alberta, 1938; M.D., 1941.
Teresa J. Vietti, A.B., Rice University, 1949; M.D., Baylor University, 1953. (See Department of Radiology)
Clarence S. Weldon, A.B., University of Michigan, 1951; M.D., Johns Hopkins University, 1955. (See Department of Surgery)

Professors Emeriti (Clinical)

Joseph C. Jaudon, A.B., Washington University, 1926; M.D., 1933.
Park J. White, A.B., Harvard College, 1913; M.D., Columbia University, 1917.

Associate Professor Emeritus

Dorothy J. Jones, A.B., Oberlin College, 1930; M.D., Washington University, 1934. (Also Lecturer)

Associate Professors

Harish C. Agrawal, B.Sc., Allahabad University, 1957; M.S., 1959; Ph.D., 1964.
Darryl C. DeVivo, B.A., Amherst College, 1959; M.D., University of Virginia, 1964. (See Department of Neurology and Neurological Surgery)
Marvin A. Fishman, B.S., University of Illinois, 1959; M.D., 1961. (See Departments of Neurology and Neurological Surgery and Preventive Medicine and Public Health, and Irene Walter Johnson Institute of Rehabilitation)
Antonio Hernandez, Jr., A.A., University of the Philippines, 1949; M.D., Manila Central University, 1954.
Lawrence I. Kahn, A.B., University of Alabama, 1941; M.D., Louisiana State University, 1945. (See Division of Health Care Research)
Charles B. Manley, Jr. (Genitourinary Surgery), A.B., University of Missouri, 1955; M.D., 1958. (See Department of Surgery) (Jewish Hospital)
William T. Shearer, B.S., University of Detroit, 1960; Ph.D., Wayne State University, 1966; M.D., Washington University, 1970.
Carl H. Smith, B.A., Swarthmore College, 1955; M.D., Yale University, 1959. (See Department of Pathology)
James K. Turner, A.B., Washington University, 1949; M.D., 1953 (See Division of Health Care Research)
Joseph J. Volpe, B.A., Bowdoin College, 1960; M.D., Harvard University, 1964. (See Department of Neurology and Neurological Surgery)
Virginia V. Weldon, A.B., Smith College, 1957; M.D., University of Buffalo, 1962. (See Administration)

Associate Professors Emeriti (Clinical)
Helen M. Aff, B.S., Washington University, 1934; M.D., 1934.
Max Deutch, M.D., Washington University, 1926.
Stanley L. Harrison, B.S., Washington University, 1928; M.D., 1930.
Frederick A. Jacobs, B.S., Washington University, 1927; M.D., 1928.
Sol Londe, B.S., Washington University, 1925; M.D., 1927.

Associate Professors (Clinical)
C. Read Boles, A.B., Washington University, 1940; M.D., 1943.
Robert H. Friedman, M.D., Washington University, 1948.
Gene H. Grabau, B.S., St. Louis College of Pharmacy, 1937; M.D., Washington University, 1942.

Norman Hankin, A.B., University of Wisconsin, 1940; M.D., 1943.
Maurice J. Keller, A.B., Yale University, 1936; M.D., Columbia University, 1940.
Kenneth A. Koerner, A.B., Washington University, 1935; M.D., 1941.
John C. Martz, A.B., University of Missouri, 1938; M.D., Washington University, 1942.
David N. McClure, M.D., University of Tennessee, 1940.
Helen E. Nash, A.B., Spelman College, 1942; M.D., Meharry Medical College, 1945.
Frederick D. Peterson, A.B., Knox College, 1953; M.D., Washington University, 1957.
George Sato, M.D., Washington University, 1947.
Bernard Schwartzman, A.B., Washington University, 1931; M.D., 1935.
Donald B. Strominger, B.A., Yale University, 1948; M.D., Washington University, 1953.
Argyrios A. Tsiftsis, M.D., Aristotelion University of Thessalonika, 1954.
Frank S. Wissmath, A.B., Washington University, 1939; M.D., 1943.
Assistant Professors

Martin J. Bell, B.A., New York University, 1959; M.D., State University of New York, Downstate, 1963. (See Department of Surgery)

Dennis M. Bier, B.S., LeMoyne College, 1962; M.D., New Jersey College of Medicine, 1966. (See Department of Medicine)

Milton L. Cobb, B.A., Baylor University, 1964; M.D., University of Texas (Southwestern) Medical School, 1968. (See Department of Anesthesiology)


Ruthmary K. Deuel, B.A., Mount Holyoke College, 1956; M.D., Columbia University College of Physicians and Surgeons, 1961. (See Department of Neurology and Neurological Surgery)

W. Edwin Dodson, A.B., Duke University, 1963; M.D., 1967. (See Department of Neurology and Neurological Surgery)


Barbara M. Herjanic, B.A., Northwestern University, 1943; B.S., Western Michigan College, 1946; M.D., University of Michigan, 1950. (See Department of Psychiatry)

Laura S. Hillman, B.A., Carleton College, 1964; M.D., Yale University, 1968.


Helen Palkes (Psychology), B.S., Washington University, 1966; M.A., 1968.

Mabel L. Purkerson, A.B., Erskine College, 1951; M.D., Medical College of South Carolina, 1956. (See Administration and Department of Medicine)

Julio V. Santiago, B.S., Manhattan College, 1963; M.D., University of Puerto Rico, 1967. (See Department of Medicine)

Gary D. Shackelford, B.A., Northwestern University, 1964; M.D., Washington University, 1968. (See Department of Radiology)

Penelope G. Shackelford, B.S., University of Wisconsin, 1964; M.D., Washington University, 1968.

Paul S. Simons, B.A., University of Texas, 1963; M.D., Washington University, 1967. (See Division of Health Care Research)

Arnold W. Strauss, B.A., Stanford University, 1966; M.D., Washington University, 1970. (See Department of Biological Chemistry)

Kutay Taysi, M.D., Ankara University School of Medicine, 1961.


Research Assistant Professor

Gurbax S. Sekhon, B.S., Agra University, 1960; M.S., 1962; Ph.D., University of Wyoming, 1969.

Assistant Professors Emeriti (Clinical)

Marianne Kuttner, M.D., Johann Wolfgang Goethe University, 1931.

Maurice J. Lonsway, B.S., Valparaiso University, 1910; M.D., St. Louis University, 1914.

Edith C. Robinson, A.B., Randolph-Macon College, 1927; M.S., University of South Carolina, 1928; M.D., Johns Hopkins University, 1932.

Assistant Professors (Clinical)

Edward T. Barker, A.B., Princeton University, 1953; M.D., Washington University, 1957.


Martin Calodney, B.S., College of the City of New York, 1930; M.D., New York University, 1936.

Gerald J. Duling, B.S., Xavier University, 1955; M.D., St. Louis University, 1959.

Ira J. Friedman, B.S., University of Arkansas, 1955; M.D., 1960.

Samuel W. Gollub, B.S., Washington University, 1941; M.D., 1941.

James R. Heersma, B.S., Western Michigan College, 1946; M.S., Northwestern University, 1948; M.D., 1949.

Henry L. Knock, A.B., Johns Hopkins University, 1949; M.D., 1953.

Richard Margolis, B.S., College of William and Mary, 1947; M.D., Western Reserve University, 1951.

Paul H. Painter, M.D., St. Louis University, 1947. (See Division of Child Psychiatry)


Alfred S. Schwartz, A.B., Amherst College, 1932; M.D., Johns Hopkins University, 1936.

George T. Wilkins, Jr., B.S., University of Illinois, 1956; M.D., 1957.

Kathleen Winters, B.S., Winthrop College, 1946; M.D., Medical College of South Carolina, 1955.
Instructors

Max H. Burgdorf, A.B., Washington University, 1970; M.D., 1974. (See Division of Health Care Research)

Charles S. C. Chang, B.A., Johns Hopkins University, 1967; M.D., 1972. (See Departments of Biological Chemistry and Neurology and Neurological Surgery)

Margan J. Chang, B.A., Johns Hopkins University, 1967; M.D., University of Maryland, 1971. (See Department of Biological Chemistry)


John Gilster (Dental Medicine), D.D.S., Washington University, 1944.

Donald V. Huebener (Dental Medicine), D.D.S., Washington University, 1969. (See Department of Radiology)

Mary I. Johnson, B.S., Washington State University, 1964; M.D., Johns Hopkins University, 1968. (See Departments of Anatomy and Neurobiology and Neurology and Neurological Surgery)


Zila Welner, M.D., Hebrew University, 1961. (See Department of Psychiatry)

Julian C. Williams, B.A., Rice University, 1967; M.S., Massachusetts Institute of Technology, 1968; Ph.D., University of California, Berkeley, 1972; M.D., Washington University, 1974.

Research Instructor

Elaine Miller, A.B., Judson College, 1944; M.D., Medical College of Alabama, 1949. (See Department of Ophthalmology)

Instructor Emeritus (Clinical)

Joseph A. Bauer, M.D., Washington University, 1926.

Instructors (Clinical)

Christos A. Antoniou, M.D., University of Athens, 1958.


Huldah C. Blamoville, B.S., Queens College, 1959; M.D., Meharry Medical College, 1965.


Elliot F. Gellman, B.A., State University of Iowa, 1957; M.D., University of Missouri, 1961.


Roman E. Hammes, B.A., University of Iowa, 1950; M.D., 1954.


Sheldon Kessler, M.D., St. Louis University, 1951.


Robert D. Lins, A.B., University of Missouri, 1965; M.D., 1969.

Stanley B. Lyss, A.B., Harvard University, 1958; M.D., Washington University, 1962.

Homer E. Nash, Jr., B.S., Morehouse College, 1948; M.D., Meharry Medical College, 1951.

Eugenia M. Pierce, M.D., St. Louis University, 1958.


Steven I. Plax, A.B., University of Missouri, 1957; M.D., 1961.


Warren G. Sherman, B.A., University of Missouri, 1965; M.D., Tulane University, 1969.

Mary A. T. Tillman, M.D., Howard University, 1960.

Orestes S. Valdes, B.S., Instituto de Santa Clara, 1947; M.D., University of Havana, 1954.

Barbara N. Voege, B.S., University of Illinois, 1950; M.D., Washington University, 1957.


H. Benjamin Zwirn, M.D., University of Basel, 1954.

Research Associates


Frederick E. Brot, B.S., University of Michigan, 1962; Ph.D., Stanford University, 1966.

David N. Dietzler, A.B., Washington University, 1957; Ph.D., 1963. (See Department of Pharmacology)

Assistants

Martha Fenger (Health Services), B.A., Texas Christian University, 1962; M.S.W., Louisiana State University, 1964. (See Division of Health Care Research)

Susan K. Keating (Health Services), B.S., University of North Carolina School of Nursing, 1965; P.N.P., Washington University, 1970.

Kathleen Potts (Health Services), R.N., B.S., St. Louis University, 1969; M.S., Boston University, 1970; P.N.P., Washington University, 1976. (See Division of Health Care Research)

Nancy B. Quigley (Health Services), A.B., College of Wooster, 1964; B.S., Columbia University School of Nursing, 1966; P.N.P., Washington University, 1970. (See Division of Health Care Research)

Research Assistants

Charles E. Crawford, Jr., B.S., Washington University, 1956.


Assistants (Clinical)

Jean M. Auguste, B.A., Lycee T. L'Ouverture, 1950; M.D., Medical School of Haiti, 1956.

Thomas G. Cleary, B.S., St. Louis University, 1967; M.D., Washington University, 1971. (On leave of absence)


Seymour M. Schlansky, M.D., Chicago Medical School, 1950.
The number of useful drugs is steadily increasing. 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. For this reason, the course is constructed as a part of the continuum of medicine rather than as a separate discipline. Since many drugs are harmful in excessive amounts, toxicology is included as a logical part of pharmacology.

The laboratory portion of the course is closely coordinated with the lecture material and is designed to demonstrate and emphasize pertinent pharmacological principles and to employ agents, equipment, and skills relevant to current medical practice.

SECOND YEAR

Bio 507, 508. Pharmacology. (a) Lectures, conferences, panel discussions. (b) Laboratory course. Credit 7 units for the year.

(Dr. Needleman and Staff)
RESEARCH

Bio 590.  The facilities of the laboratory are available to those who wish to carry on an original investigation on problems of their own or on those the Department is prepared to suggest.

Neurochemistry; regulation of metabolism; quantitative histochemistry; micro-analytical methods.

(Dr. Berger)

Biosynthesis of peptide hormones in human placenta and pancreatic islets.  (Dr. Boime)

Problems in the biochemical development of rat kidney; transport mechanisms in rat kidney; renal histochemistry.  (Dr. Burch)

Neurochemistry of seizures; neuropharmacology of anticonvulsant and psychotropic drugs; role of cyclic nucleotides in nervous tissue function and metabolism.

(Dr. Ferrendelli)

Lipids of the nervous system; structural components of myelin; functional roles of gangliosides; chemistry of the synapse; psychoactive drugs.

(Dr. Burton)

Secretion of macromolecules.  Serum albumin biosynthesis and secretion.  (Dr. Geller)

Purification and properties of the drug metabolizing enzymes.  Studies on oxidative phosphorylation and mitochondrial structure.

(Dr. Hunter)

The biosynthesis and chemical and biological characterization of slow-reacting substance of anaphylaxis (SRS-A).

(Dr. Jakschik)

Normal and abnormal development of the sympathetic nervous system; physiology and pathophysiology of the sympathetic nervous system.

(Dr. Johnson)

Liposomal model membranes as carriers for immunosuppressive drugs.  (Dr. Kinsky)

Neurochemistry; regulation of metabolism; quantitative histochemistry; micro-analytical methods; developmental biochemistry.

(Dr. Lowry)

Pineal-hypothalamic pituitary interactions in the regulation of reproductive function.

(Dr. Martin)


(Dr. Matschinsky)

Energy metabolism in nerve, axonal flow, and the biochemical effects of thiamine deficiency.

(Dr. McDougal)

Pharmacology of vasoactive substances, e.g., prostaglandins, angiotensin, bradykinin.

(Dr. Needleman)

ELECTIVES

364.  Principles of Drug Action.  A brief study of pharmacology and pharmacodynamics.  This course discusses the biological, chemical, and molecular basis of action of drugs in general and of selected specific drugs in detail.  Topics covered will include general pharmacologic principles; receptor theory; drug kinetics; distribution and metabolism; drugs which inhibit cellular growth, e.g., antibiotics, anticancer; endocrine drugs; both the autonomic and central action of drugs; drugs which act on the cardiovascular and renal systems; and elements of psychoactive drugs and of drug abuse.

(Dr. Burton and Staff)

Descriptions of the following courses are shown in the Division of Biology and Biomedical Sciences:


Bio 532.  Mechanism and Regulation of Protein Biosynthesis.


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


Professor Emeritus and Lecturer

Helen B. Burch, B.S., Texas University for Women, 1926; M.S., Iowa State University, 1928; Ph.D., 1935.

Professors

James A. Ferrendelli, A.B., University of Colorado, 1958; M.D., 1962. (See Department of Neurology and Neurological Surgery)

F. Edmund Hunter, Jr., B.S., Mount Union College, 1938; Ph.D., University of Rochester, 1941.

Stephen C. Kinsky, A.B., University of Chicago, 1951; Ph.D., Johns Hopkins University, 1957. (See Department of Biological Chemistry)

Oliver H. Lowry, B.S., Northwestern University, 1932; Ph.D., University of Chicago, 1937; M.D., 1937.

Franz M. Matschinsky, M.B., University of Freiburg, 1955; M.D., University of Munich, 1958.

David B. McDougal, Jr., A.B., Princeton University, 1945; M.D., University of Chicago, 1947.

Associate Professors

Saul Boyarsky, B.S., University of Vermont, 1943; M.D., 1946. (See Department of Surgery)

Robert M. Burton, B.S., University of Maryland, 1950; M.S., Georgetown University, 1952; Ph.D., Johns Hopkins University, 1955.

David M. Geller, B.A., Amherst College, 1952; Ph.D., Harvard University, 1957.

Assistant Professors

Irving Boime, B.S., St. Louis College of Pharmacy, 1964; M.S., Purdue University, 1966; Ph.D., Washington University, 1970. (See Department of Obstetrics and Gynecology)

Eugene M. Johnson, Jr., B.S., University of Maryland, 1966; Ph.D., 1970.


Research Assistant Professors


Donald A. Godfrey, B.S., Rensselaer Polytechnic Institute, 1966; Ph.D., Harvard University, 1972.

Sr. Barbara A. Jakschik, B.S., Duquesne University, 1963; M.S., 1965; Ph.D., Washington University, 1974.

Lecturer

David N. Dietzler, A.B., Washington University, 1957; Ph.D., 1963. (See Department of Pediatrics)
Department of Physiology and Biophysics

The Department offers instruction to medical and graduate students. A course in the second semester of the first year of the medical curriculum 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 physiology and biophysics.

The following research interests are represented in the Department at the present time: macromolecular structure as studied by X-ray crystallography and other physical methods, the mechanism of action of polypeptide hormones, transport across cell membranes, epithelial transport and renal physiology, neurophysiology, contractile activation of muscle, peripheral circulation, respiration, and the application of computer techniques to biological problems. The interests in neurophysiology concern principally membrane phenomena in nerve fibers, the physiology of synapse, and the function of receptors and sensory systems. Electron microscopy of nerve and muscle is used to relate structure and function in these tissues.

FIRST YEAR

Bio 502. General Physiology. Lectures,
demonstrations, and laboratory experiments are utilized to provide a basis for understanding general physiological mechanisms and the functional organization of physiological systems that are of immediate or potential importance in medicine. Credit 8 units.

Bio 554. Neural Sciences. An integrated course dealing with the anatomy and physiology of the nervous system at the cellular level, leading on to a consideration of sensory and motor systems. Credit 5 units.

RESEARCH

Bio 590. Research. 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; 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. (Staff)

ELECTIVES

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

Bio 457. Somatosensory System.
Bio 526. Advanced Topics in the Physiology and Biophysics of Cell Membranes.
Bio 545. Conformational Analysis of Macromolecules.


Edward Mallinckrodt, Jr., Professor and Head of Department
Carlton C. Hunt, B.A., Columbia University, 1939; M.D., Cornell University, 1942.

Professors Emeriti
Arthur S. Gilson, Jr., B.S., Dartmouth College, 1919; A.M., Harvard University, 1922; Ph.D., 1924.
Harvey L. White, B.S., Washington University, 1918; M.D., 1920.

Professors
Jerome R. Cox, Jr. (Biomedical Engineering), S.B., Massachusetts Institute of Technology, 1947; S.M., 1949; Sc.D., 1954. (See Biomedical Computer Laboratory and Division of Health Care Research) (Also School of Engineering and Applied Science)
Nigel W. Daw, B.A., Trinity College, Cambridge, 1956; M.A., 1961; Ph.D., Johns Hopkins University, 1967. (See Department of Ophthalmology)
Garland R. Marshall, B.S., California Institute of Technology, 1962; Ph.D., Rockefeller University, 1966. (See Department of Biological Chemistry)
Charles E. Molnar, B.S.E.E., Rutgers University, 1956; M.S.E.E., 1957; Sc.D., Massachusetts Institute of Technology, 1966. (Also Computer Systems Laboratory)
Albert Roos, M.D., University of Groningen, 1940. (See Department of Anesthesiology)

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

Leonard J. Banaszak, B.S., University of Wisconsin, 1955; M.S., Loyola University, 1960; Ph.D., 1961. (See Department of Biological Chemistry)

Harold Burton, B.A., University of Michigan, 1964; Ph.D., University of Wisconsin, 1968. (See Department of Anatomy and Neurobiology)

Paul J. De Weer, B.S., University of Louvain, 1959; M.D., 1963; M.S., 1964; Ph.D., University of Maryland, 1969.

Yasushi Fukami, M.D., Kyoto University, 1957; Ph.D., 1961.

Stanley Lang, Ph.B., University of Chicago, 1948; B.S., 1949; M.S., 1951; Ph.D., 1953.

F. Scott Mathews, B.S., University of California, 1955; Ph.D., University of Minnesota, 1959. (See Department of Biological Chemistry)

Alan L. Pearlman, A.B., State University of Iowa, 1958; M.D., Washington University, 1961. (See Department of Neurology and Neurological Surgery)

Dale Purves, A.B., Yale University, 1960; M.D., Harvard University, 1964.

Luis Reuss, B.A., University of Chile, 1957; M.D., 1964.

Carl M. Rovainen, B.S., California Institute of Technology, 1962; Ph.D., Harvard University, 1967.

Philip D. Stahl, B.S., West Liberty State College, 1964; Ph.D., West Virginia University, 1967.

Lewis J. Thomas, Jr., B.S., Haverford College, 1953; M.D., Washington University, 1957. (See Department of Anesthesiology and Biomedical Computer Laboratory)

Assistant Professors

C. David Barry, B.Sc., Manchester University, 1962; Ph.D., 1965. (Also Computer Systems Laboratory)

Duck O. Kim, B.S., Seoul National University, 1968; M.S., Rose Polytechnic Institute, 1969; D.Sc., Washington University, 1972. (Also Computer Systems Laboratory)

Robert F. Rakowski, B.Ch.E., Cornell University, 1964; M.Eng., 1966; Ph.D., University of Rochester, 1972.

Research Assistant Professors

Elsa Bello-Reuss, B.A., University of Chile, 1957; M.D., 1964. (See Department of Medicine)


Instructor

The Department offers instruction during the first and second years of the curriculum and provides other learning experience in elective courses in the fourth year. In clinical clerkships of other departments, students have experience in rehabilitation in the Irene Walter Johnson Institute of Rehabilitation. In the first semester of the first year, the course Social Aspects of Medicine provides background information, and students are encouraged to participate in discussion of important and evolving issues of medical care. A course in statistical methods in medicine, given in the second semester, affords a basis of understanding of quantitative assessment in biology and medicine and prepares the student for critical evaluation of reports in the medical literature. During the second year in the course in pathophysiology, the Department contributes material concerning the epidemiology of disease and the variety of factors in the person and environment which contribute to the occurrence of disease, and provides approaches and methods for prevention and control. Interested students may choose to participate in more intensive study of certain of these subject areas in the departmental elective offerings.
Opportunities for clinical and/or research experience are provided by the following organizational units within the Department:

**Division of Applied Physiology**
Dr. John Holloszy

**Division of Biostatistics**
Dr. Reimut Wette

**Nutrition Research Laboratories**
Dr. Robert Shank, Dr. Ruth Brennan

**Irene Walter Johnson Institute of Rehabilitation**
Dr. Marvin Fishman

**Lipid Research Center**
Dr. Gustav Schonfeld

**FIRST YEAR**

*The Social Aspects of Medicine.* The course consists of seventeen required two-hour sessions during which various topics dealing with current issues in ethics, medical care organization, community medicine, and politics are discussed. The objectives are to provide students with necessary quantitative data and philosophic concepts in each of these areas to serve for discussion of the ways in which inquiry, information, and logic can be utilized to affect the issues at hand. Another objective is to develop the interest of students in this field and in the pursuit of further knowledge in this area applicable both to patient care per se and to the understanding of health care systems. Students choose approximately one-half of the topics during a survey of the class prior to matriculation. At each session, about one hour is spent in formal presentation and one hour in discussion. The course is considered to be initial preparation for later teaching in nutrition, epidemiology and public health, and for various electives dealing with health care research and community aspects of medicine.

(Drs. Perkoff, Shank, Vavra, and Staff)

*Biomedical Statistics.* This introduction to the principles and methods of biostatistics emphasizes the concepts of statistical methodology as being essential to proper application and interpretation of statistical methods. Elementary statistical techniques illustrating the use of statistical principles in experimentation and clinical research are discussed. Second semester.

(Dr. Wette and Staff)

**SECOND YEAR**

*Pathophysiology.* In lectures and demonstrations, there is description of the patterns of occurrence and the distribution of selected diseases in populations. Consideration is given to the variety of characteristics of host, agent, and environment which determine the occurrence of specific disorders. Procedures which may be utilized to prevent or interrupt the course of disease and disability are described and evaluated. Patterns of provision of medical care and the social factors influencing health care needs are discussed.

(Dr. Shank and Staff)

*Summer Traineeships in Physical Disability and Rehabilitation.* (See Institute of Rehabilitation) (Drs. Fishman, Holloszy)

**FOURTH YEAR**

Electives

*Clerkship in Primary Care.* This clerkship is designed to provide the student with first-hand experience with medical practice, much in the same manner that clerkships in other medical disciplines provide patient care experience in supervised settings. The clerkship uses as its clinical settings the Medical Care Group of Washington University (MCG), a teaching and research prepaid group practice, and other practices.

Students will join individual physicians in the Medical Care Group of Washington University or in their private practices, and will work in their offices caring for patients under supervision. Preventive, social, and continuing aspects of medical practice will be emphasized. Students will accompany their supervisory physicians on hospital rounds, will share night call with the physicians and, when a house or emergency call
is to be made, will be contacted by the physician’s exchange and will make the call with the supervisory physician. Students also will attend hospital staff and committee meetings with their supervisory physicians. Each student will be requested to write a description of his six-week period tabulating patients seen by age, race and diagnosis. One patient will be described in detail, including such social, family, and community aspects of his problems as are applicable. A simple diary of the student’s daily experience (rounds and calls made, conferences attended, etc.) will also be required. It is hoped that this elective will give an overview of medical practice in internal medicine and in pediatrics, and will provide an opportunity for the student to see comprehensive medical care as it is practiced in St. Louis and as it exists in a group practice model: the Medical Care Group.

**Family Practice Preceptorship.** The Division of Health Care Research will monitor this elective. The student wishing such an experience should find the practitioner with whom he or she wishes to work and request that this physician send Dr. Gerald T. Perkoff of the School of Medicine (1) a statement of his (the physician’s) own training and experience for approval (he would need to be a bona fide licensed M.D. in practice), (2) an outline of the program he will offer the student, i.e., supervised office work and hospital visits, discussion of family problems as they bear on the patient’s illness, availability of community resources, etc., and (3) a commitment to evaluate the student’s performance. The student must then give Dr. Perkoff (1) his agreement to the proposed program, (2) a diary of patients seen and visits made and a summary of positive and negative aspects of the practice in which he was involved, and (3) a report of his study of particular problems in the community or presented by a given patient, i.e., a brief paper. This material would have to be presented in acceptable form for credit to be given.

**Primary Care Rounds.** Presentations and discussions of primary care subjects: medical, organizational, fiscal, and social.

**Clinical Elective.** Physical disability and rehabilitation. (See Institute of Rehabilitation) (Drs. Fishman, Holloszy)

**Physical Disability and Rehabilitation.** The student will become familiar at first hand with the techniques for defining the extent of physical disability and with various approaches to its treatment. Emphasis will be placed on methods used in physical, occupational, and speech therapy, and on the specialized contribution to be made by rehabilitation social work, nursing, and vocational testing and counseling. Supervised visits will be arranged to specially related outside facilities and agencies (Visiting Nurses Association, Special School District, Shriners Hospital, Central Institute for the Deaf, manufacturers of prosthetics and orthotic devices). All the above will be accomplished in relation to selected patients assigned to the student for his supervision of their rehabilitation programs. In general, these will include inpatients on the Pediatrics, Medical, Neurology, Neurosurgical, Orthopedic, and Plastic Surgery Services. Special emphasis on any one or any combination of the above services can be arranged to suit the interests of individual students. In addition to the programs available at the Rehabilitation Institute, the student may choose to spend part of the elective at Jewish Hospital on the Rehabilitation Service.

**Inpatient Rehabilitation Care.** The Department of Rehabilitation Medicine of Jewish Hospital offers a six- or twelve-week elective course to senior medical students. The Department operates a thirty-six bed service for patients with physical disabilities, under the supervision of three full-time physicians. The case material is varied by the large number of patients with spinal cord injuries, strokes, Parkinson’s disease, and arthritis. The Department holds an Amputee Clinic twice a month and does all the electromyographic examinations for the Jewish Hospital. The medical student serves as an extern.
He gains experience in the prescription of a rehabilitation program and follows his patients in physical therapy, occupational therapy, speech therapy, or whatever other activity is applicable. He works with the orthopedic, neurological, urological, and plastic surgery consultants who serve this unit. The details of the program can be adapted to fit the particular interests of the individual student. (Dr. Steinberg and Staff)

**Seminar Electives**

*Atherosclerosis and Lipoproteins.* Six lectures followed by discussions on (1) current concepts of atherogenesis; (2) lipoprotein structure; (3) lipoprotein production; (4) lipoprotein catabolism and interactions with tissues; (5) pathophysiology of dyslipoproteinemias; (6) diagnosis and treatment of hyperlipoproteinemia, coronary prevention programs.

(Drs. Schonfeld, Weidman, Witztum)

*Clinical Nutrition.* The seminars and activities of this elective will afford information and assistance in the utilization of the knowledge of nutrition for purposes of patient management and the prevention of disease. Topics to be included are nutrient requirements of humans, food sources of nutrients, dietary evaluation, clinical assessment of nutritional status, modification of nutrient requirements by disease processes, dietary management of specific disorders, and the use of nutritional information for most favorable outcome of pregnancy, growth, and development in infancy and childhood, and avoidance of disease. Readings will be assigned and case demonstrations utilized.

(Drs. Brennan, Holloszy, Schonfeld, Shank)

*Roles of Exercise in Medicine: Biochemical, Physiological, and Clinical Considerations.* Biochemical and physiological adaptations to long-term exercise; acute responses to exercise; role of exercise in the prevention and treatment of (a) obesity, (b) diabetes, (c) coronary heart disease; diagnostic use of exercise-stress-testing; use of exercise in rehabilitation medicine; effects of lack of exercise and immobilization.

(Drs. Ehsani, Holloszy, Winder)

*Applied Biostatistical Techniques.* This seminar is intended for students who have completed a basic biostatistics course and who want to increase their understanding of contemporary statistical techniques, particularly those commonly applied in clinical research. Students will be expected to participate in analysis and critique of studies appearing in the medical literature. The emphasis will be on the appropriateness of the statistical techniques and underlying rationale rather than on mathematical details of the techniques. Both basic (e.g., t tests, chi-squared tests, correlation, regression) and more advanced multivariate techniques (e.g., multiple regression, discrimin-
nant analysis, analysis of variance) will be covered during the seminar.

(Mr. J. Philip Miller and Staff)

Topics in Health Care Delivery. Student-led discussions of community medicine, social aspects of medical care systems, and alternative structures which can improve health care delivery will be directed by faculty members. Topics covered in an elective period will vary according to the faculty member assigned; course content, therefore, will not be the same for all students. The seminars will follow the design of assigned readings of specific topics, with presentations to be made by each course participant. Simultaneous participation as volunteers in the Pruitt-Igoe Project is encouraged but not required.

(Dr. Perkoff and Staff)

Research Electives

Biochemistry of Exercise. Research deals with the acute and chronic responses to exercise. Areas of interest include biochemical adaptations in muscle in response to endurance exercise and to heavy resistance exercise; effects of exercise on body composition during growth and during weight reduction; cardiac adaptations to increased work load; the serum triglyceride lowering effect of exercise; the biochemical basis of muscle fatigue.

(Drs. Ehsani, Holloszy, Winder)

Biomedical Statistics. Students will be supervised and gain experience in the proper application of statistical methods (including computer usage) to health research problems; qualified students can also engage in research projects concerned with the development of statistical methods for special biomedical and clinical research situations.

(Drs. Choi, Wette)

Immunohematology. Application of serologic and immunochromic techniques in basic studies of erythrocyte autoantibodies and isoantibodies encountered in hemolytic disease of the newborn, leukemias, lymphomas, malignancies, and connective tissue diseases. Special problems in transfusion practice are also covered with blood bank personnel.

(Dr. Chaplin)

Mathematical Biology. Qualified students may engage in research concerned with the mathematical modeling and analysis (including computing techniques) of biologic processes such as tumor growth and radiation response.

(Dr. Wette)

Rehabilitation Engineering. The student collaborates with the staff of the Rehabilitation Engineering Unit, employing electronic instrumentation to obtain objective measurements of spasticity and impaired voluntary motor function in patients with neurological and neuromuscular disorders. The equipment includes electrically driven and hydraulic systems, EMG recordings, and computer analysis of data. Machine findings are correlated with clinical performance based on standardized functional evaluation tests.

(Dr. Fishmann and Staff)

Medical Care in a Group Practice. Students will select a problem of mutual interest dealing with medical care utilization, reaction to illness, screening, etc.

(Dr. Perkoff)

Studies in Adult Ambulatory Care. Studies of medical care utilization, social and economic aspects of medical care, problems in medical care organization at Barnes or affiliated hospitals or in community projects.

(Dr. Perkoff)

Open Topics. Any topic related to health care delivery in a broad sense may be selected by discussion with the supervisor.

(Dr. Perkoff and Staff)

Clinical and Experimental Nutrition. The student engages in a selected research project under supervision of staff of this laboratory. Occasional opportunities may be made to study and observe major problems of deficiency disease in other countries.

(Drs. Brennan, Cheng, Holloszy, Schonfeld, Shank)

Studies in Pediatric Ambulatory Care. Studies in medical care utilization, social
and economic aspects of medical care, and
problems in medical care organization at St.
Louis Children's or St. Louis County Hos-
pital or in a community project. (Dr. Kahn)

*Topics in Medical Economics.* This course is
designed to expose students to economic is-
ssues in the medical sector. Students will pur-
sue a selected research topic under an
economist's supervision. Emphasis will be
placed on policy issues concerning the effec-
tive allocation of medical expenditures. Ex-
amples of topics which can be considered
are: the economics of excess capacity in
surgery; the economics of prepaid group
practice; the cost effectiveness of therapy
for hypertension; cost differences of thera-
pies for a given medical problem as a func-
tion of physicians' specialties; responsiveness
of physician to alternative incentive schemes;
criteria to be used in determining the allo-
cation of resources among the medical sub-
sectors.

(Dr. Benham)

Danforth Professor and Head of Department
Robert E. Shank, A.B., Westminster College,
1935; M.D., Washington University, 1939. (See
Department of Medicine)

Kountz Professor
Hugh Chaplin, Jr., A.B., Princeton University,
1943; M.D., Columbia University, 1947. (See
Department of Medicine)

Professor and Director of Applied
Physiology Division
John O. Holloszy, M.D., Washington Univer-
sity, 1957. (See Department of Medicine and
Irene Walter Johnson Institute of Rehabilita-
tion)

Professor and Director of Division of
Biostatistics
Reimut Wette, B.S., University of Heidelberg,
1949; M.S., 1952; D.Sc., 1955.
Professor Emeritus
C. Howe Eller (Public Health), A.B., Stanford University, 1927; M.D., University of Colorado, 1930; Ph.D., Johns Hopkins University, 1934.

Professors

M. Kenton King, B.A., University of Oklahoma, 1947; M.D., Vanderbilt University, 1951. (See Administration and Department of Medicine)

Gerald T. Perkoff, M.D., Washington University, 1948. (See Department of Medicine and Division of Health Care Research)

Gustav Schonfeld, A.B., Washington University, 1956; M.D., 1960. (See Department of Medicine)

John D. Vavra, B.A., University of Colorado, 1950; M.D., Washington University, 1954. (See Administration, Department of Medicine, and Division of Health Care Research)

R. Dean Wochner, A.B., Arizona State University, 1956; M.D., Washington University, 1960. (Hospital Commissioner of St. Louis and Director of Health and Hospitals) (See Department of Medicine)

Associate Professor Emeritus

M. Frances Watson (Social and Environmental Studies), B.S., Northeast Missouri State Teachers College, 1932; M.S.W., Washington University, 1949.

Associate Professors

Lee Benham, B.A., Knox College, 1962; Ph.D., Stanford University, 1970. (See Division of Health Care Research) (Also Faculty of Arts and Sciences)

Thomas W. Bice, B.A., Knox College, 1963; M.S., Purdue University, 1965; Ph.D., 1969. (See Division of Health Care Research) (Also Faculty of Arts and Sciences)

Sung C. Choi (Biostatistics), B.S., University of Washington, 1957; M.A., 1960; Ph.D., University of California, 1966.

Marvin A. Fishman, B.S., University of Illinois, 1959; M.D., 1961. (See Departments of Neurology and Neurosurgical Surgery and Pediatrics, and Irene Walter Johnson Institute of Rehabilitation)

Mary L. Parker, B.S., Florida State University, 1946; M.S., 1949; M.D., Washington University, 1953. (See Departments of Medicine and Pediatrics) (University Health Service)

Associate Professor (Clinical)

Franz U. Steinberg, M.D., University of Berne, 1938. (See Departments of Medicine and Surgery) (Jewish Hospital)

Assistant Professors

William C. Banton II, M.D., Howard University, 1946; M.P.H., Johns Hopkins University, 1970. (Director of Department of Community Health and Medical Care, St. Louis County)

Edward J. Berger, M.D., Washington University, 1937. (Medical Director, Labor Health Institute)

Ruth E. Brennan (Nutrition), B.S., University of Tennessee, 1943; M.S., Simmons College, 1945; Sc.D., University of Pittsburgh, 1966.

Ali A. Ehsani, M.D., Tehran University, 1965. (See Department of Medicine)

Andrew Goldberg, M.D., State University of New York, 1969. (See Department of Medicine)

Barbara B. Hixon (Biostatistics), B.S., University of Illinois, 1941.

Peregrina C. Labay, B.S. (Ed.), University of St. Thomas, 1947; B.S. (Sci.), 1949; M.D., 1954. (See Department of Surgery)

Lorraine F. Lake, B.S., Washington University, 1950; A.M., 1954; Ph.D., 1962. (See Irene Walter Johnson Institute of Rehabilitation, Department of Anatomy and Neurobiology and Program in Physical Therapy)

Stuart W. Weidman, A.B., Washington University, 1937; M.A., 1963; Ph.D., University of Chicago, 1965. (See Department of Biological Chemistry)

William W. Winder, B.S., Brigham Young University, 1966; Ph.D., 1971.

Joseph L. Witztum, A.B., Vanderbilt University, 1965; M.D., Washington University, 1969. (See Department of Medicine)

Instructors

M. Carolyn Baum (Occupational Therapy), B.S., University of Kansas, 1966.

Mary L. Cope (Physical Therapy), B.S., Washington University, 1969.

Patricia A. Csegody (Physical Therapy), B.S., St. Louis University, 1970; M.Ed., University of Missouri, St. Louis, 1975.

Mary P. Hakan (Occupational Therapy), B.S., University of Kansas, 1972.

Jacqueline Hartman (Speech Pathology), B.A., Western Reserve University, 1963; A.M., Washington University, 1965. (Also Faculty of Arts and Sciences)

A. Donna King, B.A., Western Maryland College, 1960; M.S.W., Washington University, 1966. (See Division of Health Care Research)

J. Philip Miller (Biostatistics), A.B., Washington University, 1965.


Patricia R. Pickett (Nursing and Rehabilitation), B.S.N., Western Reserve University, 1959.

Diana L. Reed (Social Work), A.B., Washington University, 1968; M.S.W., 1970.

Shirley Ann Sahrmann (Physiology), B.S.P.T., Washington University, 1958; A.M., 1971; Ph.D., 1973. (See Departments of Neurology and Neurological Surgery and Physiology and Biophysics)

Elizabeth A. Stoddard (Rehabilitation), B.S., Montana State University, 1954; M.D., Washington University, 1957. (See Department of Medicine) (Jewish Hospital)


In Sook Sunwoo (Rehabilitation), M.D., Woo Sok University, 1959. (Jewish Hospital)

Research Assistant

Patricia E. Wirth, B.A., University of Nebraska, 1971. (See Division of Health Care Research)

Lecturer

Richard A. Sutter (Industrial Medicine and Rehabilitation), A.B., Washington University, 1931; M.D., 1935.

Miscellaneous

Sven G. Eliasson, Ph.D., University of Lund, 1952; M.D., 1954. (See Department of Neurology and Neurological Surgery and Irene Walter Johnson Institute of Rehabilitation)

Paul M. Weeks, A.B., Duke University, 1954; M.D., University of North Carolina, 1958. (See Department of Surgery and Irene Walter Johnson Institute of Rehabilitation)
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. Emphasis is upon (a) effective interviewing in preparation for medical history taking, (b) evaluation of behavioral and emotional factors in patients with various kinds of illnesses, (c) the diagnosis and natural history of the major psychiatric disorders, (d) critical evaluation of conceptual and methodologic problems in psychiatry and psychology. Lectures, demonstration interviews, discussions. (Dr. Cloninger and Staff)

THIRD YEAR

Psychiatry Clerkship. Students in groups of about fifteen spend six weeks on the inpatient services of Renard and Bliss Hospitals. (Dr. Croughan and Staff)
FOURTH YEAR

Electives

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.

Opportunities are also available for students to obtain experience in drug abuse treatment modalities and programs now available in the metropolitan area. Students can participate in group therapy among adolescent multiple-drug abusers, can become adept at drug crisis intervention, can observe encounter-confrontation groups in a self-help drug therapeutic community, or a combination of such programs can be scheduled. Participation in other community psychiatry services is also available, including the County Juvenile Court and various alcohol programs.

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. Halikas, Ms. Smith)

Clinical Psychiatry in a Community Mental Health Center. This elective course provides students with opportunities to become key medical members of psychiatric treatment teams dealing with evaluation of patients in an emergency room, selective admissions of certain cases, diagnosis and management of particular patients. Supervision is provided by the full-time supervising psychiatrist in charge of wards to which the student may be assigned. The student participates in teaching sessions arranged for first year psychiatric residents in training at the Malcolm Bliss Mental Health Center.

(Drs. M. Herjanic and Tomelleri)

Child Psychiatry, Children's Hospital and the Washington University Child Guidance Clinic. This clerkship in child psychiatry gives students an appreciation of the intri-
cacies of diagnosis and treatment of emotionally disturbed children. The clerkship involves working up a small number of pre-adolescent, 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 both drug treatment and the limitations of drug treatment. They are exposed to the roles of community agencies such as settlement houses, juvenile courts, and various private 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. Kusama)

Neurochemistry. This course is given jointly by the Departments of Psychiatry and Pharmacology. Topics covered include carbohydrates; energy metabolism, including changes found in different functional states; amino-acid metabolism and its relation to protein and transmitter synthesis; special proteins and protein metabolism; cerebral lipids, membranes, and normal and disordered lipid metabolism; transmitters and modulators; learning; growth, development, and trophic functions; cerebral blood flow, blood brain barrier.

(Drs. McDougal, B. Moore)

Selected Topics in Research. Students may elect to work full time in psychiatric research at any time during their elective year. Twelve weeks is the minimum time allowed; no maximum time is specified. The arrangements are made on an individual basis with the appropriate investigators.

(Drs. Cicero, Clayton, Guze, Hartman, B. Herjanie, M. Herjanie, Murphy, Reich, and Staff)

Wallace Renard Professor Emeritus
Edwin Francis Gildea, A.B., Colorado College, 1920; M.D., Harvard University, 1924.

Wallace Renard Professor
Eli Robins, A.B., Rice University, 1940; M.D., Harvard University, 1943.

Professor Emeritus
Saul Rosenzweig, (Medical Psychology), A.B., Harvard University, 1929; M.A., 1930; Ph.D., 1932. (Also Psychology)

Professors
Blake W. Moore (Biochemistry), B.S., University of Akron, 1948; Ph.D., Northwestern University, 1952. (See Department of Biological Chemistry)
George E. Murphy, B.S., Oregon State College, 1949; M.D., Washington University, 1952.
Theodore Reich, B.S., McGill University, 1959; M.D., 1963.
Lee N. Robins (Sociology), A.B., Radcliffe College, 1942; M.A., 1943; Ph.D., 1951.
William R. Sherman (Biochemistry), A.B., Columbia University, 1951; Ph.D., University of Illinois, 1955. (See Department of Biological Chemistry)
Kathleen Smith, B.S., University of Arkansas, 1944; M.D., Washington University, 1949. (Malcolm Bliss Hospital)

Research Professor
Mitchell Taibleson (Mathematics), S.M., University of Chicago, 1960; Ph.D., 1962. (Also Faculty of Arts and Sciences)

Professor Emeritus (Clinical)
Margaret C. L. Gildea, B.S., University of Chicago, 1923; M.D., Yale University, 1936.

Professors (Clinical)
Alex H. Kaplan, B.S., College of City of New York, 1932; M.D., St. Louis University, 1936.
Frank O. Shobe, A.B., Washington University, 1938; M.D., 1942.

Spencer T. Olin Professor and Head of Department
Samuel B. Guze, M.D., Washington University, 1945. (See Administration and Department of Medicine)
**Associate Professors**

Theodore J. Cicero (Neuropharmacology), B.S., Villanova University, 1964; M.S., Purdue University, 1966; Ph.D., 1968. (See Department of Anatomy and Neurobiology)

Boyd K. Hartman, A.B., University of Kansas, 1962; M.D., 1966. (See Department of Anatomy and Neurobiology)

Marijan Herjanic, M.D., Zagreb University, 1956. (Malcolm Bliss Hospital)


Amos Velner, M.D., Hebrew University Hadassah Medical School, 1960.

**Research Associate Professor**

David J. Pittman (Sociology), A.B., University of North Carolina, 1949; M.A., 1950; Ph.D., University of Chicago, 1956. (Also Social Science Institute)

**Associate Professors (Clinical)**

John M. Anderson, B.S., Colorado State University, 1938; M.D., Meharry Medical College, 1958. (Malcolm Bliss Hospital)

Robert B. Deitchman, B.A., University of Virginia, 1949; M.D., 1953.

Edward H. Kowert, A.B., Washington University, 1940; M.D., 1943. (Malcolm Bliss Hospital)

Wanda M. Lamb, B.S., University of Missouri, 1946; M.D., Washington University, 1948.

Patricia L. O'Neal, A.B., Washington University, 1944; M.D., 1948.

Earl R. Schultz, A.B., Southeast Missouri State College, 1952; B.S.Med., University of Missouri, 1953; M.D., Washington University, 1955. (See Department of Neurology and Neurosurgical Surgery)

Harold D. Wolff, A.B., Washington University, 1952; B.S. University of Missouri, 1953; M.D., State University of Iowa, 1955.

**Assistant Professor Emeritus**

Lucile Healy (Social Work), A.B., College of St. Catherine, 1922; M.A., University of Minnesota, 1927; M.S.W., Washington University, 1949.


Jack L. Croughan, B.A., University of Kansas, 1964; M.D., Kansas University, 1968.

Philip M. Fishman (Computer Sciences), B.S., Brooklyn College, 1964; M.S., New York University, 1969; Ph.D., Washington University, 1974.


Julian C. Hall (Social Work), B.S., University of Louisville, 1949; M.S., 1951; D.S.W., Washington University, 1968. (Malcolm Bliss Hospital)

John E. Helzer, M.D., University of Utah, 1967.

Barbara M. Herjanic (Child Psychiatry), B.A., Northwestern University, 1943; B.S., Western Michigan College, 1946; M.D., University of Michigan, 1950. (See Department of Pediatrics)

Haruo Kusama (Child Psychiatry), A.B., Washington University, 1960; M.D., 1965. (St. Louis State Hospital Youth Center)


Elizabeth M. Smith (Social Work), B.A., University of Nebraska, 1960; M.S.W., 1962.

Brian K. Suarez (Genetics), B.A., San Fernando Valley State College, 1967; M.A., University of California, Los Angeles, 1972; Ph.D., 1974. (Also Faculty of Arts and Sciences)


Zila Velner (Child Psychiatry), M.D., Hebrew University Hadassah Medical School, 1961. (See Department of Pediatrics)

Richard D. Wetzel (Medical Psychology), B.A., Concordia College, 1959; B.D., Concordia Seminary, 1963; Ph.D., St. Louis University, 1974.

Vincent E. Ziegler, B.S., Xavier University, 1968; M.D., University of Kentucky, 1972.

**Research Assistant Professors**

Paul P. Hipp (Biochemistry), B.S., Lakeland College, 1966; Ph.D., North Dakota State University, 1971.
William H. Holland (Electronics), A.B., Washington University, 1950. (See Department of Biological Chemistry)

Assistant Professors (Clinical)


Robert D. Brookes, A.B., DePauw University, 1934; M.D., Washington University, 1938.

Jane B. Brownstone (Medical Psychology), A.B., Washington University, 1961; A.M., 1964; Ph.D., 1968. (Malcolm Bliss Hospital)

Alan G. Craig, M.D. (M.B., Ch.B.), Aberdeen University, 1951.

Plaridel C. Deza, M.D., University of Santo Tomas, 1956. (Malcolm Bliss Hospital)

Hyman H. Fingert, B.A., State University of Iowa, 1931; M.D., 1934.

Wilbur H. Gearhart, B.S., Butler University, 1949; M.D., Hahnemann Medical College, 1950.

James N. Haddock, A.B., University of Missouri, 1940; M.A., 1942; M.D., Washington University, 1943.

Robert S. Hicks, A.B., Hendrix College, 1951; M.D., University of Arkansas, 1958.


Jay Meyer, A.B., Washington University, 1956; M.D., St. Louis University, 1960.

Thomas F. Richardson, B.A., Milliken University, 1959; M.D., Washington University, 1963.


Alberto Soto, B.S., Instituto de Santiago, 1951; M.D., Havana University, 1960.

Cengiz M. Sumer, M.D., Istanbul University, 1951. (Malcolm Bliss Hospital)


Instructors

Bernardo G. Aleksander, M.D., University of Buenos Aires, 1959; (Malcolm Bliss Hospital)

Michael D. Bieri, B.A., University of Kansas, 1968; M.D., Washington University, 1972. (Malcolm Bliss Hospital)

Anna K. Bradley (Social Work), B.J., University of Missouri, 1956; M.S.W., Washington University, 1958. (Malcolm Bliss Hospital)

Lincoln B. Calvin (Child Psychiatry), B.Ed., Illinois State University, 1942; M.D., Meharry Medical College, 1951. (Malcolm Bliss Hospital)

Marguerite Cannon (Social Work), B.S., St. Louis University, 1936; M.S.W., Washington University, 1948.

Sei Y. Choi, B.S., Woo Sok University, 1951; M.D., 1963. (Malcolm Bliss Hospital)

Felipe Crimi, M.D., National University of Cordoba, 1946. (Malcolm Bliss Hospital)

Earl P. Dick, A.B., Central College, 1961; M.D., Baylor College, 1966. (Also School of Law) (Malcolm Bliss Hospital)

Pacita C. Dy, A.A., University of the East, 1959; M.D., Far Eastern University, 1967. (Malcolm Bliss Hospital)

Sabah N. El-Chammas, M.D., American University of Beirut, 1974.

Eduyn A. Figueroa (Child Psychiatry), M.D., University of San Carlos, 1970. (St. Louis State Hospital Youth Center)

James A. Freeberg (Medical Psychology), B.S., University of Wisconsin, River Falls, 1968; M.A., University of Tulsa, 1970; Ed.D., 1973. (Malcolm Bliss Hospital)

Clifford Gilpin, S.B., University of Chicago, 1945; M.D., 1948. (Malcolm Bliss Hospital)

Ali Kashfi-Lari (Child Psychiatry), M.D., University of Teheran, 1965. (St. Louis State Hospital Youth Center)

John W. Knesevich, A.B., Indiana University, 1970; M.D., McGill University, 1974.

Natarajan Lakshminarayanan, M.B., University of Madras, 1960; M.S., 1960; M.D., 1967. (Malcolm Bliss Hospital)

Sana C. Moucharafieh, M.D., American University of Beirut, 1973. (Malcolm Bliss Hospital)

John F. Mueller (Social Work), B.S., Washington University, 1947; M.S.W., 1952. (Malcolm Bliss Hospital)

Earni Pal, M.B.B.S., Andhra University, 1965. (Malcolm Bliss Hospital)

William M. Riedesel II, A.B., University of Rochester, 1968; M.D., Cornell University, 1973. (Malcolm Bliss Hospital)

Kenneth L. Russ (Medical Psychology), A.B., University of Rochester, 1965; M.S., University of Pittsburgh, 1969; Ph.D., 1970.

Carlos Tomelleri, B.A., Colegio San Jose, 1955; M.D., Universidad Javeriana, 1965. (Malcolm Bliss Hospital)

Jaime Vargas, M.D., National University of Colombia, 1954. (Malcolm Bliss Hospital)

Eliza E. Wochnik (Child Psychiatry), M.D., Medical Academy of Warsaw, 1962. (St. Louis State Hospital Youth Center)

Alejandro M. Datuin, A.A., University of Santo Tomas, 1951; M.D., 1956. (Malcolm Bliss Hospital)

Mary Davis, B.A., Ohio State University, 1947; M.D., Washington University, 1952.


Eduardo A. Garcia-Ferrer, M.D., Havana University, 1952. (Malcolm Bliss Hospital)

Research Instructors


Robert Goldstein (Medical Psychology), B.A., City College of New York, 1954; Ph.D., University of Illinois, 1962. (Also Faculty of Arts and Sciences) (Malcolm Bliss Hospital)


Patricia A. West (Sociology), B.S., Memphis State University, 1967; M.A., 1969; Ph.D., St. Louis University, 1975.

Instructors Emeriti (Clinical)

Robert M. Bell, M.D., St. Louis University, 1928.

Barbara S. Kendall (Medical Psychology), A.B., Radcliffe College, 1913; Ed.M., Harvard University, 1928.

Reese H. Potter, A.B., University of Kansas, 1931; B.S., University of Missouri, 1933; M.D., Washington University, 1935.

Instructors (Clinical)


Juan C. Corvalan, M.D., Argentina National University, 1965. (Malcolm Bliss Hospital)

Edmund V. Cowdry, Jr., A.B., Princeton University, 1942; M.D., Washington University, 1945. (On leave of absence)

Mary E. Cox, A.B., Washington University, 1941; M.D., 1944.
Fred W. Gaskin, B.S., University of Minnesota, 1966; M.D., 1968. (Malcolm Bliss Hospital)
Maria E. Manion (Child Psychiatry), M.D., University of Buenos Aires, 1961. (St. Louis State Hospital Youth Center)
Elizabeth Mann, B.S., Valparaiso University, 1966; M.D., St. Louis University, 1970.
Ronald A. Oliver (Medical Psychology), B.A., University of Rhode Island, 1968; M.A., Xavier University, 1970; Ph.D., Iowa State University, 1973. (Malcolm Bliss Hospital)
Howard E. Rogers (Medical Psychology), B.A., New York City College, 1960; M.A., Los Angeles State College, 1963; Ph.D., Arizona State University, 1969. (Malcolm Bliss Hospital)
Nathan M. Simon, B.S., Yale University, 1949; M.S., 1950; M.D., Washington University, 1955.
John Sweet, B.A., University of Michigan, 1964; M.D., University of Missouri, 1968. (Malcolm Bliss Hospital)

Lecturer (Clinical)
Rhea L. Dornbush (Medical Psychology), B.A., Queens College, 1962; M.A., 1963; Ph.D., City University of New York, 1967. (Reproductive Biology Research Foundation)

WILLIAM GREENLEAF ELIOT
DIVISION OF CHILD PSYCHIATRY

The Division of Child Psychiatry offers a varied teaching program for residents in psychiatry and fellows in child psychiatry through its Child Psychiatry Clinic at 369 North Taylor Avenue, the St. Louis Children's Hospital, and the Youth Center at the St. Louis State Hospital. Trainees are assigned to these various units, where they participate in diagnostic evaluations and see patients in treatment under supervision. Seminars in child psychiatry, child development, individual and group treatment, clinical psychology, social work, and research are held weekly. New methods of teaching and observation (videotaped sessions, one-way screens, clinical films) are in regular use. The Harry Edison Child Development Research Center, attached to the Division of Child Psychiatry, carries out research in child psychiatry. Fellows in child psychiatry participate in the various research programs.

Director and Blanche F. Ittleson Professor
Assistant Professor Emeritus

Loretta K. Cass (Medical Psychology), B.A., Colorado College, 1934; M.A., 1942; Ph.D., Ohio State University, 1950. (Also Faculty of Arts and Sciences)

Assistant Professors

Doris C. Gilpin (Child Psychiatry), B.S., Drury College, 1944; M.D., University of Chicago School of Medicine, 1948.

Emel A. Sumer (Child Psychiatry), M.D., University of Istanbul, 1957. (St. Louis State Hospital Youth Center)

Assistant Professors (Clinical)

Roy M. Mendelsohn (Child Psychiatry), B.S., University of Illinois, 1950; M.D., 1952.

Paul H. Painter (Child Psychiatry), M.D., St. Louis University, 1947. (See Department of Pediatrics)


Instructor Emeritus

Louetta Berger (Psychiatric Social Work), B.S., University of Wichita, 1941; M.S.W., Washington University, 1946.

Instructors

Ebrahim Amanat (Child Psychiatry), M.D., Tehran University Medical Faculty, 1959. (Child Center of Our Lady of Grace)


Richard J. Laitman (Medical Psychology), A.B., Washington University, 1967; M.A., Case Western Reserve University, 1971; Ph.D., 1975.


Syed A. Raza (Child Psychiatry), M.D., Dow Medical College, 1959. (St. Louis State Hospital Youth Center)


Marylyn Voerg (Medical Psychology), B.A., University of Florida, 1950; Ph.D., 1964.

Robert P. Wade (Psychiatric Social Work), B.A., Maryknoll College, 1960; M.S.W., St. Louis University, 1969.


Research Instructor

Cynthia L. Janes (Medical Psychology), B.A., University of Oklahoma, 1965; Ph.D., 1970.

Research Instructors (Clinical)

Lois E. Franklin (Medical Psychology), B.A., Blackburn College, 1950; M.A., MacMurray College, 1952; Ph.D., St. Louis University, 1976.

John B. Lewis (Medical Psychology), M.S.W., Washington University, 1952.

Instructors (Clinical)

Anna E. Hartnett (Child Psychiatry), B.S., Loyola University, 1956; M.D., University of Ottawa, 1960.


Consultant

Robert E. Lefton (Medical Psychology), A.B., Washington University, 1953; Ph.D., 1958.

Lecturer

The Department of Radiology occupies the Edward Mallinckrodt Institute of Radiology and provides diagnostic radiology, nuclear medicine, and radiation oncology services to Barnes and St. Louis Children's hospitals. It connects by corridor and tunnel with Barnes, St. Louis Children's, East Pavilion, Wohl, Barnard, and Renard hospitals, Queeny Tower, and the Washington University Clinic.

Clinical facilities for the Division of Radiation Oncology are located on the ground floor of the Institute and in Barnard Hospital. The therapy equipment consists of an advanced 35 MeV linear accelerator, 24 MeV Betatron, 4 MeV linear accelerator, and Cobalt 60 therapy. There are also facilities and an ample stock of Cesium 137 sources for both interstitial and intracavitary therapy. The first floor of the Institute houses administrative and business offices, film library, consulting viewing rooms, and the 135-seat Scarpellino Auditorium.

Diagnostic radiology facilities are located on the second floor (chest, musculoskeletal radiology, mammography, and whole body computerized tomography), third floor (two cardiac catheterization laboratories, two head computerized tomography facilities, special neuroradiological and vascular radi-
ological equipment, ultrasound and genitourinary radiology), fourth floor (gastrointestinal and genitourinary radiology, including a second whole body computerized tomography unit), and the fifth floor (pediatric radiology).

The sixth floor contains the Division of Radiation Sciences, which also utilizes the medical cyclotron in Barnard Hospital. Nuclear Medicine is also located on this floor and in the adjoining Barnard Hospital. Research facilities are located on the seventh floor (nuclear medicine and cancer biology), ninth floor (diagnostic radiology) and tenth floor (cancer biology).

Administrative, teaching, and support functions occupy the eighth and eleventh floors. The twelfth floor has recently been completed in order to develop modern computer facilities for clinical, research, and teaching use.

The undergraduate teaching program is designed to present both diagnostic and therapeutic radiology to students as part of the clinical clerkship experience. Every effort is made to provide an opportunity to correlate roentgen and clinical findings through interdepartmental conferences, consultations, and group discussions. The thirteen floors of the Mallinckrodt Institute are utilized for the following academic activities.

SECOND YEAR

Thirty-four hours of lecture are devoted to an introduction to radiology. The majority of the course is devoted to diagnostic radiology. Other topics included are ultrasound, nuclear medicine, and radiation oncology.

Electives

Research Electives. Opportunity is available to carry out research in the laboratories under the guidance of the staff in the fields of diagnostic radiology, therapeutic radiology, radiation physics, nuclear medicine, and radiation biology.

SUMMER ELECTIVE FOR FRESHMAN STUDENTS

A ten-week summer clerkship program is available for freshman medical and dental 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 some laboratory research or clinical investigation under the direction of the staff members of the sections of Clinical Radiation Oncology and Cancer Biology.

(Dr. Lee or Stewart)

CANCER BIOLOGY PROGRAM

The section of cancer biology provides a twelve-week (full time) oncology training program beginning in January in even-numbered years. A series of laboratory exercises, with emphasis on quantitative cellular cancer biology, constitutes the major portion of this course. Experiments in tissue culture systems and in mice have been chosen to emphasize aspects of oncology important in the understanding of cancer biology and in its application for optimal cancer therapy. A number of concepts necessary to the understanding of tumor biology and cancer therapy are presented through three sets of formal lectures: radiation biology; cellular kinetics of normal and tumor tissues; and the biochemical, cellular, and clinical action of anticancer drugs. Each set consists of approximately twenty one-hour lectures. In addition, an informal seminar series will be presented to include topics in molecular biology, cell biology, immunology, virology, statistics, and instrumentation.

(Dr. Valeriote)

FOURTH-YEAR ELECTIVES

Clerkship in Radiation Oncology. 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, clinical physics conference, protocol conference, and interdepartmental conferences with the Departments of Pediatrics, Obstetrics and Gynecology, Surgery, and Pathology.

(Dr. Lee or Perez)

Clerkship in Diagnostic Radiology. A six-week elective in which approximately half of the student's time will be spent attending lectures, seminars, and conferences emphasizing the principles of general radiology, including film interpretation and the role of radiology in the solution of clinical diagnostic problems. The remaining time will be divided between elective periods on subspecialty rotations within the Department (thoracic, abdominal, musculoskeletal, neurologic, pediatric, nuclear medicine, radiation oncology) under the direct supervision of a senior faculty member. The student will be exposed to the daily workload of a subspecialty radiologist, and have an opportunity to observe the appropriate diagnostic and therapeutic procedures in each section.

(Dr. Shackelford)

Additional six-week clerkships in diagnostic radiology are offered at Jewish Hospital (Dr. Hyman Senturia) and St. Luke's Hospital.

(Drs. Sumber, Holtz)

Clerkship in Clinical Nuclear Medicine. A six-week elective in which the student will be exposed to the full range of techniques including organ imaging with radionuclides, nuclear hematology, in vitro tests, and radio-nuclide therapy. The student will be responsible for planning appropriate isotope studies in patients referred to the Department in conjunction with the staff. Opportunity exists to learn instrumental techniques, including newer ones such as computer applications. Participation in clinical and laboratory research projects may also be arranged if desirable. There are daily conferences and scan interpretation sessions.

(Dr. Siegel)
Michael J. Welch (Radiation Chemistry), B.A., Cambridge University, 1961; M.A., 1964; Ph.D., University of London, 1965. (Also Faculty of Arts and Sciences)

**Associate Professors**

John O. Eichling (Radiation Sciences), B.S., Northeastern Oklahoma State College, 1958; M.S., Oklahoma State University, 1959; Ph.D., Washington University, 1970.

Robert L. Grubb, Jr. (Radiation Sciences), A.B., University of North Carolina, 1961; M.D., 1965. (See Department of Neurology and Neurological Surgery)

Hsiu-san Lin (Cancer Biology), M.D., Taiwan University, 1960; Ph.D., University of Chicago, 1968. (See Department of Microbiology and Immunology)

Robert C. McKnight, B.S., Florida State University, 1957; M.D., Washington University, 1961. (See Department of Medicine)


Marcus E. Raichle (Radiation Sciences), B.S., University of Washington, 1960; M.D., 1964. (See Department of Neurology and Neurological Surgery)

Gary D. Shuckelford, B.A., Northwestern University, 1964; M.D., Washington University, 1968. (See Department of Pediatrics)


Robert J. Stanley, B.S., St. Peter's College, 1959; M.D., St. Louis University, 1963.


Teresa J. Vietti (Radiation Oncology), A.B., Rice University, 1949; M.D., Baylor University, 1953. (See Department of Pediatrics)

A. Norman Arnesson, B.S., Texas Christian University, 1924; M.D., Washington University, 1928. (See Department of Obstetrics and Gynecology)

Hyman R. Senturia, A.B., Washington University, 1929; M.D., 1933.

**Associate Professors (Clinical)**

Mark D. Eagleton, Jr., A.B., Amherst College, 1947; M.D., Washington University, 1950.

Sumner Holtz, M.D., St. Louis University, 1948.

**Assistant Professors**


Guillermo C. Gelsie, B.A., University of Chile, 1957; M.D., 1965.

Louis A. Gilula, M.D., University of Illinois, 1967.

Rexford L. Hill (Computer Sciences), B.S., University of Cincinnati, 1964; M.S., 1966. (See Biomedical Computer Laboratory)

Donald V. Huebener (Dental Medicine), D.D.S., Washington University, 1969. (Also School of Dental Medicine)


Philip R. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Medicine)


Adel G. Mattar, M.B., Ch.B., Ain-Shams University, 1964.

Gaellan McIlmoyle, M.D., University of Toronto, 1968.

Michael A. Mikhail, M.B., Ch.B., Alexandria University, 1959.


William A. Murphy, Jr., B.S., University of Pittsburgh, 1966; M.D., Pennsylvania State University, 1971.


Alexander N. Nakeff, (Cancer Biology), B.S., University of Toronto, 1962; M.S., 1965; Ph.D., University of Rochester, 1969.

**Associate Professors Emeriti (Clinical)**

William E. Allen, Jr., B.S., Howard University, 1927; M.D., 1930.
Cary A. Presant, M.D., State University of New York at Buffalo, 1966. (See Department of Medicine)


Aly A. Razek, M.B., B.Ch., Cairo University, 1963; M.D., 1969.


Palmer G. Steward (Cancer Biology), B.A., Haverford College, 1959; M.S., University of California, 1964; Ph.D., 1968.


Hollace L. Cox, Jr. (Radiation Physics), B.A., University of Rochester, 1959; Ph.D., Indiana University, 1967.

Glenn P. Glasgow (Radiation Physics), B.S., Western Kentucky State College, 1965; M.S., University of Kentucky, 1969; Ph.D., 1974.

Walter G. Holloman, Jr., B.A., Rice University, 1966; B.S., 1967; M.D., University of Texas, 1971.

Isidro L. Huete, B.A., St. Louis College, 1960; M.D., University of Chile, 1969.

Javad Jamshidnejad, M.D., Tehran University Medical School, 1966.

Enrique Cubillo, M.D., University of Madrid, 1962.


Wayne A. Simril, A.B., Culver-Stockton College, 1941; M.D., Washington University, 1944.

Noah Susman, A.B., Washington University, 1948; M.D., 1952. (Jewish Hospital)

Instructors

Enrique Cubillo, M.D., University of Madrid, 1962.


Jeanette Y. Lee (Biostatistics), B.A., Boston University, 1972; Ph.D., Johns Hopkins University, 1976.

Ramesh B. Patel, M.D., University of Baroda, 1967.
Satist C. Prasad (Radiation Physics), B.S., University of Patna, 1963; M.S., University of Delhi, 1965; M.S., University of Massachusetts, 1968; Ph.D., 1972; M.S., University of Colorado, 1976.
Fabio J. Rodriguez, M.D., Facultad de Medicina, 1971.
Subhash C. Sharma (Radiation Physics), B.S., Panjab University, 1964; M.S., Birla Institute of Technology & Science, 1966; M.S., University of Nebraska, 1970; Ph.D., 1971.
Chandrakant C. Tailor, M.D., Medical College, 1972.

Instructors (Clinical)
MacDonald B. Logie, B.S., Northwestern University, 1965; M.D., 1967.
Gary H. Omell, M.D., University of Tennessee, 1967.
Gary T. Ratkin, B.A., Rice University, 1963; M.D., Washington University, 1967. (See Department of Medicine)

Gerald L. Shaikun, B.S., University of Kentucky, 1960; M.D., University of Chicago, 1964.
T. K. Youssef, M.D., Ein-Shams University, 1960.

Research Associates
Carol Higgins, A.B., Georgia State University, 1969.
Linda C. Knight, B.S., University of California, Davis, 1972; M.A., Washington University, 1974; Ph.D., 1976.
Nizar Mullani, B.S., Washington University, 1967.
Giovanni R. Santelli, Ph.D., Bologna University, 1969.
Sally J. Wagner, B.S., University of Iowa, 1971; M.S., University of Southern California, 1976.

Research Assistants
Charles M. Currie, B.S., Florida Technological University, 1974.

Lecturer
Armand Diaz (Radiologic Technology), R.N., R.T., Havana University School of Medicine, 1948. (See Program in Radiologic Technology)

Consultants
Arthur L. Hughes (Physics), B.Sc., Liverpool University, 1906; M.Sc., 1908; D.Sc., 1912; B.A., Cambridge University, 1910.
Edward H. Reinhard (Hematology and Oncology), A.B., Washington University, 1935; M.D., 1939. (See Department of Medicine)

Mildred Trotter (Anatomy), A.B., Mount Holyoke College, 1920; Sc.M., Washington University, 1921; Ph.D., 1924; Sc.D., (hon.), Western College, 1956; Sc.D., (hon.), Mount Holyoke College, 1960. (See Department of Anatomy and Neurobiology)
The Department of Surgery includes general surgery, plastic and reconstructive surgery, orthopedic surgery, genitourinary surgery, cardiothoracic surgery, and pediatric surgery. The formal instruction begins in the second year with an introduction to surgical principles. For the most part, these surgical principles are derived from concepts in the preclinical sciences which the students have been studying since the beginning of the freshman year. Although in this course a few patients are used for the demonstration of lesions which illustrate the principles of surgery, it is in the junior year that the first personal contact with patients occurs. Students in the third year are assigned to general surgical clinical clerkships in the hospitals, where they have an opportunity to study the frequent and important surgical diseases.

The junior surgical clerkship, lasting twelve weeks, is spent on the surgical services of the Medical Center and allied hospitals. Students attend patient rounds with residents and staff daily during the clerkship and attend seminars conducted by the general and specialty surgical staffs.

Students are encouraged to attend and assist at operations upon patients assigned to them. The physiology, pathology, chemistry, and
bacteriology and pre- and post-operative care are stressed. Experience is acquired in surgical diagnosis and in the use of scientific methods that permit students to assess the effectiveness of what they do.

The fourth-year surgical program permits the senior student to select any of the following types of electives for periods of six to eighteen weeks: (1) sub-internships and preceptorships in which the student is assigned to a staff member for instruction and exposure to the problems of clinical practice, (2) surgical research under supervision (minimum time twelve weeks), (3) electives in pediatric surgery, thoracic and cardiac surgery, orthopedics, neurosurgery, urology, oncology, transplantation, and emergency room surgery.

In both the third and fourth years, a series of computer-assisted CORE tutorials is an integral part of the surgical curriculum. The tutorials contain both didactic material and clinical simulations. They are highly interactive and individualized, and may be taken at a number of locations within the Barnes complex and at some outlying hospitals where students rotate.

SECOND YEAR

Introduction to Surgery. Panel discussions present certain fundamental principles of physiology, biochemistry, and pathology as applied to surgery. Recitations and demonstrations are included. Two hours weekly for eighteen weeks during the second and third trimesters of the second year.

THIRD YEAR

Surgical Wards. For twelve weeks the students serve as clerks in surgery, working on the wards of the hospitals of the Medical Center. Students take case histories and make the physical examinations and the usual laboratory examinations on the patients assigned to them. They are assigned patients with diseases treated by both surgical specialists and general surgeons. They assist at operations and do some surgical dressings. Surgical pathological material is followed as an integral part of the case study. At regular intervals the students meet with residents and attending staff in informal conferences, when questions which have arisen during the day are discussed and various aspects of the care of the patient considered. In addition, the material is presented to students in small discussion groups with their preceptors. They follow their patients after discharge in the postoperative and outpatient clinic. Particular effort is made to see that students have some experience with the more frequent and important surgical lesions, and that the assigned cases are sufficiently diversified to afford an accurate perspective of surgery. Students are encouraged to consult the library frequently in the solution of problems concerning patients. One afternoon a week students participate in the tumor clinic and attend a tumor conference held jointly by the Departments of Surgery, Pathology, and Radiology. Students may attend a variety of other scheduled conferences conducted by the various divisions of the Department. Finally, by rotation, students spend time in the emergency room, where they function under the supervision of house staff and attendings.
FOURTH YEAR

The electives offered to senior students are principally clinical sub-internships or research.

Surgical Preceptorships and Sub-internships. Each student is assigned to a carefully selected senior general surgeon. The student sees patients in the surgeon's office, takes histories, performs physical examinations on the patients, and follows them in the hospital. The student is expected to attend the surgeon's office hours, operate with him, and make rounds with him. Reading assignments are evaluated by the surgeon to whom the student is assigned. Projects of a clinical nature may be undertaken during this preceptorship. Sub-internships are offered at Barnes, Starkloff, Jewish and St. Luke's Hospitals, where the student acts as an intern under the guidance of the senior staff.

(Dr. Ballinger and Staff)

Surgical Research Elective. This elective introduces the student to the general approach to analyzing clinical problems of surgery in the laboratory and to familiarize him with some of the investigative methods in surgery. In general, the student gains more experience by working with an established investigator on a current project. The student is encouraged, however, to plan and execute a laboratory solution to a specific problem within the limitations of his elective time. The student participates in the weekly departmental research seminars, where investigators describe a wide range of current topics.

(Dr. Ballinger and Staff)

Pediatric Surgery Elective. Emphasis is placed on the different problems this age group presents in respect to type of surgical diseases and their care. In addition to the daily ward rounds, conferences are arranged twice a week to discuss the etiology, diagnosis, and treatment of disorders that have not been encountered on the ward. The student also attends the general surgery pediatric clinic, where he participates in postoperative follow-up of patients. Once a week the student attends the pediatric oncology clinic. Pertinent pediatric X-ray films are reviewed regularly.

(Dr. Ternberg and Staff)

Principles of Thoracic and Cardiac Surgery. Two avenues are available which may be mixed. The first involves a clinical rotation on cardiothoracic surgical service where the student will be assigned duties comparable to that of an intern. They will share night call under supervision of the first- and second-year residents in rotation with the ward interns. They will have the prerogative of selection of operative cases on which to scrub and are at liberty to spend time within the cardiac catheterization laboratory, with members of the cardiopulmonary bypass team, or on any particular problem of acute pulmonary or hemodynamic nature in the intensive care unit. The second alternative is 6 weeks in the laboratory working on ongoing projects having to do with ischemic heart disease and a myocardial infarction model, prosthetic heart valves, perfusion techniques for infants and the studies of the pulmonary micro-circulation. Individual meetings with Drs. Weldon and Clark or both are available on a weekly basis.

(Dr. Weldon and Staff)

Plastic and Reconstructive Surgery Preceptorship. The aim of this elective is to familiarize the student with some of the problems in plastic and reconstructive surgery. The student has an opportunity to discuss the application of principles of tissue repair to a variety of surgical conditions, including burns and other forms of trauma, and major soft tissue injury associated with cancer surgery. There is a constant personal relationship between the student and the attending staff during the period.

(Dr. Weeks and Staff)

Orthopedic Surgery Elective. Clinical clerkship electives are available for six weeks, during which time the student attends conferences and outpatient clinics and serves in the various orthopedic clinical divisions. It is also possible to establish a research elective in the Orthopedic Research Laboratory under the guidance of Dr. David Simmons.
and Dr. Leo Whiteside. Students on the clinical elective become an active part of the orthopedic team and may spend part of their time at the Shriners Hospital for Crippled Children, Veterans Hospital and Barnes Hospital, the exact program to be worked out on an individual basis with the Chairman of the Division. (Dr. Whiteside and Staff)

Urology Elective. A six-week clinical clerkship offers the interested student an adequate knowledge of the type of problems with which the clinical urologist deals. The student is taught the basic diagnostic procedures and the management of surgical and nonsurgical patients on both the private and ward services under the supervision of the attending staff and house officers. The experience involves direct care of patients in the clinics, as well as the urologic admissions to the hospital. Daily morning and evening rounds of all patients on a particular service are conducted by the responsible resident. Two additional teaching rounds for the house staff and students are held weekly. In addition, the student attends daily X-ray conferences, the weekly staff conference, and the pathology conference and journal club conducted every other week. The student is given an opportunity to assist in open and endoscopic surgery, as well as in the various diagnostic procedures performed in the cystoscopy and urography section.

(Dr. Fair and Staff)

Oncology Elective. Students electing to study the theoretical and practical aspects of the epidemiology, diagnosis, treatment, and prognosis of neoplastic diseases in man may select a program (subject to the approval of the Tumor Committee) which includes interdepartmental experience in several of the following areas of knowledge:

1. Surgical Pathology of Neoplasms. (Dr. Bauer)
2. Neoplasms in Children. (Dr. Vietti)
3. Head and Neck Cancer. (Dr. Ogura)
4. Radiation Therapy of Neoplasms. (Dr. Perez)
5. Hematologic Neoplastic Disease. (Dr. Reinhard)
6. Chemotherapy of Solid Tumors. (Dr. Philpott)

All students attending the oncology elective will be expected to attend the tumor, gynecologic cancer, ENT tumor, and neoplastic hematology conferences, as well as the cancer workshop.

Each student taking an elective in oncology must select (or be assigned) a problem for study in this field. Each student is expected to report to his peers and instructors on the selected subject at the end of the elective period. Members of the Tumor Committee evaluate the report, as well as the student's performance during the elective.

(Drs. Bauer, Philpott, and Staff)

Transplantation Elective. This orientation course is designed to offer the student an overview of the entire field of organ transplantation. The student is an integral part of the renal transplantation team and assumes appropriate responsibilities under supervision. (Dr. Anderson and Staff)

Biomedical Professor of Surgery and Head of Department

Harry Edison Professor of Surgery
Gordon W. Philpott, B.S., Yale University, 1957; M.D., Washington University, 1961. (Jewish Hospital) (Cancer Coordinator and Director, Division of Tumor Services)

Professors
Harvey R. Butcher, Jr., A.B., Central College, 1941; M.D., Harvard University, 1944.
William T. Newton, B.S., Yale University, 1947; M.D., 1950. (Head, Washington University Surgical Service, St. Louis V.A. Hospitals)

Professor Emeritus (Clinical)
Eugene M. Bricker, M.D., Washington University, 1934.
Associate Professors
Charles B. Anderson, A.B., Johns Hopkins University, 1958; M.D., Yale University, 1962.
Bernard M. Jaffe, A.B., University of Rochester, 1961; M.D., New York University, 1964.

Associate Professors Emeriti (Clinical)
Robert W. Bartlett, B.S., University of Michigan, 1926; M.D., 1930.
Heinz Haffner, B.S., University of Arizona, 1931; M.D., Washington University, 1935.
Carl F. Lischer, A.B., University of California, 1933; M.D., Washington University, 1937.
J. G. Prokopenko, M.D., Loyola University, 1917.

Associate Professors (Clinical)
Ralph J. Graff, A.B., Washington University, 1957; M.D., 1957. (See Department of Microbiology and Immunology)
Falls B. Hershey, B.S., University of Illinois, 1939; M.D., Harvard University, 1943.
C. Alan McAfee, B.S., Washington State College, 1938; M.D., Washington University, 1942.
Lawrence W. O'Neal, M.D., Washington University, 1946.
William D. Sieber, M.D., Washington University, 1953.
James M. Stokes, M.D., Washington University, 1948.

Assistant Professors
Lawrence Cheung, M.D., National Defense Medical Center, 1968. (St. Louis V.A. Hospitals)
Thomas H. Covey, Jr., A.B., West Virginia University, 1957; M.D., Harvard University, 1961.
Robert C. Donaldson, A.B., University of Missouri, 1941; M.D., Washington University, 1944. (St. Louis V.A. Hospitals)
Edward E. Etheredge, B.A., Yale College, 1961; M.D., Yale University, 1965; Ph.D., University of Minnesota, 1974.

Mark Wallack, B.S., Albright College, 1966; M.D., University of Pittsburgh, 1970.

Research Assistant Professor
Harry W. Margraf, M.Sc., Polytechnicum, 1941; D.Sc., Milan University, 1943.

Assistant Professors (Clinical)
Richard V. Bradley, M.D., Washington University, 1952.
Cyril J. Costello, B.S., University of Texas, 1935; M.D., 1939.
Shale Rifkin, M.D., Washington University, 1948.
Leo A. Sachar, A.B., Washington University, 1936; M.D., 1940.
Sam F. Schneider, A.B., Washington University, 1932; M.D., 1936.
Richard G. Sisson, A.B., Harvard University, 1943; M.D., Yale University, 1946.
Andrew D. Spencer, A.B., Indiana University, 1951; M.D., 1954.

Instructors Emeriti (Clinical)
Virgil O. Fish, M.D., Washington University, 1930.
George C. Wee, M.D., University of Louisville, 1931.

Instructors (Clinical)
Robert R. Anschuetz, M.D., Washington University, 1940.
Kenneth J. Bennett, M.D., Tulane University, 1965.
Samuel Bonney, B.A., Westminster College, 1950; B.S., University of Missouri, 1953; M.D., University of Kansas, 1955. (Emergency Medicine)


Arthur R. Dalton, B.S., University of Missouri, 1938; B.S.Med., Northwestern University, 1940; M.D., 1941. (Jewish Hospital)


Fleming B. Harper, M.D., Medical College of Virginia, 1947.


Eugene N. Mitchell, B.S., St. Louis University, 1955; M.D., University of Missouri, 1960.

George A. Oliver, A.B., Washington University, 1948; M.D., 1952.


Joseph C. Peden, Jr., B.S., Harvard University, 1940; M.D., 1943.

Mather Pfeiffenberger, Jr., A.B., Yale University, 1941; M.D., Harvard University, 1944.

George B. Rader, M.D., Washington University, 1951.

Frank O. Richards, A.B., Talladega College, 1944; M.D., Howard University, 1947.


Belmont R. Thiele, M.D., St. Louis University, 1948. (St. Louis County Hospital)
 Assistants (Clinical)
Leslie F. Bond, A.B., University of Illinois, 1948; M.D., Meharry Medical College, 1952.
Katherine J. Crawford, B.S., Michigan State College, 1942; M.D., Woman’s Medical College of Pennsylvania, 1946.
James R. Criscione, B.S., Youngstown University, 1943; M.D., St. Louis University, 1951.
Samuel Lugo, B.S., St. Louis University, 1954; M.D., 1958.
Raj N. Mohapatra, I.Sc, Utkal University, 1953; M.B.B.S., 1958; F.R.C.S., Royal College of Surgeons, 1967. (St. Louis V.A. Hospitals)
Lester J. Nathan, B.A., University of Omaha, 1949; M.D., University of Nebraska, 1952.
Robert Rainey, B.S., Yale University, 1944; M.D., Washington University, 1947.

CARIOTHRACIC SURGERY
Professors
Richard E. Clark, B.S.E., Princeton University, 1956; M.D., Cornell University, 1960; M.S., University of Virginia, 1962.
Clarence S. Weldon, A.B., University of Michigan, 1951; M.D., Johns Hopkins University, 1955. (See Department of Pediatrics)

Professor Emeritus (Clinical)
Thomas H. Burford, A.B., University of Missouri, 1931; B.S.Med., 1933; M.D., Yale University, 1936.

Professor (Clinical)

Associate Professors (Clinical)
Martin Bergman, A.B., Washington University, 1942; M.D., 1945.

Assistant Professors
John P. Connors, A.B., Holy Cross College, 1961; M.D., Georgetown University, 1965. (Jewish Hospita)

GENITOURINARY SURGERY
Professor Emeritus
Justin J. Cordonnier, B.S., Washington University, 1926; M.D., 1928. (Also Lecturer)

Professors
Saul Boyarsky, B.S., University of Vermont, 1943; M.D., 1946. (See Department of Pharmacology)

Associate Professors
William Catalona, B.S., Otterbein College, 1964; M.D., Yale Medical School, 1968.
Charles B. Manley, Jr., A.B., University of Missouri, 1955; M.D., 1958. (See Department of Pediatrics)
Gerald Sufrin, B.S., University of Pennsylvania, 1960; M.D., State University of New York, Upstate Medical Center, 1966.
Research Associate Professor

Associate Professor Emeritus (Clinical)
Rogers Deakin, M.D., Washington University, 1922.

Associate Professors (Clinical)
Morris Abrams, B.S., University of Illinois, 1934; M.D., 1937.
William T. Bowles, M.D., Stanford University, 1955.
Robert K. Royce, B.S., University of Mississippi, 1939; M.D., Washington University, 1942.
Carl A. Wattenberg, A.B., University of Kansas, 1934; M.D., 1937.

Assistant Professors
David B. Crane, M.D., University of Rochester, 1968.

Research Assistant Professors
Warren D. Heston, Ph.D., University of Colorado, 1972.
Franz U. Steinberg, M.D., University of Berne, 1938. (See Departments of Medicine and Preventive Medicine and Public Health)

Assistant Professors (Clinical)
M. Richard Carlin, B.A., Dartmouth College, 1944; M.D., Yale University, 1947.

Instructors (Clinical)
J. Byron Beare, B.S., St. Louis University, 1936; M.D., 1939; M.S., University of Minnesota, 1947.
Saul Klein, M.D., Syracuse University Medical Center, 1959.

Research Associate
Rose E. Boyarsky, B.S., University of Vermont, 1944; M.A., Columbia University, 1946; Ph.D., Duke University, 1969.

ORTHOPEDIC SURGERY

Professor Emeritus
Fred C. Reynolds, A.B., Washington University, 1931; M.D., 1934. (Also Lecturer)

Professor (Clinical)

Associate Professor Emeritus (Clinical)
Oscar P. Hampton, Jr., M.D., University of Tennessee, 1928.

Associate Professors (Clinical)
Lee T. Ford, Jr., M.D., University of Tennessee, 1940.
Harry C. Morgan, B.A., University of Missouri, 1949; B.S., 1951; M.D., Harvard University, 1953.

Assistant Professors
Virginia M. Badger, B.A., Occidental College, 1950; M.S., University of Southern California, 1957; M.D., Woman's Medical College of Pennsylvania, 1961.
Leo A. Whiteside, B.S., University of Oklahoma, 1965; M.D., University of Texas, 1969.

Research Assistant Professor
David J. Simmons, B.A., Boston University, 1954; M.A., Clark University, 1956; Ph.D., University of Chicago, 1959.

Assistant Professors (Clinical)
Earl P. Holt, Jr., B.A., Duke University, 1942; M.D., 1945.
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James O. Lottes, Ph.B., St. Louis College of Pharmacy, 1926; Ph.G., 1928; A.B., University of Missouri, 1934; B.S., 1935; M.D., University of Louisville, 1937.  
George E. Scheer, A.B., Municipal University of Wichita, 1940; M.D., Washington University, 1943.  

Assistant Professors  
Martin J. Bell, B.A., New York University, 1959; M.D., State University of New York, Downstate Medical Center, 1963. (See Department of Pediatrics)  
Richard J. Bower, B.S., Northern Illinois University, 1965; M.D., University of Virginia, 1969.  

Instructors (Clinical)  
Vilray P. Blair, Jr., M.D., Washington University, 1939.  

Research Associates  
Gary D. Rosenberg, B.S., University of Wisconsin, 1966; Ph.D., University of California, Los Angeles, 1972.  

Assistants (Clinical)  
John P. Arnot, B.A., Rice University, 1954; M.D., Yale University, 1958.  
Kyu Sop Cho, M.D., Yon-Sei University, 1954.  

PLASTIC AND RECONSTRUCTIVE SURGERY  
Professor  
Paul M. Weeks, A.B., Duke University, 1954; M.D., University of North Carolina, 1958. (See Department of Preventive Medicine and Public Health and Irene Walter Johnson Institute of Rehabilitation)  

Professor (Clinical)  
Minot P. Fryer, A.B., Brown University, 1936; M.D., Johns Hopkins University, 1940; D.Sc., Brown University, 1972.  

Associate Professor  

Assistant Professors  

Assistant Professors (Clinical)  
George H. Zografakis, M.S., Rutgers University, 1955; M.D., State University of New York, Upstate Medical College, 1959.  

Instructor (Clinical)  
Bruce I. White, M.D., Washington University, 1964.  

Consultant in Oral Surgery  
Leroy W. Peterson, D.D.S., University of Michigan, 1940. (Also School of Dental Medicine)  

PEDIATRIC SURGERY  
Professor  
Jessie L. Ternberg, A.B., Grinnell College, 1946; Ph.D., University of Texas, 1950; M.D., Washington University, 1953. (See Department of Pediatrics)
BIOMEDICAL COMPUTER LABORATORY
The Biomedical Computer Laboratory collaborates with research investigators at the Medical Center in the application of modern information processing techniques to problems in biology and medicine. The laboratory currently has active programs in electrocardiographic rhythm analysis, monitoring the critically ill in a surgical intensive care unit, cardiac catheterization data processing, regional tracer kinetics in nuclear medicine, clinical research and diagnosis using mass spectrometry, speech synthesis and models of cochlear function, and patient-based medical information systems.

Research and training are offered to medical and graduate students in mathematical techniques, digital system design, and advanced programming techniques applied to the biomedical problems described above. Externships in biomedical computing of two to three months' duration are offered during the summer for students who have completed the first year of the medical school curriculum. Opportunities to carry out research are also available to graduate students on a year-round basis. A number of assistantships are available. The laboratory participates in the interdepartmental programs in Biomedical Engineering and Health Care Technology.
The Biomedical Computer Laboratory is affiliated with the Computer Systems Laboratory located in nearby quarters at the School of Medicine. The mission of the Computer Systems Laboratory is the design and development of advanced computer systems with a current focus on the development of a compatible set of “macromodules” for which arbitrary large, complex, or specialized computer systems can be assembled. These systems are being applied to molecular and neural modeling, electrocardiographic rhythm analysis, speech synthesis, and ventricular dynamics.

**Elective Courses**

**Bio 530. Digital Computers for Laboratory Use.** Methods of using small digital computers with laboratory instruments. Basic programming, data collection and conversion, data processing, digital control, output techniques. Credit 3 units.  
(Dr. Holmes)

**BMed 693. Physical and Mathematical Principles of Tracer Kinetics.** Theoretical foundations of tracer-kinetic methods. Topics covered are differential equations for conservation of tracer mass, applications of elementary linear systems theory, stochastic and compartmental models, methods of accounting for tracer recirculation, and methods of data-processing.  
(Dr. Larson)

**Programming for Medical Information Systems.** An interpretive language designed for medical information systems is described, with programming examples from hospital and ambulatory care settings. The language used is MUMPS (MGH Utility Multi-Programming System). Three hours of class work plus laboratory each week for six weeks.  
(Ms. Moore)

**Introduction to Programming a Laboratory Computer.** A generalized description of digital computers, octal and binary number systems, structured programming techniques, assembly language for the PC (Programmed Console), and introduction to higher level languages (FORTRAN). Three hours of class work plus laboratory each week for six weeks.  
(Mr. Garfield)

**Survey of Biomedical Computer Techniques.** This course is directed toward biological scientists who seek an appreciation of the capabilities and limitations of digital computers as applied to biomedical problems. Only a minimal background in mathematics and electrical theory will be assumed. Topics include elements of sampling theory relevant to computer processing of biological signals, architectures of computers and computer systems, pertinent number systems, logical design of digital computers, programming techniques including elements of machine, assembler, and higher level languages, input and output devices, information systems, application techniques as exemplified by existing systems (e.g., clinical and laboratory research systems, patient monitoring, molecular modeling, and patient information systems). Given in two parts (six weeks each), with Part I as prerequisite to Part II. Three class hours plus laboratory each week.  
(Dr. Blaine and Staff)

**Associate Professor and Director**

Lewis J. Thomas, Jr., B.S., Haverford College, 1953; M.D., Washington University, 1957. (See Departments of Anesthesiology and Physiology and Biophysics)

**Professor and Senior Research Associate**

Jerome R. Cox, Jr., S.B., Massachusetts Institute of Technology, 1947; S.M., 1949; D.Sc., 1954. (See Department of Physiology and Biophysics and Division of Health Care Research) (Also School of Engineering and Applied Science)

**Assistant Directors**


**Professors**

G. Charles Oliver, A.B., Harvard University, 1953; M.D., 1957. (See Department of Medicine)
Donald L. Snyder, B.S., University of Southern California, 1961; M.S., Massachusetts Institute of Technology, 1963; Ph.D., 1966. (Also School of Engineering and Applied Science)

Associate Professors
R. Martin Arthur, B.A., Rice University, 1962; B.S., 1963; M.S., 1964; Ph.D., University of Pennsylvania, 1968. (Also School of Engineering and Applied Science)
William F. Holmes, A.B., Princeton University, 1953; Ph.D., University of Pennsylvania, 1960. (See Department of Biological Chemistry)

Research Associates
Robert J. Arnzen, B.S., Washington University, 1964; M.S., 1966; Ph.D., 1969. (Also Computer Systems Laboratory)
A. Maynard Engbergson, B.S., University of Minnesota, 1958; M.S., Washington University, 1963; D.Sc., 1970. (Also Central Institute for the Deaf)
Bruce F. Spenner, B.S., Washington University, 1969; M.S., 1971; D.Sc, 1976.
Joan Zimmerman, B.S., Leeds University, 1966; Ph.D., Oxford University, 1970.

Assistant Professors
Rexford L. Hill, B.S., University of Cincinnati, 1964; M.S., 1966. (See Department of Radiology)
John W. Lewis III, B.S., Georgia Institute of Technology, 1966; M.S., 1968; Ph.D., 1971. (See Department of Pathology)
Thomas F. Martin, B.S., St. Louis University, 1961; M.D., 1965. (See Department of Medicine)

Instructor
J. Philip Miller, A.B., Washington University, 1965. (See Department of Preventive Medicine and Public Health)

Research Instructor
Philip M. Fishman, B.S., Brooklyn College, 1964; M.S., New York University, 1969; Ph.D., Washington University, 1974. (See Department of Psychiatry)

DIVISION OF HEALTH CARE RESEARCH

The Division of Health Care Research is an extradepartmental unit of the School, directly responsible to the Dean. Staff members hold appointments in a variety of departments of the School of Medicine and the University; indeed, broad multidisciplinary staffing is considered appropriate for address to the complicated sociomedical and economic problems of health care and education. The primary function of the divisional staff is to contribute to the solution of such problems. Its responsibilities include:

Experimental Programs in Medical Care. The Division operates the Medical Care Group of Washington University, a prepaid group practice model. This practice is being developed as a teaching practice to provide a setting for training in general internal medicine, general pediatrics, medical care organization and economics, and for health care research.

Health Care Planning, Ambulatory Services, Washington University Medical Center. The Division conducts studies to provide a factual basis for planning improvements in the use of ambulatory medical facilities of the Center. In this way it is hoped that more effective medical care can be achieved.

Research in Health Care. Studies of several broad areas are conducted by the staff of the Division, including investigations into effects of various methods of practice on medical care costs, factors in the organization of medical care, studies of triage in emergency rooms, sociologic and economic aspects of medical care, and methods of education for comprehensive care.

Medical and Paramedical Education. The Division is responsible for the course Social Aspects of Medicine, a series of seventeen two-hour lecture-discussion periods presented during the freshman year. Other educational activities include the collection and cataloguing of literature related to medical care for the library of the Division, the provision of elective courses for medical stu-
students (see Preventive Medicine and Public Health), plus an integrated training experience in primary care in internal medicine and pediatrics. This program provides both junior and senior medical and pediatrics residents with the opportunity to practice general medicine or pediatrics in the Medical Care Group of Washington University for one or two years during their regular training. The program is available to residents already accepted for training in their parent departments. The program for training pediatric nurse practitioners (PNP) is described on page 166; the interinstitutional program for physicians' assistants is described on pages 166 and 167.

Director
Gerald T. Perkoff, M.D., Washington University, 1948. (See Departments of Medicine and Preventive Medicine and Public Health)

Associates
Kenneth J. Arnold, B.A., Notre Dame University, 1964; M.D., Washington University, 1968. (See Department of Surgery)

Thomas W. Bice, B.A., Knox College, 1963; M.S., Purdue University, 1965; Ph.D., 1969. (See Department of Preventive Medicine and Public Health) (Also Faculty of Arts and Sciences)

Lee Benham, B.A., Knox College, 1962; Ph.D., Stanford University, 1970. (See Department of Preventive Medicine and Public Health) (Also Faculty of Arts and Sciences)

Clifford A. Birge, A.B., Amherst College, 1956; M.D., Washington University, 1961. (See Department of Medicine)

Bruce L. Brown, M.D., University of Rochester, 1947. (See Department of Medicine)

Max H. Burgdorf, Jr., A.B., Washington University, 1970; M.D., 1974. (See Department of Pediatrics)

Jerome R. Cox, Jr., S.B., Massachusetts Institute of Technology, 1947; S.M., 1949; Sc.D., 1954. (See Biomedical Computer Laboratory and Department of Physiology and Biophysics) (Also School of Engineering and Applied Science)

Wendell R. Drew, B.A., DePauw University, 1967; M.S.W., Washington University, 1969. (See Department of Preventive Medicine and Public Health)

Martha Fenger, B.A., Texas Christian University, 1962; M.S.W., Louisiana State University, 1964. (See Department of Pediatrics)

Robert L. Fletcher, B.A., University of Kansas, 1974; B.S., Johns Hopkins University, 1976. (See Department of Medicine)

Carol E. Giblin, B.S., Fontbonne College, 1957; M.P.H., University of California, 1966. (See Department of Preventive Medicine and Public Health)

Carl G. Harford, A.B., Amherst College, 1928; M.D., Washington University, 1933.

Clemens H. Jacques, B.S., University of California, 1949; O.D., 1949. (See Department of Ophthalmology)

Lawrence I. Kahn, A.B., University of Alabama, 1941; Louisiana State University, 1945. (See Department of Pediatrics) (Also Pediatric Nurse Practitioners Program)

A. Donna King, B.A., Western Maryland College, 1960; M.S.W., Washington University, 1966. (See Department of Preventive Medicine and Public Health)

Connie M. Pollock, B.S., Indiana University, 1972; O.D., 1974. (See Department of Ophthalmology)

Kathleen Potts, R.N., St. Louis University, 1969; B.S., 1969; M.S., Boston University, 1970. (See Department of Pediatrics)

Maureen M. Prange, R.N., Mt. Sinai Hospital, 1966; M.N.P., Starkloff Hospital, 1975. (See Department of Medicine)

Calixto A. Romero, B.A., University of Pennsylvania, 1942; M.D., 1945. (See Department of Medicine)

Michael L. Scher, A.B., Lafayette College, 1967; M.D., State University of New York, Downstate, 1971. (See Department of Medicine)

Paul S. Simons, B.A., University of Texas, 1963; M.D., Washington University, 1967. (See Department of Pediatrics)

James K. Turner, A.B., Washington University, 1949; M.D., 1953. (See Department of Pediatrics)
John D. Vavra, B.A., University of Colorado, 1950; M.D., Washington University, 1954. (See Administration and Departments of Medicine and Preventive Medicine and Public Health)

Patricia Wirth, B.A., University of Nebraska, 1971. (See Department of Preventive Medicine)

DIVISION OF TUMOR SERVICES

The Division of Tumor Services was organized by the coordinating committee for the cancer education program. Cancer, like many other subjects in the medical curriculum, is taught in an interdepartmental manner. In the sophomore year, a six-week interdepartmental course in hematology and oncology is taught as part of the pathophysiology course by members of all clinical departments which participate in the Division. In the junior year, students are assigned to the tumor clinics of the various services, where they gain firsthand experience with cancer.

Interdepartmental tumor conferences, held each week for members of the junior class, postgraduate students, visitors, and staff, serve as a forum to demonstrate some of the complex problems in diagnosis and therapy which arise in patients with malignant disease. Other tumor conferences are held at regular intervals by the various clinical departments.

In the senior year, students may elect periods of study which expose them to the theoretical and practical aspects of the epidemiology, diagnosis, treatment, and prognosis of various human neoplasms. This program is tailored to the particular interests of each student with the approval of the executive committee of the Division of Tumor Services. The oncological electives available to seniors include studies in any of the following fields: surgical pathology, neoplasms in children, surgical oncology, radiation therapy, hematologic neoplasms, and epidemiology of cancer.

Cancer Coordinator, Director of Division, and Chairman of Executive Committee
Gordon W. Philpott

Executive Committee

William D. Owens
Anesthesiology

Stuart A. Kornfeld
Edward H. Reinhard
Internal Medicine

William S. Coxe
Neurology and Neurological Surgery

H. Marvin Camel
Ming-Shian Kao
Obstetrics and Gynecology

Morton E. Smith
Ophthalmology

Joseph H. Ogura
Donald G. Sessions
Otolaryngology

Walter C. Bauer
Heschen J. Raskas
Pathology

Teresa J. Vietti
Pediatrics

Fransiska Lee
Carlos A. Perez
Radiology

Harvey R. Butcher, Jr.
Gordon W. Philpott
Surgery
BEAUMONT-MAY INSTITUTE OF NEUROLOGY

The Beaumont-May Institute of Neurology was established in 1955 by gifts from the Louis D. Beaumont Foundation, Mrs. Charles M. Rice, and Morton J. May. It is the purpose of the Institute to foster basic and clinical research in neurology, with special reference to defects in the structure of the nerve cell which occasion important neurological disorders having a high incidence of prolonged disability.

THE IRENE WALTER JOHNSON INSTITUTE OF REHABILITATION

The teaching of rehabilitation is conducted by the Department of Preventive Medicine and Public Health in collaboration with various specialty services. The Irene Walter Johnson Institute of Rehabilitation is a modern, five-story facility that is air-conditioned and well equipped for the care of disabled patients. Students of medicine, house officers, and students of paramedical services have an opportunity to affiliate with the Institute.

Traineeship Elective. Traineeships in Physical Disability and Rehabilitation of eight weeks' duration may be elected during the interval between the end of the spring semester and beginning of the fall semester by up to six students who have completed the first year of the medical school curriculum. Specific instruction is given by means of informal lectures, demonstrations, and seminars.

Senior Elective. In the six-week elective in physical disability and rehabilitation, the student becomes familiar at first hand with the techniques for defining the extent of physical disability and with various approaches to its treatment. Emphasis is placed on methods used in physical, occupational, and speech therapy, and on the specialized contributions to be made by rehabilitation, social work, nursing, and vocational testing and counseling. Opportunity is made available for special emphasis on the rehabilitation of hand injuries and for participating in research activities of the Rehabilitation Engineering Unit.

Interests of the students will be met by arranging experience in rehabilitation medicine at extramural facilities, including Jewish Hospital. (Dr. Fishman)

Director
Marvin A. Fishman, B.S., University of Illinois, 1959; M.D., 1961. (See Departments of Neurology and Neurological Surgery, Pediatrics, and Preventive Medicine and Public Health)

Associate Director for Education and Administration

Associate Medical Directors
Sven G. Eliasson, Ph.D., University of Lund, 1952; M.D., 1954. (See Departments of Neurology and Neurological Surgery and Preventive Medicine and Public Health)
John O. Holloszy, M.D., Washington University, 1957. (See Departments of Medicine and Preventive Medicine and Public Health)

Director of Milliken Hand Rehabilitation Center
DIVISION OF BIOLOGY AND BIOMEDICAL SCIENCES

The Division of Biology and Biomedical Sciences, formed in the summer of 1973, was established because of the realization that training and research in modern biology transcended the limits of departmental structure, and scientists interested in related areas of investigation were distributed among many departments in the School of Medicine, as well as the Department of Biology in the Graduate School of Arts and Sciences. The faculty consists of members of preclinical departments of the School of Medicine: Anatomy and Neurobiology, Biological Chemistry, Genetics, Microbiology and Immunology, Pathology, Pharmacology, Physiology and Biophysics; and of the Department of Biology of the Faculty of Arts and Sciences. For purposes of graduate training, the Division is divided into the following programs: Developmental, Cellular, and Systemic Biology, Evolutionary Biology and Ecology, Molecular Biology, Neural Sciences and Plant Biology.

The faculty in each of these programs participates in the presentation of divisional courses and sets the requirements for the Ph.D. degree within the programs. These courses are also available to medical students.
as senior electives. The Ph.D. requirements in all programs are highly flexible. They include courses which are adjusted to the student’s background and interest, a qualifying examination to be taken in the second year, execution of original research suitable for a dissertation, and defense of the thesis. Graduate students will be admitted to the Division as students-at-large for the first year of their training. During the first year, advisers will be appointed to assist students in selecting courses and to help them become acquainted with the various research programs in the Division. At the conclusion of the first year, it is expected that students will make a decision as to which program they wish to join and, by choosing a research adviser, will be located in one of the departments which comprise the Division.

Graduate students may also select training programs within the disciplines represented by the departments. The Ph.D. degree requirements for these students will be determined by the individual departments.

In order to obtain expertise in teaching as well as research, all students will serve as teaching assistants for one year during their graduate training.

Students in the Ph.D. program will receive full tuition remission and stipends at the level of $3,900.

Applications for admission are due no later than January 31 of the academic year preceding that in which study is to begin. Admission is based solely on ability and the number of openings currently available. In general, a student should have completed at a high scholastic level undergraduate training in biology, chemistry, or physics, and have completed most of the following courses: biology, genetics, chemistry (general, analytical, organic and physical), physics and calculus. It is possible for the student, in exceptional cases, to fill some lack of basic entrance requirements for the specific program by electing these courses in the beginning year of graduate study. It is strongly recommended that the applicant take the Graduate Record Examination, both the aptitude and advanced portions. Additional information and the application for admission may be obtained by writing directly to the Office of Graduate Student Affairs, Box 8072, Washington University School of Medicine, 660 South Euclid Avenue, St. Louis, Missouri 63110.

For the 1977-78 academic year, the tuition in the Graduate School of Arts and Sciences will be $1,975 a semester for full-time study. For students enrolled for fewer than twelve units, the rate is $165 a unit. Graduate students who are enrolled for more than six units per semester in courses at the Medical Center are required to participate in the Medical Center Student Health Service. The health fee is payable each semester at the time of registration.

The following graduate courses are offered by the Division of Biology and Biomedical Sciences. Those courses which are particularly relevant to any given department are cross-listed under that department in this Bulletin. The faculty member in charge of the course and his departmental affiliation are shown at the end of each course.

Bio 405. Physiological Basis of Acoustic Communication. Lectures and seminars in hearing of various species of animals, from invertebrates to humans. Structural and functional adaptation to the environment in
which their acoustic communication is performed is considered. Not only auditory physiology, but also sound production, acoustic communication, echolocation in bats, and electroreception by lateral line organs of fishes will be discussed. Demonstrations of neural responses to acoustic stimuli will be included. Credit 2 units. (Suga [Biology])

Bio 406. Experimental Approaches in Embryology. A lecture-laboratory course in which classical analytical studies of embryonic development and cellular differentiation are re-examined in an attempt to elucidate underlying mechanisms at the molecular level. The laboratory will include morphological and biochemical studies of selected developmental systems in intact embryos and cultured organs and tissues. Credit 4 units. (Kirk [Biology])

Bio 408. Evolution of Man and Culture. The fossil evidence for human and non-human primate evolution. Classification and genetics in evolutionary perspectives, relations between biology and culture in ancient and modern populations. (Sussman [Anthropology])

Bio 411. Phycology. A systematic treatment of the freshwater and marine algae. Emphasis primarily on morphology, physiology, taxonomy, and genetics of the major and minor algal groups. Certain aspects of recent research and present problems in phycology will be considered. Credit 4 units. (Nichols [Biology])

Bio 412. Experimental Aquatic Biology. Studies of current research problems and research techniques devoted to aquatic flora and fauna. The course will include group or individual participation in a research problem or problems dealing with individual aquatic components of the aquatic environment or their interaction. Credit 4 units. (Nichols [Biology])

Bio 414. Structure and Function of Plants: Physiology. The daily metabolic activities of the mature green plant. Credit 3 units. (Varner [Biology], Walbot)
Bio 416. Evolutionary Biology. Individual areas of evolutionary biology will be discussed in depth. Topics will include the Biological Species Concept, the hypothesis of selective neutrality of enzyme polymorphism, modern concepts in systematics, molecular approaches to the study of adaptation, the coevolution of insects and plants, and other topics of current evolutionary interest. Credit 3 units. (Johnson [Biology], Raven)

Bio 423. Physiology of Development. Special topics in modern developmental biology, including fertilization and early development, morphogenesis, tissue interactions, synthesis of new substances, and hormonal control of developmental events. Credit 3 units. (Moog [Biology])

Bio 424. Immunology. The basic molecular and cellular aspects of the vertebrate immune response, emphasizing the specificity of antibody reactions, the molecular structure of antibodies, the genetic origin of their diversity, and the cellular basis of their formation. Other topics will include tolerance, autoimmunity, allergy, blood groups, and tissue transplantation. Credit 3 units. (Fleischman [Microbiology and Immunology])

Bio 428. Developmental Neurobiology. Lectures, demonstrations, and discussions presenting a survey of the major features of neuroembryology (induction of neural tissue, cell proliferation, migration, and specification) and the contributions of tissue culture (cellular and organotypic) to the understanding of neural development. Credit 2 units. (Bunge [Anatomy and Neurobiology], Cowan, Hamburger)

Bio 431. Principles of Cellular Physiology. A course in basic physiological principles with emphasis on cellular mechanisms. Four major topics are considered: (1) exchange of oxygen and carbon dioxide between cells and environment, (2) membrane function in the regulation of cell volume and composition, (3) properties of excitable and contractile cells, and (4) the role of cellular and subcellular organization in cell function. Credit 3 units. (Roos [Physiology])

Bio 439. History of Scientific Thought to Newton. Mainstreams of cosmological, physical, chemical, and biological thought from the pre-Socratics to Newton. Credit 3 units. (Hall [Biology])

Bio 440. The History of Scientific Thought Since Newton. A chronological continuation of Bio 439, the course covers the period 1700 to the present. It begins with a historical analysis of the origins of the scientific, political, and industrial revolutions of the seventeenth century; it proceeds to discuss Newtonianism in the eighteenth century, the chemical revolution, German "nature-philosophy" in the early nineteenth century, Darwinism, thermodynamics, quantum and relativity theory in the middle and late 1900's. The rise of genetics, social Darwinism, and eugenics will form the focus of developments in the early twentieth century. The course will focus on the interrelationships between economics, science, politics, philosophy and art as interpreted from a Marxist view of history. Credit 3 units. (Allen [Biology], Hall)

Bio 443. Advanced Genetics. A general genetics course designed for graduate and advanced undergraduate students. Content will vary from year to year and will include such topics as: techniques in genetic analysis, the nature of mutation, mapping and recombination, genetics of regulation, genetics of indispensable cellular processes, genetics of organelles, Drosophila fate maps and genetic engineering. Credit 3 units. (Apirion [Microbiology and Immunology], Staff)

Bio 444. Experimental Genetics Laboratory. A laboratory course introducing experimental approaches employed in major areas of genetics. Experiments such as genetic cross analysis in Drosophila, mutagenesis in bacteriophage, biochemical pathway analysis in fungi, electrophoretic survey of enzyme polymorphism, mark-release-recapture analysis, cytogenetic analysis in plants, and
caryotype analysis in humans will be included. Each experiment will be taught by a faculty member experienced in the experimental approach. Credit 3 units.

(Johnson [Biology], Staff)

Bio 446. Biology of the Fungi. General aspects of the biology of the major fungal groups, including their development, genetics, cytology, metabolism and ecology. Roles these microorganisms play in nature, research, medicine, and agriculture. Credit 3 units.

(Maniotis [Biology])

Bio 451. General Biochemistry. (See Department of Biological Chemistry)

Bio 452. Biochemistry Laboratory. An experimental approach to a number of topical biochemical problems, with emphasis on the isolation and purification of biological macromolecules, studies on their biosynthesis and degradation, and mechanisms by which their concentration and activity are regulated. Credit 4 units.

(Brown [Biochemistry], Staff)

Bio 454. History of Genetics. A survey of the historical development of genetics, focusing on the period after 1900. Attention will be given to Mendel's work and its rediscovery in 1900, the chromosome theory of heredity (1910-1925), population genetics, the eugenics movement, biochemical and molecular genetics. The course will also touch on philosophical and historical issues such as the role of models in science, confluence of fields, the nature of reality (materialism versus idealism), the role of techniques and instrumentation, and the influence of one science on another. Credit 3 units.

(Allen [Biology])

Bio 455. Neurocytology. A consideration at the light and electron microscopical level of the structure of neural tissues, including neurons and their processes, synapses, glial cells, myelin, etc., and their reaction to experimental injury. Lectures and laboratory. Credit 2 units.

(Jones [Anatomy and Neurobiology], Price, Woolsey)

Bio 457. Somatosensory System. This course is designed to correlate anatomical, physiological and psychophysical information on tactile sensation, proprioception, thermal and pain sensation. Emphasis will be placed on peripheral receptor mechanisms as well as central nervous system processing of afferent inputs in each somesthetic system. Credit 2 units.

(Burton [Anatomy], Hunt, Jones)

Bio 459. Vision. A course designed to bring together the anatomy, physiology, and psychology of vision to provide an understanding of function. Properties of light and receptors will be covered, and analysis of form, movement, color and depth in the vertebrate visual system, with some material on invertebrates. Credit 3 units.

(Daw [Physiology and Biophysics], Cohen, Pearlman)

Bio 482. Ecology: Ecosystems. A study of selected topics, including measurements of species diversity, productivity, carbon cycle, energy flow, and secondary succession, with emphasis on trophic dynamics of specific interactions such as predation and grazing. Credit 3 units.

(Covich [Biology])

Bio 501. Human Anatomy. (See Department of Anatomy and Neurobiology)

Bio 502. General Physiology. (See Department of Physiology and Biophysics)
Bio 503. **Biology of Cultured Cells.** Lectures and laboratory experiments dealing with metabolism, growth, and differentiation of cells grown in vitro. Established cell lines, primary cultures, and organ cultures will be used to investigate basic problems in cell biology. Credit 2 units.

(Bischoff [Anatomy and Neurobiology], Tolmach)

Bio 504. **Environmental Pathology.** Lectures and seminars discussing the effect of modern industrial environment on man's health. The adaptability of man, his ability to manipulate his environment and the effects of these manipulations in regard to health and disease will be discussed. Topics include acute and chronic diseases associated with air and water pollution, waste disposal, pesticide usage, transportation and urban living and noise. Credit 2 units.

(Kuhn [Pathology])

Bio 505. **Intrauterine Development.** Lectures and discussion on the structure and function of the maternal placenta, maternal-fetal exchange of gases and metabolites, immunological development of the fetus, hormone metabolism in the fetal-placental unit and abnormal trophoblastic growth. Credit 2 units.

(King [Anatomy and Neurobiology])

Bio 506. **Microscopic Anatomy.** (See Department of Anatomy and Neurobiology)

Bio 507. **Pharmacology.** (See Department of Pharmacology)

Bio 508. **Pharmacology.** Second semester of Bio 507. (See Department of Pharmacology)

Bio 509. **Current Topics in Pharmacology.** Topics of current interest will be presented and discussed. Critical evaluation will be made of recent articles in the scientific literature. Credit 2 units for the year.

(Hunter [Pharmacology], Staff)


(Lang [Physiology and Biophysics])

Bio 512. **Human Growth and Development.** Discussions on the principles and patterns of postnatal growth and development. Topics include nature of growth, growth in height and weight, growth of tissues, growth of systems, indices of maturity, factors influencing growth and maturity, growth and
repair, disturbances of growth, old age. Credit 2 units.

(Peterson [Anatomy and Neurobiology])

Bio 515. General Pathology. (See Department of Pathology)

Bio 516. General Pathology. Second semester of Bio 515. (See Department of Pathology)

Bio 517. General Immunology. A general introduction to humoral and cellular immunity. Lectures and laboratory in the first nine weeks of the fall semester. Credit 2 units. (Fleischman [Microbiology and Immunology])

Bio 519. Pathology Research Seminar. Study of current and reported research in experimental pathology. Credit 2 units.

(Williamson [Pathology], Staff)

Bio 520. Methods in Experimental Pathology. Discussion and demonstration of routine and special microscopic techniques (light, phase, fluorescent, transmission, and scanning electron microscopy); other techniques (bio- and immunoassay, various physiologic correlates). Design of experiments using laboratory animals and autopsy specimens will be emphasized. Students will be expected to do a short research project of interest to them. Credit 2 units.

(Hartroft [Pathology], Grieder)

Bio 521. Cellular Aspects of the Immune Response. The mechanisms of regulation of immune responses by antigen, macrophages, T cells, B cells, and their products will be discussed. The material covered will vary in emphasis from year to year and will stress critical analysis of the literature. Credit 2 units. (Pierce [Pathology])

Bio 522. Immunogenetics. Offered in spring semester only. Lectures on selected examples of application of immunologic techniques to detection of genetic variations in macromolecules (blood groups, allotypes, lymphocyte antigens), genetic dissection of immune mechanisms (immune response genes immuno-deficiencies), and genetics and immunology of transplantation and of neoplasia. Credit 2 units.

(Shreffler [Microbiology and Immunology])

Bio 523. Microbial Physiology and Genetics. Molecular and cellular aspects of microbial growth and reproduction. Lectures and laboratory in the first nine weeks of the fall semester. Credit 1 unit. (Schlessinger [Microbiology and Immunology])

Bio 524. Radiation Biology. The action of ionizing radiation at the biochemical, cellular, tissue, and whole organism levels will be discussed. A cellular approach will be taken for a number of topics such as the target for lethality, the biological basis of radiation therapy, and radiation effects on specific tissues in mammals. Credit 2 units.

(Valierote [Cancer Biology])

Bio 525. Fundamental Concepts in Cell Membrane Physiology and Biophysics. A lecture course devoted to the theoretical principles underlying the physiological properties of biological membranes. Topics to be covered include (1) a review of aqueous solution thermodynamics, (2) properties of electrolyte solutions, (3) diffusion and osmosis, (4) electro-diffusion, with applications to membranes, (5) membrane potentials and interfacial potentials, (6) kinetics and thermodynamics of carrier-mediated transport. Credit 3 units. (De Weer [Physiology and Biophysics], Blaustein)
Bio 526. Advanced Topics in the Physiology and Biophysics of Cell Membranes. A seminar course devoted to in-depth analysis of selected readings. Topics to be covered include ionophorous antibiotics and artificial membranes; movements of salt and water across organelle and cell membranes and epithelia; kinetics of carrier mechanisms; and the chemistry and kinetics of the sodium pump. Credit 3 units.

(Blaustein [Physiology and Biophysics], De Weer)

Bio 527. Reproductive Endocrinology. Staff lectures. This course will present current concepts of the molecular mechanisms of hormone action directly related to the endocrinology of mammalian reproduction, including hypothalamic, pituitary, and ovarian hormones. Consideration of the mechanism of hormone action will be directed toward the function of mobile and fixed receptors, second messengers, nuclear receptors, and translational processes. Reproduction in the female will be treated, with emphasis on the ovulatory cycle, menstruation, the growth of ovarian follicles (including abnormalities of follicular growth), ovulation, corpora lutea, implantation of the blastocyst in the uterus, and placentaion. Reproduction in the male will be treated, with emphasis on the production, quality, and capacitation of spermatozoa. Discussions will be centered on the practical as well as theoretical understanding of these vital systems. Students are required to do a research paper, which will be presented and discussed during class time. Credit 3 units.

(Wiest [Biochemistry], Staff)


(S. Schlessinger [Microbiology and Immunology])

Bio 530. Digital Computers for Laboratory Use. Methods of using small digital computers with laboratory instruments. Basic programming, data collection and conversion, data processing, digital control, output techniques. Credit 3 units.

(Holmes [Biochemistry])

Bio 531. Advanced Biochemistry. (See Department of Biological Chemistry)

Bio 532. Mechanism and Regulation of Protein Biosynthesis. Properties of eukaryotic and prokaryotic systems will be discussed, including a survey of reaction involved in initiation, elongation, and termination of protein synthesis. Special consideration will be given to a number of systems involved in biosynthesis of proteins destined for secretion; regulatory steps will be emphasized. Credit 2 units.

(Geller [Pharmacology])

Bio 533. Pathogenic Microbiology. A survey of the major genera of pathogenic bacteria, fungi and parasites. Lectures and laboratory in the second nine weeks of the fall semester. Credit 2 units.

(Simms [Microbiology and Immunology])

Bio 534. Gene Expression and Differentiation in Eukaryotic Cells. Emphasis will be on nuclear events which are relevant to gene expression. Material covered will include examples mainly from Drosophila, mouse, chicken, and cells in tissue culture. We shall cover the cell cycle, mitosis, meiosis, organization of chromatin and chromosomes, the content of the nucleus, chromosomal proteins, nuclear RNA, polytenic chromosomes, the transcription machinery, expression of RNA genes in pro and eukaryotes, nucleolus turnover and processing of RNA in the nucleus and cytoplasm, expression of the globin genes and genes induced by steroid hormone teratomas, somatic cell genetics, nuclear cytoplasmic relationships, plasmids and cloning of eukaryotic genes in bacteria. Credit 3 units.

(Apirion [Microbiology and Immunology])

Bio 535. Physical-Chemical Basis of Techniques in Molecular Biology. The following techniques will be discussed from a physical-chemical viewpoint: sedimentation, viscosity, electrophoresis, chromatography, radioactivity counting, electron microscopy, spectrophotometry, X-ray diffraction, nuclear magnetic resonance and electron spin resonance. Credit 2 units.

(Thach [Biochemistry])
Bio 536. Physical Chemistry of Macromolecules. Application of physical chemistry to the study of proteins, nucleic acids and other natural and synthetic polymers. The thermodynamics of macromolecular solutions and the use of osmotic pressure, light scattering, viscosity, ultracentrifugation, diffusion, and birefringence experiments in the determination of the molecular structures of these substances. Credit 3 units.

(Holtzer [Chemistry])

Bio 537. Protein Chemistry and Enzyme Mechanisms. Protein chemistry: peptide synthesis; sequence analysis; development of enzyme kinetic theory, including concepts of regulatory enzymes. Credit 3 units.

(Bradshaw [Biochemistry])

Bio 538. Structure and Function of Cell Membranes and Surfaces. Topics include contemporary cell membrane models; membrane structure as revealed by electron microscopy, X-ray analysis, etc.; physical properties of lipids and membrane proteins; model membranes and their applications: permeability and active transport in mammalian and bacterial systems; cell recognition, contact inhibition, and transformation; immunological characteristics of membranes. Credit 3 units.  (Kinsky [Pharmacology])

Bio 539. Topics in Animal Virology. Molecular Biology of DNA and RNA animal viruses, with emphasis on viral replication and viral-induced transformation of cells in tissue culture and slow viral diseases in animals. Credit 3 units.

(M. Schlesinger, S. Schlesinger [Microbiology and Immunology])

Bio 543. Molecular Biology of Bacterial Viruses. (See Department of Microbiology and Immunology)

Bio 544. Mechanisms of Disease (Cancer). This course embodies a multidisciplinary approach to cancer. Experimental results from basic research on tissue culture cells and animal tumors will be correlated with clinical observations on human cancer. Lectures will contain some background material, but will be primarily devoted to explicating current trends and ideas in research. Subject areas dealt with include biochemical and regulatory aspects of the cancer cell, causative agents, host-tumor interactions, and modes of treatment of human cancer. Credit 2 units.  (Thach [Biochemistry], Staff)

Bio 545. Conformational Analysis. Structure of macromolecules. Emphasis on CD, ORD, fluorescence, ESR, NMR, fiber and
single crystal X-ray analysis, theoretical energy calculations. Credit 3 units.

(Marshall [Physiology and Biophysics])

Bio 546. Cell Surface Receptors. Course will consist of discussion of cell surface components which allow cells to interact specifically with a variety of environmental substances such as drugs, neurotransmitters, protein hormones, toxins and other cells. This course will include a consideration of cell-cell interactions, macromolecule receptors and small molecule receptors. Credit 2 units.

(Noteleman [Pharmacology], Bradshaw, Frazier)

Bio 548. Structure, Synthesis and Regulation of Nucleic Acids. Mechanisms involved in the biosynthesis and function of nucleic acids in cellular processes are emphasized. Specialized aspects of prokaryotes, eukaryotes, and their viruses are considered. Credit 2 units.

(Roeder [Biochemistry], D. Schlessinger)

Bio 549. Antibodies: Structure, Function, and Formation. (See Department of Microbiology and Immunology)

Bio 551. Topics in Neurobiology. A weekly seminar series on selected topics of current interest in neurobiology, such as synaptic and neuromuscular transmission, plasticity in the nervous system, the structure and function of receptors, etc. Credit 2 units.

(Cowan [Anatomy and Neurobiology], Staff)


Bio 553. Seminar in Cellular Basis of Behavior. Weekly meetings will consider theoretical and experimental work with neuronal networks. Emphasis will be placed on systems controlling motor behavior. Credit 2 units.

(Stein [Biology])

Bio 554. Neural Sciences. (See Departments of Anatomy and Neurobiology and Physiology)

Bio 555. Neurological Pharmacology. Basic neuropharmacology for graduate students. The course covers the principles of general pharmacology, drug metabolism, and autonomic and neuromuscular pharmacology. Credit 3 units. May be taken without laboratory for 2 units of credit.

(Ferrendelli [Pharmacology], Staff)

Bio 556. Biochemistry of the Nervous System. Topics covered include carbohydrates; energy metabolism related to different functional states; amino acid metabolism in relation to protein and transmitter synthesis; cerebral lipids, membranes, lipid metabolism; cerebral blood brain barrier. Credit 2 units.

(McDougal [Pharmacology], Moore)

Bio 558. Long-term Changes in the Nervous System. This course will cover those interactions between excitable cells that take place over long periods (days to months or more). Beginning with trophic interactions between nerve and muscle cells, the extent to which the neuromuscular junction serves as a model for neuronal interactions will be explored. Finally, long-term changes in simple central nervous systems and in the visual system of higher animals will be examined. Credit 2 units.

(Purves, [Physiology and Biophysics], Cowan, Daw, Pearlman)

Bio 559. Nerve Muscle and Synapse. The ionic basis of the resting and action potentials and the mechanisms of synaptic transmission. Students will be expected to present two to five one-hour seminars based on assigned original papers. Credit 2 units.

(Rovainen [Physiology and Biophysics], Staff)

Bio 560. Pharmacology of the Nervous System. Topics covered include biochemistry of neurotransmitters, mechanisms of neurotransmission, and mechanisms of action of neuroactive and psychoactive agents. Credit 2 units.

(McDougal [Pharmacology], Moore)

Bio 561. Topics in Molecular Neurobiology. The course will consist of lectures and seminars on selected areas in which the function of the nervous system is being
studied at the molecular level. Among topics considered will be: behavior in simple organisms, continuous neuronal lines, intraxonal transport, transmitter receptors, transmitter biosynthesis, cell recognition, filamentous proteins of the nervous system. Credit 2 units.
(D. Gottlieb [Anatomy and Neurobiology], Willard)

Bio 563. *Techniques in Neural Sciences.* A laboratory course for first-year graduate students in the Neural Sciences program including intracellular recordings from muscle fibres; growth of nerve tissue culture and electron microscopy of it; recording of synaptic potentials in crayfish muscle; extracellular recording in lateral geniculate and visual cortex; tracing of thalamo-cortical pathways by an autoradiographic technique; and biochemical analysis of proteins transported down an axon.

(Daw [Physiology and Biophysics], Staff)

Bio 571. *Classical Approaches to Plant Systematics.* Topics in nomenclature, classification, and revisions leading to monographic and floristic studies. Credit 3 units.

(Lewis [Biology], Staff)


(Varner [Biology])

Bio 573. *Experimental Approaches to Plant Systematics.* Topics in nomenclature, classification, and revisions leading to monographic and floristic studies. Credit 3 units.

(Lewis [Biology])


(Lewis [Biology])

Bio 580. *Seminar in Population Biology: Evolution.* This weekly seminar, covering topics in both population genetics and ecology, will be taken by graduate students in this program each semester. Research and literature reports will be given by staff, visitors and graduate students. Credit 2 or 3 units.

(Covich [Biology], Johnson, Raven, Staff)

Bio 581. *Seminar in Techniques in Field Biology.* Planning and presentation of techniques in selected areas of population biology. Credit 3 units.

(Sexton [Biology])

Bio 590. *Research.* Credit to be arranged.

(Staff)

Bio 591. *Seminar in Biology and Biomedical Sciences.* These seminars cover the recent literature in various areas not included in other courses, or in more depth than other courses. A list of topics to be covered for the next semester is published shortly before registration. 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 BIOMEDICAL ENGINEERING

Professor Robert E. Sparks, Chairman, Executive Committee; Professors Saul Boyarsky, W. Maxwell Cowan, Jerome R. Cox, Jr., Philip L. Gould, Robert M. Hochmuth, Charles E. Molnar, William F. Pickard, Salvatore P. Sutera, Michel M. Ter-Pogossian, Donald F. Wann, Reimut Wette; Associate Professors R. Martin Arthur, Richard E. Clark, William F. Holmes, Marcus E. Raichle, Curt Thies, Lewis J. Thomas, Jr., Donald Walkup, George I. Zahalak; Research Associate Professor Peregrina Labay; Assistant Professors Stuart Boxerman, John W. Lewis, Michael L. McCartney; Research Assistant Professor Howard A. Bomze; Senior Research Associate N. S. Mason; Research Associate Kenneth B. Larson.

This course of graduate study is designed to provide education and training for students wishing to apply principles of modern engineering and mathematics to theoretical and practical problems in biology and medicine. Students and faculty of both the School of Engineering and Applied Science and the School of Medicine participate in the program.

Every student seeking an advanced degree in engineering must be admitted to one of the participating departments of the Sever Institute of Technology, the graduate division of the School of Engineering and Applied Science. The program permits the student to earn a certificate in biomedical engineering or health care technology in addition to the M.S. or D.Sc. degree in a chosen engineering field. Students not candidates for a degree are welcome to take courses as electives.

Graduate study plans are tailored to the individual's needs and interests, and provide essential background in the related areas of life and medical sciences. Students with diverse undergraduate backgrounds may be admitted provided they have adequate preparation and experience in mathematics and the physical sciences. Areas of specialization include sensory communications, electrocardiography, flow and diffusion in biological systems, electrobioLOGY, technology in health care, biomedical statistics, modeling of biological systems, engineering of artificial organs, drug concentration control, urodynamics, and applications of advanced computer techniques to biology and medicine. Research facilities available to the program are located in the School of Engineering and Applied Science, the School of Medicine, and the Washington University Computer Laboratories. The faculty includes representatives from the Biomedical Computer Laboratory, the Departments of Biological Chemistry, Physiology and Biophysics, Preventive Medicine and Public Health, Radiology, Surgery, and Anatomy and Neurobiology in the School of Medicine; and the Departments of Computer Science, Chemical, Civil, Electrical, and Mechanical Engineering, and Systems Science and Mathematics in the School of Engineering and Applied Science.
Complete course listings and information about application and degree requirements may be found in the *Bulletin of the School of Engineering and Applied Science*.

**BMed 547. Biological Mass and Momentum Transfer.** Principles of viscous incompressible flow and diffusion and mass transfer in flowing fluids. Application of these principles to the analysis of physiological problems and to the design and operation of artificial organ devices. Discussion of convective diffusion in blood and flow in peristaltic pumps, arteries, and capillaries. Credit 3 units.

**BMed 600. Research for Doctoral Dissertation.**

**BMed 660. Biomedical Applications of Small Digital Computers.** Introduction to the use of digital computers in the laboratory. Considerations in the choice of computer equipment and algorithms for the solution of laboratory and clinical problems. Examples of applications in data gathering and algorithms for the solution of laboratory and clinical problems. Examples of applications in data gathering and processing control of experiments, modeling, and simulation. Prerequisite, Electrical Engineering 360, Applied Mathematics and Computer Science 132, or permission of instructor. Credit 3 units.

Other Biomedical Engineering course offerings:

**EE 481. Foundations of Bioengineering.**

**EE 490. Biomedical Measurements and Instrumentation.**

**BMed 545. Hospital Electrical Systems and Instrumentation.**

**BMed 549. Engineering Aspects of Health Care Delivery.**

**BMed 560. Biomechanics.**

**BMed 573. Electrobiology.**

**BMed 576. Sensory Communications.**

**BMed 578. Biological Control Systems.**

**BMed 610. Clinical Engineering Practicum I.** (For Technology in Health Care students only)

**BMed 611. Clinical Engineering Practicum II.** (For Technology in Health Care students only)

**BMed 612. Clinical Engineering Practicum III.** (For Technology in Health Care students only)

**BMed 651. Science of Synthetic and Biological Polymers.**

**BMed 675. Mathematical Methods in Physiology.**

For additional related courses, see Biomedical Computer Laboratory in this *Bulletin* and the *Bulletin of the School of Engineering and Applied Science*. 
Allied Health Professions

Programs are conducted by the School of Medicine in health care administration, occupational therapy, physical therapy, radiologic technology, and for pediatric nurse practitioners. All courses are approved by the American Medical Association or other certifying agencies, and graduates qualify for certifying examinations. For further information, write to the director or educational director listed under the particular program, 660 South Euclid Avenue, St. Louis, Missouri 63110.

GRADUATE PROGRAM IN HEALTH CARE ADMINISTRATION

The Setting
The Graduate Program in Health Care Administration is designed to provide an educational opportunity for individual students through learning, clinical experience, and research. The faculty and staff are committed to providing a quality education leading to careers in the administration of health facilities and organizations, to sponsoring scholarly research concerning health services, and to making a beneficial contribution to the community through advice and service.

Curriculum and Sequence of Study
The curriculum of the graduate program is designed to provide the student with the knowledge, skills, and attitudes necessary to enter and progress in the field as a profes-
sional health administrator. As a result, the curriculum interfaces the study of the delivery of health care and the value our society places on human life with the areas of finance, organizational behavior, law, quantitative methods, and health planning, among others.

Each student has the option of completing a thesis, independent study, or applied research project in partial fulfillment of the requirements for conferment of the Master of Health Administration (M.H.A.) degree. A total of 60 hours is required for graduation with all courses being pursued through the graduate program.

The didactic content for the Master of Health Administration degree requires four semesters (15 months), with each class matriculating annually in June. The time sequence is: First Semester (Summer); Second Semester (Fall); Third Semester (Spring); and Fourth Semester (Summer). Following the didactic period, there is a nine-month administrative residency (September through May) for a total of 24 months.

Administrative Residency

The nine-month off-campus administrative residency is an integral part of the graduate program's educational sequence and is required regardless of the student's previous experience. The residency assignment, as approved by the faculty, is served in an affiliated hospital, agency, or association as recommended by the faculty. The purpose of the residency is to provide the graduate student with an opportunity to observe in the field those concepts and principles learned during the on-campus didactic sequence. The requirement is completed under the direction of a well-qualified and experienced administrator who is given an annual adjunct faculty appointment at the Washington University School of Medicine.

The on-campus faculty maintains close communication with the administrative resident and the off-campus faculty. The preceptor must file an educational plan that outlines the administrative resident's activities for the coming year. The preceptor will also send periodic progress evaluation reports to the director of the graduate program.
An on-campus faculty member also visits residency sites to meet with the preceptor and resident. The preceptor is invited to return at least once each year to the campus. These site and campus visits enable faculties to review jointly the resident's progress and to evaluate and refine the educational program.

Stipends are received by graduate students during the administrative residency and vary from one site to another. The residency is also approved for Veterans Administration educational benefits for eligible graduate students.

Admission Requirements

Applicants are required to have a bachelor's degree from a university or college acceptable to Washington University. The aptitude test of the Graduate Record Examination is required of all applicants.

Tuition per semester, effective 1977: $2,200 (Four semesters: $8,800)
Books and supplies (per semester): $100-$150
Application fee (nonrefundable): $15

Associate Professor and Director


Associate Professor and Deputy Director

Donald J. Horsh, B.S.B.A., University of Nebraska, 1941; M.H.A., Washington University, 1951; J.D., St. Louis University, 1953.

Associate Professor


Assistant Professor


Assistant Professors (Adjunct)

Ted Bowen, B.S., Austin College, 1941; M.H.A., Washington University, 1948.

Donald W. Cordes, A.B., Hope College, 1940; M.A., University of Michigan, 1941.
Frank S. Groner, A.B., Baylor University, 1934; LL.D., East Texas Baptist College, 1946; Union University, 1952; Baylor University, 1969.
James D. Harvey, B.A., University of South Dakota, 1950; M.H.A., University of Minnesota, 1952.
Robert J. Hickok, B.S., Washington University, 1953; M.H.A., 1971. (See Program in Physical Therapy)

Boone Powell, LL.D., Baylor University, 1958.
Mary Roch Rocklage, B.S., St. Xavier College, 1961; M.H.A., St. Louis University, 1963.
Robert F. Scates, B.A., Baylor University, 1939.


Instructors (Adjunct)

Taylor O. Braswell, B.S., Wake Forest University, 1940; M.H.A., Northwestern University, 1949.
Arthurline Clingman, B.S., University of Houston, 1957; M.H.A., Washington University, 1959.


Myron M. Kraff, B.S., University of Nebraska, 1961; M.H.A., Washington University, 1965; Ph.D., University of Iowa, 1971.

Joseph B. Mackey, A.B., University of Missouri, 1951; M.H.A., St. Louis University, 1954.

Joseph C. Mackney


Robert W. McCuistion, A.B., Hendrix College, 1949; J.D., University of Arkansas, 1952.


Donald D. Nesbit, B.S., University of California, 1947.


Gerald C. Stewart, B. Comm., University of Saskatchewan, 1948; Diploma in Hospital Administration, University of Toronto, 1961.
Charles E. Thoele, B.S.C., St. Louis University, 1961.

Lecturers:
James D. Collom, B.S., Ball State Teachers College, 1954; M.H.A., Washington University, 1961; Ph.D., University of Iowa, 1971.
Harold Hinderer, B.A., College of St. Thomas, 1952.
Merlin E. Lickhalter, B.A., Massachusetts Institute of Technology, 1957.
Harry E. Panhorst, B.S., Missouri University, 1938; M.H.A., Washington University, 1949.

PROGRAM IN NURSE ANESTHESIA
Barnes Hospital School of Nurse Anesthesia, established in 1929, offers an accredited two-year program to registered nurses. Applicants for admission must have graduated from an accredited nursing school in which they have maintained an outstanding academic and clinical performance.

The purpose of the program is to provide a correlated academic and clinical background to enable the student to administer anesthesia with competence and confidence.

Approximately 400 didactic hours are presented to the students in anatomy, physiology, chemistry, physics, anesthetic agents, and all subjects related to the field of anesthesia. Approximately 850 anesthetics are administered by each student under supervision. Clinical experience is received in all types of anesthetic techniques.

After graduation, the student is required to take the National Qualifying Examination of the American Association of Nurse Anesthetists. Upon successful completion of this examination, the student becomes a Certified Registered Nurse Anesthetist (C.R.N.A.).

Tuition (for entire 24-month program) $200
Stipend and maintenance
   First year (per month) ............... 325
   Second year (per month) .......... 385

Instructor and Director

Instructor and Educational Director

Clinical Instructors
Robert Ayres, R.N., C.R.N.A.
Ann Bailey, R.N., C.R.N.A.
Michel Brown, R.N., C.R.N.A.
June Crafton, R.N., C.R.N.A.
James D. Cuddeford, R.N., C.R.N.A.
Margaret Ellerman, R.N., C.R.N.A.
Donald Flacke, R.N., C.R.N.A.
The School of Medicine, through the Department of Pediatrics and the Division of Health Care Research, has established a program for training Pediatric Nurse Practitioners. It encompasses a period of nine months beginning in September of each year. The program was developed to help meet the challenge of expanded health services needed by the pediatric community and to provide nurses with an opportunity to extend the range and depth of their skills.

The curriculum is divided into an eighteen-week didactic period, followed by a seventeen-week practicum. The practicum may be obtained through the facilities of the program or, by special arrangement, at the site of future employment for those nurses who are sponsored by an employer or agency guaranteeing an appropriate position upon the completion of training. The instruction is centered at the St. Louis Children's Hospital and the Division of Health Care Research.

Supervised clinical practice is scheduled in a variety of settings, including public health clinics, neighborhood health centers, and private pediatricians' offices. Instruction is shared by medical and nursing faculty of the Department of Pediatrics.

The Pediatric Nurse Practitioner (PNP) is a registered nurse whose special training enables her to play a larger role in providing pediatric services. She obtains histories, performs physical examinations, and appraises physical, psychological, and intellectual growth and development. She is competent to counsel families in matters concerning nutrition, accident prevention, and child-rearing. With the physician, she participates in the management of acute and chronic illnesses.

Applicants must be registered nurses with at least one year of nursing experience. A B.S. degree in nursing from an accredited program and experience in pediatrics are preferred but not required. On completion of training, the PNP is qualified to serve anywhere in the country where pediatric services are offered. The program complies with the guidelines for such training as proposed by the American Academy of Pediatrics and the American Nurses' Association.

Tuition (full program) .................... $1,600
Tuition (practicum elsewhere) ........ 1,300

PROGRAM FOR PEDIATRIC NURSE PRACTITIONERS

The School of Medicine, through the Department of Pediatrics and the Division of Health Care Research, has established a program for training Pediatric Nurse Practitioners. It encompasses a period of nine months beginning in September of each year. The program was developed to help meet the challenge of expanded health services needed by the pediatric community and to provide nurses with an opportunity to extend the range and depth of their skills.

The curriculum is divided into an eighteen-week didactic period, followed by a seventeen-week practicum. The practicum may be obtained through the facilities of the program or, by special arrangement, at the site of future employment for those nurses who are sponsored by an employer or agency guaranteeing an appropriate position upon the completion of training. The instruction is centered at the St. Louis Children's Hospital and the Division of Health Care Research.

Supervised clinical practice is scheduled in a variety of settings, including public health clinics, neighborhood health centers, and private pediatricians' offices. Instruction is shared by medical and nursing faculty of the Department of Pediatrics.

The Pediatric Nurse Practitioner (PNP) is a registered nurse whose special training enables her to play a larger role in providing pediatric services. She obtains histories, performs physical examinations, and appraises physical, psychological, and intellectual growth and development. She is competent to counsel families in matters concerning nutrition, accident prevention, and child-rearing. With the physician, she participates in the management of acute and chronic illnesses.

Applicants must be registered nurses with at least one year of nursing experience. A B.S. degree in nursing from an accredited program and experience in pediatrics are preferred but not required. On completion of training, the PNP is qualified to serve anywhere in the country where pediatric services are offered. The program complies with the guidelines for such training as proposed by the American Academy of Pediatrics and the American Nurses' Association.

Tuition (full program) .................... $1,600
Tuition (practicum elsewhere) ........ 1,300

ST. LOUIS INTERINSTITUTIONAL PHYSICIAN'S ASSISTANT TRAINING PROGRAM

Washington University, in conjunction with St. Louis University and the St. Louis Veterans Administration Hospital, participates in
the St. Louis Interinstitutional Physician's Assistant Training Program administered through the St. Louis University School of Nursing and Allied Health Professions. This A.M.A.-accredited 24-month program consists of three phases: basic sciences, clinical inpatient and outpatient rotations, and a twenty-week community preceptorship. Students are trained to collect historical and physical data and to perform various diagnostic and therapeutic procedures. The goal is to produce individuals capable of assisting the primary care physician and extending the effectiveness of his/her medical practice. For application forms and further information, contact:

Director
Physician's Assistant Program
1504 South Grand Boulevard
St. Louis, Missouri 63104

PROGRAM IN OCCUPATIONAL THERAPY

The efforts of the Program in Occupational Therapy are directed toward providing students with a thorough background in occupational therapy in preparation as practitioners in a rapidly developing field. The primary focus of occupational therapy is the development of adaptive skills and improved performance, not only in the realm of working for a living but also in tasks and activities concerned with leisure, daily living, and avocations. It follows that the occupational therapist must be concerned with external and environmental barriers as well as biological or psychological problems which inhibit occupational performance. The therapist must be equally alert to factors which enhance performance.
Within this context of concerns, occupational therapists work with individuals whose abilities to cope with tasks of living are threatened or impaired by such problems as the aging process, physical illness or injury, psychological and/or social disability, chronic conditions, poverty and cultural differences, or deficits in perceptual-sensory-motor control or in cognitive, emotional, or social development.

Applicants for admission must present a minimum of sixty semester hours of credit from an accredited college or university.

Upon completion of four academic semesters at the School of Medicine, the degree of Bachelor of Science in Occupational Therapy is conferred. Six months of supervised field work experience is required following graduation.

Tuition (four semesters),
per semester .................................. $1,950
Fee, field work experience ............... 500

For further information, contact: Program in Occupational Therapy, 4567 Scott Avenue, St. Louis, Missouri 63110. Phone: 454-2564.

Professor and Elias Michael Director
Jerry A. Johnson, B.S.O.T., Texas Woman's University, 1953; M.B.A., Harvard University, 1961; Ed.D., Boston University, 1970.

Assistant Professor and Associate Director
Ellen T. Tyson, B.S., Syracuse University, 1949; M.A., 1950; Cft. in O.T., University of Pennsylvania, 1952.

Assistant Professors
Ruthan B. Kannegieter, A.B., University of California, 1950; Cft. in O.T., School of Occupational Therapy, 1954; M.A., San Francisco State University, 1958; Ph.D., Stanford University, 1968.
Garth D. Tubbs, B.S., Wisconsin State College, 1953; Cft. in O.T., Washington University, 1955.

Instructors
M. Carolyn Baum, B.S., University of Kansas, 1966. (See Department of Preventive Medicine and Public Health and Irene Walter Johnson Institute of Rehabilitation)
Jacquelyn K. Bell, B.S., Ohio State University, 1965; M.A., University of Southern California, 1971.
Mary L. Rath, B.S.O.T., Tufts University, 1969; M.S., University of Hartford, 1972.
Dixie M. Sleight, B.S., University of Kansas, 1959.
Instructors (Clinical)
Mercedes Abella
Evelyn Bloch
Theresa C. Burmeister
Marion A. Calph
Marilyn K. Dien
Irene G. Doell
Vickie G. Fausz
Kathleen H. Garrity
Barbara Glambalvo
Barbara N. Goldsmith
LaVerne W. Grady
Doris M. Hartman
Michelle Isserman
Kathleen M. Kniepmann
Nelwyn P. Longfield
Susan Lowrey
Bettie Lumpkin
Nancy S. Mashak
Patricia J. Melechen
Mary K. Murphy
Els Nieuwenhuisen
Jo Anne Powers
Carla Schnewerk
Ruth K. Schwartz
Joanne Silhavy
Martha S. Skillman
Mary Brendon Smith
Marlene R. Swan
Sallie Taylor
Martha Van Sweden
Jane VendeBogert
Marion S. Warack
Janet Williamson

Lecturer
Susan M. Kusama, B.S.O.T., Washington University, 1965.

Students entering this program must have satisfactorily completed sixty semester hours in an accredited college or university. Required are courses in English, psychology, biology, physics, chemistry, and social sciences.

The program includes courses in the basic medical sciences, medical and surgical lectures as applied to the practice of physical therapy, theory and application of physical therapy procedures, and a minimum of 800 hours of clinical experience.

The aim of the program is the development of competent physical therapists whose broad cultural backgrounds and thorough professional training prepare them to accept appropriate responsibilities in the comprehensive care program of modern medicine.

Tuition (three semesters),
per semester $1,950
Tuition, final clinical semester 1,300

Further information may be secured by direct correspondence with the Program in Physical Therapy, Box 8083, 660 South Euclid Avenue, St. Louis, Missouri 63110.

PROGRAM IN PHYSICAL THERAPY

The program of instruction in physical therapy in the School of Medicine consists of the junior and senior years of a four-year college curriculum leading to the degree of Bachelor of Science in Physical Therapy.
Assistant Professor and Acting Director
Isabelle M. Bohman, B.S., Skidmore College, 1951; M.S., University of Illinois, 1954.

Assistant Professors
Lorraine F. Lake, B.S., Washington University, 1950; M.A., 1954; Ph.D., 1962. (See Departments of Anatomy and Neurobiology and Preventive Medicine and Public Health, and Irene Walter Johnson Institute of Rehabilitation)

Instructor
Robert J. Hickok, B.S., Washington University, 1953; M.H.A., 1971. (See Administration and Program in Health Care Administration)

Instructors (Clinical)
Deborah J. Clemens
Carole L. Coleman
Patricia A. Csengody
Rochelle M. Grebel
Elvera C. Guebert
Carolyn Halstead
Judith A. Harbers
Helen M. Holzum
Donald E. Honey
Kathleen M. Keller
Susan A. Kenville
Edith K. La Cour
Sandra A. Lake
Janice E. McNeill
Sean E. Maloney
Kathryn M. Milinowicz
Richard F. Roetginger
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Cynthia B. Smith
Mary A. Smith
Marye J. Songer
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Maureen P. Wulf

PROGRAMS IN RADIOLOGIC TECHNOLOGY

The Department of Radiology, which has its headquarters in the Edward Mallinckrodt Institute of Radiology, offers a basic course in X-ray technology and two one-year postgraduate courses. Each course leads to a certificate awarded by the Washington University School of Medicine, Department of Radiology.

X-ray Technology. This two-year program is approved by the American Society of Radiologic Technologists, the American College of Radiology, the Joint Review Committee on Education in Radiologic Technology, the Council on Medical Education of the American Medical Association, and the Veterans Administration. It includes the following courses: radiation protection, professional ethics, anatomy and physiology, nursing procedures, radiation physics, medical terminology, survey of medical and surgical diseases, radiographic positioning, darkroom processing procedures, radiation therapy, radiation biology, nuclear medicine, special procedure radiography, room design and selection of equipment, and introduction to business administration and personnel management. Course work totals approximately 600 hours.

During the first six months, a student is on probation. Upon satisfactory completion of this work, he will be paid a monthly stipend of $50 for the next six months. This stipend increases to $75 for the third six months and $100 for the last six months. During the twenty-four months, the student is assigned tours of duty in various diagnostic and therapeutic areas for practical experience, amounting to a total of 30 contact hours a week.

Candidates for admission must be graduates of an accredited secondary school and should rank in the upper third of their class. Special consideration is given to graduates of schools of nursing that are recognized by the State Board of Nurse Examiners and to students who have passed a college entrance
examination. A one-year postgraduate course is offered in the fields of therapy and nuclear medicine.

*Nuclear Medicine Technology.* This course covers twelve consecutive months divided between didactic course material (319 hours) and practical experience. The student receives a monthly stipend of $300. Candidates for admission must be registered technologists (A.R.R.T.) or registered nurses with two years of college or with a baccalaureate degree. Medical technologists or persons having a B.S. degree with a major in biology, chemistry, or physics may also be considered if they have completed basic courses in human anatomy and physiology of at least 60 class hours.

*Graduate Course in Radiation Therapy Technology.* The division of Radiation Oncology offers a twelve-month postgraduate course in radiation therapy technology. This course consists of 260 hours of didactic material plus extensive practical experience and training in the clinical application and dosimetry procedures of radiation therapy. Approximately 1,400 new patients are treated each year. The equipment includes a 35 MeV linear accelerator, a 4 MeV linear accelerator, a 25 MeV betatron, a cobalt unit, and a superficial ortho-voltage machine. Students obtain experience on each of the therapy machines, as well as in the dosimetry and treatment planning area, and in nursing procedures. Two on-site computers are used for dosimetry and treatment planning computations. In addition, a simulator is available for treatment planning and the students are assigned to this area for a portion of their training.

Lecturer and Educational Director  
**Armand Diaz,** R.N., R.T., Havana University School of Medicine, 1948. (See Department of Radiology)
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2Honorary member.
3Representing the Faculty Council during 1976-77.
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DOCTOR OF MEDICINE DEGREE

Fourth-Year Class 1975-76 (August)
Residency 1976-77

Schmidt, Robert Edward, A.B., Washington University, ’69—Barnes Hospital, St. Louis, Missouri
Spiegel, Gregory W., A.B., Washington University, ’67—New York University Medical Center
Wheeler, Carroll Ray, B.S., Cameron State College, ’71—Central State Hospital, Norman, Oklahoma

Schmidt, Robert Edward, A.B., Washington University, ’69—Barnes Hospital, St. Louis, Missouri
Spiegel, Gregory W., A.B., Washington University, ’67—New York University Medical Center
Wheeler, Carroll Ray, B.S., Cameron State College, ’71—Central State Hospital, Norman, Oklahoma

Fourth-Year Class 1976-77
Residency 1977-78

Adams, Jerry Winston, B.S., Morehouse College, ’73—Indiana University Medical Center, Indianapolis, Indiana
Adams, Jesse William, B.S., University of California at Berkeley, ’73; B.M.S., Dartmouth Medical School, ’75—Barnes Hospital, St. Louis, Missouri
Altmeyer, Vickie Lee, B.S., Yale College, ’73—Baylor College of Medicine, Houston, Texas
Armbruster, Robert George, B.A., University of Notre Dame, ’69—Barnes Hospital, St. Louis, Missouri
Askew, Edward Ray, Jr., A.B., Harvard University, ’73
Atter, Joann Lynette Miller, A.B., Washington University, ’73—University Hospitals of Cleveland, Cleveland, Ohio
Aul, Christopher Taylor, B.A., Wabash College, ’73—North Carolina Memorial Hospital, Chapel Hill, North Carolina
Baker, Gary Lynn, A.B., University of Nebraska at Lincoln, ’73—University of Alabama Medical Center, Birmingham, Alabama
Ballou, Carol Bryan, A.B., Oberlin College, ’70—Michael Reese Hospital, Chicago, Illinois
Barnes, James Henry, B.S., Alcorn A & M College, ’71—Barnes Hospital, St. Louis, Missouri
Barredo, Victor Hugo, B.S., University of Missouri at Columbia, ’72; M.S., ’73—University of Miami Affiliated Hospitals, Miami, Florida
Bell, Laird Arthur, B.S., University of Illinois, ’73—Barnes Hospital, St. Louis, Missouri

Berkowitz, Ellis Richard, A.B., Washington University, ’73—Barnes, Hospital, St. Louis, Missouri
Bernfeld, Barry David, B.A., Queens College, ’71—Jewish Hospital, St. Louis, Missouri
Bitz, Donald Michael, B.S., University of Illinois, ’73; M.S., ’73—Barnes Hospital, St. Louis, Missouri
Bobzien, Bonnie Ruth, A.B., University of Illinois, ’73—Jewish Hospital, St. Louis, Missouri
Borou, Christopher Paul, B.S., University of Illinois, ’73—Mayo Graduate School of Medicine, Rochester, Minnesota
Boron, Walter Frank, B.A., St. Louis University, ’71—Washington University School of Medicine Fellow
Bortz, Sheri Lee, A.B., University of Illinois at Urbana, ’72—St. John’s Mercy Hospital, St. Louis, Missouri
Bowen-Williams, Janne Emlyn, B.A., Reed College, ’73—Texas Medical Branch Hospital, Galveston, Texas
Bragdon, Andrew Cook, B.S., Bates College, ’71; B.M.S., Dartmouth Medical School, ’73—Duke University Medical Center, Durham, North Carolina
Bridwell, Keith Happ, A.B., Washington University, ’73—Barnes Hospital, St. Louis, Missouri
Brody, Steven Andrew, A.B., Brown University, ’73; M.M.Sc., Brown University School of Medicine, ’74—Yale—New Haven Medical Center, New Haven, Connecticut
Brown, James Trig Perdue, Drury College—Duke University Medical Center, Durham, North Carolina
Bryan, Bruce Lohrmann, B.S.M.E., Purdue University, ’73—Barnes Hospital, St. Louis, Missouri
Buck, Stanley Wellington, B.S.E., Princeton University, ’73—Presbyterian St. Luke’s Hospital, Chicago, Illinois
Campbell, John William, A.B., Washington University, ’73—Barnes Hospital, St. Louis, Missouri
Carrasco, Charles Ray, Weber State College—University of Utah Affiliated Hospitals, Salt Lake City, Utah
Chennell, Irene Louise, A.B., University of California at Santa Cruz, '72—St. Mary's Medical Center, Long Beach, California
Clabots, Joseph Paul, B.A., St. Louis University, '73—Jewish Hospital, St. Louis, Missouri
Clardy, David Jerome, B.A., University of Chicago, '73—Michael Reese Hospital, Chicago, Illinois
Clayton, Frederic Christie, B.A., Rice University, '73—Stanford University Hospital, Stanford, California
Coller, David Harris, B.A., California Institute of Technology, '73—Barnes Hospital, St. Louis, Missouri
Cornatzer, Nancy Freeman, B.A., University of North Dakota, '73—University of Alabama Medical Center, Birmingham, Alabama
Davis, James Lawrence, B.S.E.E., Stanford University, '72—University of Missouri Medical Center, Columbia, Missouri
Desper, David Dale, Jr., A.B., Washington University, '73—Barnes Hospital, St. Louis, Missouri
Duncombe, Mary Helena, A.B., Whitman College, '73—Hennepin County General Hospital, Minneapolis, Minnesota
Dutton, Jonathan Joseph, B.A., Queens College, '65; A.M., Harvard University, '67; Ph.D., '71; M.M.S., Rutgers Medical School, '75—University of Washington Affiliated Hospitals, Seattle, Washington
Dwyer, Patrick Nagle, B.S., University of Notre Dame, '73—Johns Hopkins Hospital, Baltimore, Maryland
Edelstein, Richard David, A.B., Columbia College, '73—New York University Medical Center, New York, New York
Eggerding, Caroline, B.S., University of Illinois, '73—Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
Felt, Paul Alan, B.A., Colorado College, '73—Geisinger Medical Center, Danville, Pennsylvania
Fete, Timothy Joseph, University of Dayton—St. Louis Children's Hospital, St. Louis, Missouri
Fink, Mitchell Phillip, B.S., University of California at Davis, '70; M.A., University of California at Irvine, '71—National Naval Medical Center, Bethesda, Maryland
Foster, Norman Louis, B.A., MacMurray College, '73—Jewish Hospital, St. Louis, Missouri
Freeman, Pamela Gail, B.A., Vanderbilt University, '73—Barnes Hospital, St. Louis, Missouri
Frost, John James, A.B., Washington University, '71
Galster, Allen Dale, B.S., University of South Dakota, '73—Stanford University, Stanford, California
Gilmore, Richard Millard, Jr., A.B., Washington University, '73—University of Texas Southwestern Affiliated Hospitals, Dallas, Texas
Gleason, Daniel Lee, B.A., Portland State University, '73—University of Oregon Medical Center Hospitals and Clinics, Portland, Oregon
Gollobin, Glenn Stephen, A.B., Oberlin College, '73—University of Minnesota Hospitals, Minneapolis, Minnesota
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution 1</th>
<th>Institution 2</th>
<th>Location 1</th>
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<tbody>
<tr>
<td>Greene, Warner Craig</td>
<td>A.B., Stanford</td>
<td>Massachusetts</td>
<td>General Hospital,</td>
<td>Boston, Massachusetts</td>
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<tr>
<td>Greenwood, Scott Douglas</td>
<td>University of Nevada</td>
<td>Barnes Hospital, St. Louis, Missouri</td>
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<tr>
<td>Griffin, Margaret Ann</td>
<td>A.B., Talladega</td>
<td>'68; M.P.H., Yale University, '70</td>
<td>Los Angeles County Harbor General Hospital, Torrance, California</td>
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<tr>
<td>Hanish, Sidney Joseph</td>
<td>B.A., North Dakota</td>
<td>'73; B.S. Med., University of North Dakota Medical School, '75</td>
<td>Jewish Hospital, St. Louis, Missouri</td>
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<tr>
<td>Hatlelid, John Michael</td>
<td>B.A., St. John's University, '70; B.S. Med., University of North Dakota Medical School, '75</td>
<td>Jewish Hospital, St. Louis, Missouri</td>
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<td>Hershey, Charles Owen</td>
<td>B.A., DePauw University, '69</td>
<td>St. Louis University Group Hospitals, St. Louis, Missouri</td>
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<td>Hiskin, Eric Carnot</td>
<td>B.S. Eng., University of Washington, '73</td>
<td>Mercy Hospital, San Diego, California</td>
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<tr>
<td>Horstman, Jonathan William</td>
<td>A.B., Colgate University, '68</td>
<td>Mercy Hospital, San Diego, California</td>
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<td>Ingle, Robert Maurice</td>
<td>B.A., Florida State University, '69</td>
<td>United States Air Force, Wilford Hall Hospital, San Antonio, Texas</td>
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<td>Jacobson, Peter Lars</td>
<td>A.B., Princeton University, '73</td>
<td>North Carolina Memorial Hospital, Chapel Hill, North Carolina</td>
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<tr>
<td>Johnson, Jeneene Carolyn</td>
<td>B.S., Upsala College, '64; M.S., Rutgers Graduate School, '66; Ph.D., '71; M.M.S., Rutgers Medical School, '75</td>
<td>Jewish Hospital, St. Louis, Missouri</td>
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<td>Johnson, Richard Anthony</td>
<td>B.S., University of Washington, '73</td>
<td>University of California Hospital, Los Angeles, California</td>
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<td>Jones, Judson Edward</td>
<td>Purdue University—University Hospitals, Madison, Wisconsin</td>
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<td>Koch, Gary Alan</td>
<td>A.B., Grinnell College, '73</td>
<td>Doctors Hospital, Seattle, Washington</td>
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<td>Kochan, Andrew</td>
<td>B.A., Miami University, '73</td>
<td>Valley Medical Center, Fresno, California</td>
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<td>Kovnar, Edward Harry</td>
<td>B.S. Eng., Washington University, '73</td>
<td>St. Louis Children's Hospital, St. Louis, Missouri</td>
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<td>Krauss, Elliot Aryeh</td>
<td>University of Rochester—Jewish Hospital, St. Louis, Missouri</td>
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<td>Koenke, Kurt Kyle</td>
<td>B.S., Valparaiso University, '73</td>
<td>Tripler Army Hospital, Honolulu, Hawaii</td>
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<td>Lammert, Gary Reyburn</td>
<td>B.S., Purdue University, '72</td>
<td>United States Naval Hospital, Jacksonville, Florida</td>
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<td>Lanzer, William Linwood</td>
<td>B.A., University of California at Los Angeles, '68; M.Ed., North Carolina State University, '71; M.M.S., Rutgers Medical School, '75</td>
<td>University Hospital, San Diego, California</td>
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<td>Lee, Kerwin Jong</td>
<td>B.A., University of California at San Diego, '72</td>
<td>Kaiser Foundation Hospital, Oakland, California</td>
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<tr>
<td>Leiner, Matthew Saul</td>
<td>A.B., Rutgers University, '70</td>
<td>District of Columbia General Hospital, Georgetown Medical Service, Washington, D.C.</td>
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<td>Lewis, Edward Sibley</td>
<td>B.A., University of Texas, '73</td>
<td>Barnes Hospital, St. Louis, Missouri</td>
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<td>Ley, Carl Eugene</td>
<td>B.A., University of Colorado, '66</td>
<td>United States Naval Hospital, San Diego, California</td>
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<td>Maksem, John Adelbert</td>
<td>B.S., John Carroll University, '73</td>
<td>Case Western Reserve University Hospital, Cleveland, Ohio</td>
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<td>Marcella, Joseph John</td>
<td>A.B., Rutgers University, '72</td>
<td>Waterbury Hospital, Waterbury, Connecticut</td>
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<td>Marquardt, Donald Nilan</td>
<td>A.B., Grinnell College, '69; Ph.D., Stanford University, '74</td>
<td>University of Utah Affiliated Hospitals, Salt Lake City, Utah</td>
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<tr>
<td>McDonnell, William Foskey</td>
<td>III, B.S.E., Tulane University, '72</td>
<td>North Carolina Memorial Hospital, Chapel Hill, North Carolina</td>
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<td>McLain, Pamela Fullmer</td>
<td>B.S., Birmingham-Southern College, '74; St. John's Mercy Medical Center, St. Louis, Missouri</td>
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<tr>
<td>Meckler, Gary Mitchell</td>
<td>B.S., Ohio State University, '73</td>
<td>North Carolina Memorial Hospital, Chapel Hill, North Carolina</td>
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<tr>
<td>Michael, Helen Elizabeth Blair</td>
<td>A.B., Washington University, '73</td>
<td>Barnes Hospital, St. Louis, Missouri</td>
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<tr>
<td>Mitzel, Duane Lee</td>
<td>B.S., University of California at Davis, '72</td>
<td>San Francisco General Hospital, San Francisco, California</td>
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<td>Moore, Eileen Emily</td>
<td>B.S., Furman University, '73</td>
<td>Children's Medical Center, Dallas, Texas</td>
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<td>Munz, Harlan Ray</td>
<td>B.S., Miami University, '73</td>
<td>Jewish Hospital, St. Louis, Missouri</td>
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</tr>
</tbody>
</table>
Murov, Roslyn Gail, A.B., Washington University, '73—Los Angeles County—U.S.C. Medical Center, Los Angeles, California
Nelson, Donald Michael, B.A., Cornell College, '71—Barnes Hospital, St. Louis, Missouri
Nesler, Cheryl Lynn, B.A., MacMurray College, '73—Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
Newman, Alan Philip, A.B., University of California at Berkeley, '73—University Hospital, San Diego, California
Nunery, Eugene, Jr., B.S., Purdue University, '71; M.S., University of California at Berkeley, '73—Cleveland Metropolitan General Hospital, Cleveland, Ohio
Ogle, John Wendelin, B.S.Ch.E., University of Colorado at Boulder, '73—Children's Medical Center, Dallas, Texas
Phillips, Thomas Edward, B.A., University of Kansas, '73—University of Washington Affiliated Hospitals, Seattle, Washington
Pierson, Steven Bruce, B.A., University of Colorado, '73; M.M.S., Rutgers Medical School, '75—North Carolina Memorial Hospital, Chapel Hill, North Carolina
Ponce, Pamela Neff, A.B., Washington University, '72—Wilmington Medical Center, Wilmington, Delaware
Pugsley, Mary Phyllis, B.A., Southern Methodist University, '72—Creighton University Affiliated Hospitals, Omaha, Nebraska
Raymond, Kent Howard, Purdue University—University of San Antonio Teaching Hospital, San Antonio, Texas
Reynolds, Barbara Jane, A.B., Connecticut College, '70—Barnes Hospital, St. Louis, Missouri
Rich, Eugene Carroll, B.A., University of Mississippi, '73—University of Minnesota Hospitals, Minneapolis, Minnesota
Ritter, Melody Joy, A.B., Stanford University, '73—Ochsner Foundation Hospital, New Orleans, Louisiana
Robbins, Frank Edward, Jr., A.B., Earlham College, '73—Walter Reed Army Medical Center, Washington, D.C.
Rollings, John William, Washington University—University of Oklahoma, Tulsa Medical College, Tulsa, Oklahoma
Ruddock, Martin Dennis, A.B., Washington University, '73—Case Western Reserve University Hospital, Cleveland, Ohio
Rusche, John Michael, B.S.Ch.E., University of Notre Dame, '73—University of Arizona Medical Center, Tucson, Arizona
Rusche, Kay Miller, B.A., University of California at San Diego, '72—University of Arizona Medical Center, Tucson, Arizona
Sacks, Steven H., B.E., Cooper Union, '72—Mount Sinai Hospital, New York, New York
Saper, Clifford Baird, B.S., University of Illinois; M.S., '72—Jewish Hospital, St. Louis, Missouri
Sato, Richard William, B.A., Johns Hopkins University, '73—St. Louis Children's Hospital, St. Louis, Missouri
Schier, John Joseph, B.S.E., Princeton University, '73—Barnes Hospital, St. Louis, Missouri
Schlanger, Stuart Rayfer, B.A., New York University, '70—Creighton University Affiliated Hospitals, Omaha, Nebraska
Schuster, Victor Leonard, University of Nebraska—University of Washington Affiliated Hospitals, Seattle, Washington
Seaworth, Barbara Joyce, B.S., North Dakota State University, '70—United States Air Force, Wilford Hall Hospital, San Antonio, Texas
Shirley, Frank Arthur, B.A., DePauw University, '73—Jewish Hospital, St. Louis, Missouri
Shore, Bernard Larry, B.S., Washington University, '72—Barnes Hospital, St. Louis, Missouri
Shore, John William, B.A., University of New Hampshire, '68; B.S.Med., University of North Dakota School of Medicine, '75—United States Air Force, Wilford Hall Hospital, San Antonio, Texas
Siegel, Richard Lawrence, A.B., Washington University, '70—Children's Medical Center, Boston, Massachusetts
Spoering, Craig Allen, B.S., Washburn University, '73—St. Louis Children's Hospital, St. Louis, Missouri
Steger, James Warren, B.S., University of Michigan, '72—United States Naval Hospital, San Diego, California
Steinmetz, William Lee, B.S., Eastern Illinois University, '73—Indiana University Medical Center, Indianapolis, Indiana
Strominger, Adele Iris, A.B., University of Chicago, '56; M.S., '60—Albany Hospital, Albany, New York
Terrell, Calvin Byron, A.B., Washington University, '73—Los Angeles County—U.S.C. Medical Center, Los Angeles, California
Thiel, Christopher William, B.S., University of Illinois, '73—Presbyterian St. Luke's Hospital, Chicago, Illinois
Tobin, Hugh McNair, B.S., Iowa State University, '72—University of Iowa Hospital, Iowa City, Iowa
Tollefsen, Douglas Meyer, A.B., Grinnell College, '70—University of Colorado Affiliated Hospitals, Denver, Colorado
Toth, Phillip Dennis, B.S., Purdue University, '72—Methodist Hospital, Indianapolis, Indiana
Wald, Mark Steven, A.B., Oberlin College, '72—Jewish Hospital, St. Louis, Missouri
Welgus, Howard Glenn, B.A., Rice University, '73—Barnes Hospital, St. Louis, Missouri
Wells, Lionelle Dudley, Jr., B.A., University of Pennsylvania, '73—Yale-New Haven Medical Center, New Haven, Connecticut
Williams, Richard Frank, B.S.Ch.E., Washington University, '73—University of Kansas Medical Center, Kansas City, Kansas
Willis, Rudolph, B.A., Northwestern University, '73—Truman Medical Center, Kansas City, Missouri
Willisky, Eric Michael, B.S.C.E., Massachusetts Institute of Technology, '73—Kaiser Foundation Hospital, San Francisco, California
Younkin, Scott Wiley, A.B., University of Illinois, '73—Medical Center Hospital of Vermont, Burlington, Vermont

Third-Year Class 1976-77
Abensohn, Meryl Kaye, A.B., Washington University, '72—Washington, D.C.
Ackerman, Rollie Sue, B.A., University of Minnesota, '70; M.S., University of Chicago, '72—St. Louis Park, Minnesota
Albert, Moses Kadranel, B.S., Georgetown University, '74—Arlington, Virginia
Alexander, Victor, A.B., Harvard College, '72; M.M.S., Rutgers Medical School, '74; M.P.H., Harvard School of Public Health, '76; M.I.H., '76—Watertown, Massachusetts
Amusa, Kweli Johara, B.S., University of Illinois, '73—Chicago, Illinois
Auffenberg, Robert John, Colorado State University—St. Louis, Missouri
Baird, John Robert, B.S., North Dakota State University, '74; B.S., North Dakota Medical School, '76—Dickinson, North Dakota
Bastian, Robert Wilfred, B.S., Greenville College, '74—Greenville, Illinois
Bischoff, Marshall Burnice, B.S., University of Illinois, '60; M.S., '62—U.S. Army
Blaufuss, Mark Charles, B.S., University of North Dakota, '74—Hebron, North Dakota
Boles, Eyla Glee, B.S., College of Idaho, '74—Wells, Nevada
Brewer, Keith Frederic, A.B., Indiana University, '74—Wilmington, Delaware
Brim, John Anthony, A.B., Washington University, '62; A.M., '64; Ph.D., Stanford University, '70—Somerset, New Jersey
Brown, Laura Jane, B.A., Vassar College, '74—Madison, Wisconsin
Burlaiff, Diane Claire, B.S., University of Nebraska, '73; B.S.Med.Tech., '74—Lubbock, Texas
Cantrell, Candy Jo, B.S., University of Nevada, '74—Reno, Nevada
Capps, Robert James, B.S., Stanford University, '74—St. Louis, Missouri
Clayburgh, Robert Henry, B.A., St. Olaf College, '74—Grand Forks, North Dakota

Colter, Kim David, B.S., University of Missouri at Rolla, '73; M.S., University of California, '74—Downers Grove, Illinois

Couper, Nicholas Beemer, B.A., University of Virginia, '74—Lexington, Virginia

Crump, Nathaniel Lloyd, B.S., Howard University, '74—St. Louis, Missouri

David, Laura Jean, B.A., Grinnell College, '74—St. Louis, Missouri

Davidson, Raymond Pearson, II, B.S., Washington and Lee University, '74—Joplin, Missouri

Dickler, Andrew Cronson, B.A., University of Hawaii, '74—St. Louis, Missouri

Doty, Jeffrey Edward, B.A., Stanford University, '74—Hamden, Connecticut

Ettelson, Charles David, A.B., Oberlin College, '74—Westfield, New Jersey

Farr, Barry Miller, B.A., University of Mississippi, '75—Greenville, Mississippi


Frisse, Mark Edwin, B.S., University of Notre Dame, '74—Highland, Illinois

Gallin, Pamela Frances, A.B., Washington University, '74; B.S., '74—White Plains, New York

Galloway, Anthony, B.S., Southern Illinois University at Edwardsville, '73—East St. Louis, Illinois

Geggel, Harry Steven, A.B., Princeton University, '74—Elkins Park, Pennsylvania

Gibb, Marcy Lynn, B.S., Washington State University, '72—Bellingham, Washington

Gluck, Charles Arthur, Emory University—New York, New York

Goldstein, Carl Samuel, A.B., Cornell University, '73—Springfield, New Jersey

Goran, Daniel David, A.B., Washington University, '73—St. Louis, Missouri

Gunn, Debra Clark, B.A., Fisk University, '72—Greenville, Mississippi

Hartley-Brewer, Valerie Forbes, University of Birmingham—Birmingham, England

Henry, Ann Katherine, B.S., University of Nebraska, '74—Lincoln, Nebraska

Hochreiter, Margaret Campbell, B.S., Maryville College, '66; Ph.D., Johns Hopkins University, '70—Rockville Centre, New York

Holers, Vernon Michael, B.S., Purdue University, '73—Napoleon, Ohio

Horn, Mary O'Flaherty, B.A., University of Idaho, '74—Rolling Hills, California

Huck, Robert Love, A.B., Middlebury College, '74—Tarrytown, New York

Jemison, Ada Sue, Wesleyan University—Chicago, Illinois

Jenson, David Richard, B.S., Brigham Young University, '75—Lancaster, California

Johnson, Denise Lynn, B.S., Northwestern University, '76; B.S., Northwestern University School of Medicine, '76—Chicago, Illinois

Juergens, Andrew Louis, Montana State College—Dillon, Montana

Kennerly, Donald Alan, A.B., Harvard College, '74—Darien, Connecticut

Kent, Harold Lee, B.A., Kansas State College of Pittsburgh, '74—Asbury, Missouri
King, Frances Allene, B.S., University of Oklahoma, '66—St. Louis, Missouri
Kirk, Scott Harold, B.S., University of Illinois, '75—River Forest, Illinois
Kleyman, Thomas Ralph, B.S., Syracuse University, '73—St. Louis, Missouri
Koller, Hermann Michael, B.S., Stanford University, '74—Minneapolis, Minnesota
Koppennol, Carolyn Sue, B.A., Grand Valley State College, '69—Coopersville, Michigan
Kreiss, Joan Kathryn, B.A., Reed College, '73—Princeton, New Jersey
Kurlan, Roger Mark, B.A., University of Rochester, '74—Rochester, New York
Kurnik, Brenda Chinn, B.S., Massachusetts Institute of Technology, '74—Flemington, New Jersey
Kurnik, Peter Barry, B.S., Massachusetts Institute of Technology, '74; M.S., '74—Manlius, New York
Kwong, Kwong-Fai, B.S.Ch.E., Washington University, '74; A.B., '74—Kowloon, Hong Kong
Laux, Brian Edward, B.A., University of Delaware, '74; B.S., '74—Wilmington, Delaware
Levinson, Mark Allen, A.B., University of Missouri at Columbia, '73—St. Louis, Missouri
Ley, Timothy James, B.A., Drake University, '74—Des Moines, Iowa
Li, Ellen, B.S., Stanford University, '74—Chicago, Illinois
Litman, Dan Rudolf, A.B., Princeton University, '74—Wynewood, Pennsylvania
Ludvigsen, Carl William, Jr., B.A., University of Colorado at Boulder, '74—Littleton, Colorado
Malan, Scott Lynn, B.S., Brigham Young University, '71—Reno, Nevada
Marchetta, Joseph Peter, B.A., University of Wisconsin, '74—New Brunswick, New Jersey
Margulies, Thomas Daniel, B.S., University of Iowa, '74—Iowa City, Iowa
Marvel, Carol Ann, B.S., Purdue University, '74—West Lafayette, Indiana
McKenzie, Douglas Bruce, B.S., Stanford University, '72—Reno, Nevada
McQueen, Charles Edward, B.S., University of Illinois, '74—Tiskilwa, Illinois
Meldi, Dominic Matthew, B.S., University of Illinois, '74—Wilsonville, Illinois
Melnyk, Larysa Mary, B.A., Douglass College, '74; M.S., Rutgers University, '74—Irvington, New Jersey
Merrill, Charles Robert, B.S., University of Southern California, '74—Hemet, California
Michalski, Martha Caroline, B.A., Oaklend University, '71—Chevy Chase, Maryland
Milbrandt, Jeffrey Dean, B.S., University of Nebraska, '74—Hooper, Nebraska
Mirkkanani, Nola Tamayo, B.A., Wellesley College, '71—Honolulu, Hawaii
Montana, Margaret Anne, B.A., Colorado College, '74—Denver, Colorado
Mooney, Ellen, B.S., University of Utah, '74—Ytri-Njardvik, Iceland
Moran, Stanley Mark, B.S., University of Oklahoma, '70—Oklahoma City, Oklahoma
Morgan, Ross Eric, B.S., Colorado State University, '72; B.S., '74—Wheat Ridge, Colorado
Mullenger, Keith Lee, B.S., Iowa State University, '74—Larchmont, New York
Murphy, Thomas Aquinas, B.S., University of Notre Dame, '74—South Bend, Indiana
Mustin, Henry Dutton, B.A., Haverford College, '73—Haverford, Pennsylvania
Nasca, David, A.B., Stanford University, '73—Lockport, New York
Nelson, Carol Anne, B.A., Concordia College, '74; B.S., University of North Dakota Medical School, '76—Westby, Montana
Nelson, Susan, A.B., Oberlin College, '69; A.M., '71—St. Louis, Missouri
Nowak, Felicia Veronika, A.B., Trinity College, '70; Ph.D., University of Wisconsin, '75—Westmont, New Jersey
O'Connor, John James, B.A., University of Missouri at St. Louis, '74—St. Louis, Missouri
Oldham, John Timothy, A.B., Washington University, '74—Wheaton, Illinois
Ozanich, Katherine Mary, B.S., University of Pittsburgh, '71—McKees Rocks, Pennsylvania
Palmer, Ronald Lee, B.S., University of Florida, '73—Clearwater, Florida
Parent, Dennis Louis, B.S., Rutgers University, '73—Wayne, New Jersey
Pearse, Carlton Sherman, B.S.Ch.E., University of Colorado at Boulder, '73—Denver, Colorado
Poindexter, Theresa Parker, B.A., Pomona College, '73—Pasadena, California
Portnoff, Lee Stuart, B.S., Purdue University, '72; M.A., University of California at Berkeley, '74—St. Louis, Missouri
Reed, Barbara Diane, Purdue University—Columbus, Indiana
Regenstein, Frederic Gary, B.A., Rutgers College, '73—West Orange, New Jersey
Renie, William Andrew, A.B., Washington University, '73—Springfield, Missouri
Rhinehart, Kenneth Bernard, B.S., Duke University, '74—Winston-Salem, North Carolina
Rhoades, Daniel Jay, Jr., A.B., Stanford University, '73—Fremont, California
Rich, Andrew Adam, B.A., Yale University, '74—Westfield, New Jersey
Robinette, Charles Leonard, Jr., B.E., Vanderbilt University, '65—Seattle, Washington
Robinson, Margaret Lynn, B.S., Stanford University, '73—Los Altos, California
Roes, William Frederick, B.A., University of Washington, '73—Cody, Wyoming
Rose, Carol Grammer, B.S., Duke University, '74—Centreville, Virginia
Rubin, Jeffrey Steven, A.B., Harvard College, '74; A.M., '74—New City, New York
Scheiber, Marc Hudson, A.B., Washington University, '74—Winter Park, Florida
Schmitz, Robert Lowell, A.B., Stanford University, '74—Menlo Park, California
Schwartz, Bruce Mitchell, B.A., Johns Hopkins University, '74—Springfield, New Jersey
Schwartz, Mary Rebecia, A.B., Stanford University, '74—Honolulu, Hawaii
Schweitzer, John Butler, B.S.E.E., Washington University, '74—St. Louis, Missouri
Shega, John Francis, B.S.E.E., University of Pittsburgh, '74—McKeesport, Pennsylvania
Sisk, Clark Edmund, A.B., Stanford University, '74—St. Louis, Missouri
Spaulling, Sandra Louise, B.A., Montana State University, '74—Helena, Montana
Spellen, Carol Denise, B.S., Duke University, '74—Atlanta, Georgia
Spoon, Donald Ray, B.S., United States Air Force Academy, '64—Pleasant Hill, Missouri
Stricker, Charles X., A.B., University of Missouri at Columbia, '73—St. James, Missouri
Stuart, Mary Hamilton, A.B., Grinnell College, '72—Reno, Nevada
Stull, John Davis, B.S., University of Illinois, '74—Olney, Illinois
Sweeney, Thomas Kevin, A.B., Cornell University, '74—Ithaca, New York
Thaler, Bruce Jay, A.B., Hamilton College, '74—Laurel Hollow, New York
Thompson, Jimmie Lee, B.S., Tougaloo College, '72—Madison, Mississippi
Toth, Joseph Karoly, B.S., Stanford University, '68—Gardnerville, Nevada
Turner, Donn Martin, B.A., Colorado College, '74—Denver, Colorado
Vander Woude, John Cecil, Jr., B.A., Augustana College, '74—B.S., University of South Dakota School of Medicine, '76—Sioux Falls, South Dakota
Wahl, Richard Leo, B.A., Wartberg College, '74—Waverly, Iowa
Walker, Gaylord Tenold, B.A., University of the South, '74—Mobile, Alabama
Watkins, David Lynn, A.B., University of Missouri at Columbia, '74—Lancaster, Missouri
Webber, Paul Michael, B.S., U.S. Military Academy, '74—St. Louis, Missouri
White, David Scott, Antioch College—St. Louis, Missouri
White, John Robert, B.S., University of Kentucky, '74—Marion, Kentucky
Wilkinson, Robin Ann, B.A., University of Texas at Austin, '74—Austin, Texas
Wincek, Thomas John, B.S., University of Minnesota, '70; Ph.D., University of Utah, '74—Salt Lake City, Utah
Witkowski, Francis Xavier, B.S.E.E., Manhattan College, ’69; M.S., Northeastern University, ’72—Long Island City, New York
Young, Stephen Granville, A.B., Princeton University, ’74—Topeka, Kansas
Zazove, Philip Bertram, B.A., Northwestern University, ’73; M.S., ’74—Lincolnwood, Illinois

Second-Year Class 1976-77

Anderson, Dale Johnson, A.B., Oberlin College, ’75—St. Louis, Missouri
Armbruster, Thomas John, B.A., Adelphi University, ’75—Rockville Centre, New York
Attiah, Augustine Kwadno, B.S., University of Chicago, ’75—Ghana, Africa
Babcock, Susan Kay, B.A., Augsburg College, ’75—Anoka, Minnesota
Barker, Kendall Howard, A.B., Oberlin College, ’75—Grosse Pointe Farms, Michigan
Bartmess, John Edgar, B.A., Vanderbilt University, ’74—Sheffield, Alabama
Beatie, William Edward, B.S., Northwestern University, ’74—Chicago, Illinois
Bechtold, Robert Edmund, B.A., Duke University, ’72; M.S., Florida State University, ’76—Tallahassee, Florida
Blodi, Christopher Frederick, B.A., University of Iowa, ’75; B.S., ’75—Iowa City, Iowa
Bradley, Stephen Kent, B.A., Duke University, ’75—Lenexa, Kansas
Breitmeyer, James Bradley, A.B., University of California at Santa Cruz, ’75—Atherton, California
Brotherson, Kurt Jeffrey, A.B., Washington University, ’75—Springfield, Illinois
Brown, Stephanie Cordell, B.A., Williams College, ’75—Brooklyn, New York
Bucy, Ralph Patterson, B.A., Austin College, ’75—Galveston, Texas
Burger, Gerald Arthur, Jr., B.S., U.S. Naval Academy, ’75—Overland Park, Kansas
Burroughs, Kim D., B.A., University of Colorado, ’75—Littleton, Colorado
Camuto, Alice Ackerman, A.B., Sarah Lawrence College, ’75—New York, New York
Chatkin, George Alan, B.S., Stanford University, ’74—Skokie, Illinois
Cichon, Jeffrey Peter, B.A., St. Louis University, ’75—Clifton, New Jersey
Clark, John Ross, B.S., Brown University, ’75—Philadelphia, Pennsylvania

Clifton, Devoree Ann, B.S., Regis College, ’75—Denver, Colorado
Coe, Jeffrey Dean, B.S.E.E., University of Notre Dame, ’75—San Antonio, Texas
Connor, Robert Emmet, B.S., Massachusetts Institute of Technology, ’75—Ossining, New York
Cook, Debra Lynn, B.S., Denison University, ’75—Park Ridge, Illinois
Craver, Jeffrey Lloyd, A.B., Cornell University, ’75—Pelham Manor, New York
Dann, John Joseph, III, B.A., College of Holy Cross, ’69; D.M.D., Harvard School of Dental Medicine, ’73—Forney, Texas
Demers, Renee Carol, B.A., Northwestern University, ’74; M.S., ’74—West Orange, New Jersey
Derechin, Neil Mark, B.A., Brown University, ’75—St. Paul, Minnesota
DiMarco, Jack Peter, B.S., St. John’s University, ’75—Jackson Heights, New York
Doan, Nancy Grace, B.A., St. Olaf College, ’75—Minnetonka, Minnesota
Dooley, David Patrick, B.S., University of Notre Dame, ’75—Sharonville, Ohio
Dumler, Thomas Lee, B.A., Colorado College, ’74—Denver, Colorado
Ferguson, Thomas Bruce, Jr., B.A., Williams College, ’75—St. Louis, Missouri
Fillingame, Ralph Alan, B.S., University of California at Davis, ’75—Red Bluff, California
Fishman, Leslie E., B.S., University of Michigan, ’75—Pittsburgh, Pennsylvania
Fitts, William Elton, B.A., Boise State University, ’75—Boise, Idaho
Fogel, Sandy Lewis, A.B., Washington University, ’75—Monsey, New York
Forstate, William Jacob, B.A., Washington and Jefferson College, ’68—North Miami Beach, Florida
Frame, John Raymond, University of Oklahoma—Mequon, Wisconsin
Frankel, Scott Jay, A.B., Grinnell College, ’75—St. Louis, Missouri
Freter, Carl Ernest, B.A., University of California at San Diego, ’75—San Diego, California
Friedman, Kenneth Stan, B.A., Kenyon College, ’75—Lawrence, New York
Garnes, Arista, University of Chicago—Baltimore, Maryland
<table>
<thead>
<tr>
<th>Name</th>
<th>Degree</th>
<th>University</th>
<th>City, State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgieff, Michael Kara</td>
<td>B.A.</td>
<td>Yale University</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>Gibson, John Ragan</td>
<td>B.A.</td>
<td>Vanderbilt University</td>
<td>Nashville, Tennessee</td>
</tr>
<tr>
<td>Goodman, Andrew Kemper</td>
<td>B.A.</td>
<td>University of Wisconsin</td>
<td>West Orange, New Jersey</td>
</tr>
<tr>
<td>Grassie, Charles Robert</td>
<td>B.A.</td>
<td>Swarthmore College</td>
<td>Hochessin, Delaware</td>
</tr>
<tr>
<td>Green, Michael Richard</td>
<td>B.S.</td>
<td>University of Wisconsin</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>Gregorie, Erik Martin</td>
<td>A.B.</td>
<td>Lehigh University</td>
<td>Alexandria, Virginia</td>
</tr>
<tr>
<td>Gregory, Donald Wayne</td>
<td>B.A.</td>
<td>Pacific College of Fresno</td>
<td>Fresno, California</td>
</tr>
<tr>
<td>Grassman, Robert Alan</td>
<td>A.B.</td>
<td>Harvard College</td>
<td>Worcester, Massachusetts</td>
</tr>
<tr>
<td>Hairston, Frank Noel, Jr.</td>
<td>B.A.</td>
<td>Fisk University</td>
<td>Martinsville, Virginia</td>
</tr>
<tr>
<td>Hanson, John Stephen</td>
<td>B.A.</td>
<td>University of Missouri</td>
<td>St. Louis, Missouri</td>
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<tr>
<td>Holliman, Cecil James</td>
<td>B.S.</td>
<td>Duke University</td>
<td>Blackburg, Virginia</td>
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<tr>
<td>Hsu, David Chung Kuen</td>
<td>B.S.</td>
<td>University of Minnesota</td>
<td>Kowloon, Hong Kong</td>
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<tr>
<td>Jackson, Gregory Donald</td>
<td>A.B.</td>
<td>Indiana University</td>
<td>St. Louis, Missouri</td>
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<tr>
<td>Jacobs, Danny Odell</td>
<td>A.B.</td>
<td>Harvard College</td>
<td>Camden, Arkansas</td>
</tr>
<tr>
<td>James, Arthur Ruebin</td>
<td>B.A.</td>
<td>Stanford University</td>
<td>Los Angeles, California</td>
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<tr>
<td>Johnston, Kathryn Joyce</td>
<td>B.S.</td>
<td>University of California at Davis</td>
<td>Oakdale, California</td>
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<tr>
<td>Kaczmar, Theodore, Jr.</td>
<td>A.B.</td>
<td>Princeton University</td>
<td>Cheltenham, Pennsylvania</td>
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<tr>
<td>Karwoski, Gene Gary</td>
<td>A.B.</td>
<td>Colorado State University</td>
<td>St. Paul, Minnesota</td>
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<tr>
<td>Kimmey, Michael Bryant</td>
<td>A.B.</td>
<td>Washington University</td>
<td>Grand Junction, Colorado</td>
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<tr>
<td>Kolb, Susan Elizabeth</td>
<td>B.A.</td>
<td>Johns Hopkins University</td>
<td>LaVale, Maryland</td>
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<tr>
<td>Kraemer, Bruce Alan</td>
<td>B.S.</td>
<td>University of Tulsa</td>
<td>Tulsa, Oklahoma</td>
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<tr>
<td>Kunkel, Steve Edward</td>
<td>A.B.</td>
<td>University of Missouri</td>
<td>Mankato, Minnesota</td>
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<tr>
<td>Langguth, Steven David</td>
<td>A.B.</td>
<td>Drury College</td>
<td>Overland, Missouri</td>
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<tr>
<td>Larsen, Robert Allen</td>
<td>B.A.</td>
<td>Colorado College</td>
<td>Denver, Colorado</td>
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<tr>
<td>Lebovitz, Russell Martin</td>
<td>University of Michigan</td>
<td>Pittsburgh, Pennsylvania</td>
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<tr>
<td>Leonard, Patrice Ann</td>
<td>B.A.</td>
<td>University of Colorado</td>
<td>Boulder, Colorado</td>
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<tr>
<td>Liu, Kathy Jung-Mei</td>
<td>A.B.</td>
<td>Washington University</td>
<td>St. Louis, Missouri</td>
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<tr>
<td>Lloyd, Frances Ann</td>
<td>B.A.</td>
<td>Millsaps College</td>
<td>Jackson, Mississippi</td>
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<tr>
<td>Lowenstein, Gail Irene</td>
<td>B.S.</td>
<td>Fordham University</td>
<td>New York, New York</td>
</tr>
<tr>
<td>Lund, Robert Herluf, Jr.</td>
<td>B.A.</td>
<td>Williams College</td>
<td>St. Louis, Missouri</td>
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<tr>
<td>Maret, Christopher Richard</td>
<td>A.B.</td>
<td>Washington University</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>Marquardt, Diana Lee</td>
<td>B.A.</td>
<td>David Lipscomb College</td>
<td>Vail, Colorado</td>
</tr>
<tr>
<td>Melman, Kenneth Howard</td>
<td>B.A.</td>
<td>University of Michigan</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>Miller, Edward Charles</td>
<td>B.S.E.E.</td>
<td>University of Missouri at Columbia</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>Mitchell, Carol Marie</td>
<td>B.S.</td>
<td>University of Southern California</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>Molitoris, Bruce Albert</td>
<td>B.S.</td>
<td>University of Illinois</td>
<td>New Berlin, Illinois</td>
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<td>New, Nancy Beth</td>
<td>University of Colorado</td>
<td>Scottsdale, Arizona</td>
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<tr>
<td>Opila, Donald Andrew</td>
<td>B.S.</td>
<td>Michigan State University</td>
<td>Chicago Heights, Illinois</td>
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<td>Owen, James Wilson, III</td>
<td>B.A.</td>
<td>Southern Methodist University</td>
<td>Bartlesville, Oklahoma</td>
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<tr>
<td>Parker, Keith Langston</td>
<td>B.S.</td>
<td>Williams College</td>
<td>St. Louis, Missouri</td>
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<td>Patton, Timothy John</td>
<td>B.S.</td>
<td>University of Washington</td>
<td>Seattle, Washington</td>
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<td>Piercy, Stephen Lester</td>
<td>B.A.</td>
<td>Greenville College</td>
<td>Ellery, Illinois</td>
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<td>Ratcliffe, Stephen Douglas</td>
<td>B.S.</td>
<td>Bethany College</td>
<td>New Martinsville, West Virginia</td>
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<td>Robinson, David Edward</td>
<td>B.S.</td>
<td>Duke University</td>
<td>Bethesda, Maryland</td>
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<td>Roden, Raymond Alan</td>
<td>B.S.</td>
<td>Northern Illinois University</td>
<td>South Holland, Illinois</td>
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<td>Rosenberg, Robert David</td>
<td>B.S.</td>
<td>University of California at Riverside</td>
<td>Encino, California</td>
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<tr>
<td>Rowell, David Paul</td>
<td>B.S.</td>
<td>Oregon State University</td>
<td>Salem, Oregon</td>
</tr>
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<td>Rudloff, Mary Anne</td>
<td>B.A.</td>
<td>University of North Carolina</td>
<td>Eglin AFB, Florida</td>
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<tr>
<td>Sando, William Craig</td>
<td>B.S.E.</td>
<td>Duke University</td>
<td>Kettering, Ohio</td>
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</table>
Sanofsky, Stephen Jay, B.A., Northwestern University, '75—St. Louis, Missouri
Sayre, Robert Lynn, B.S., Colorado State University, '75—Delta, Colorado
Schmitt, Philip John, B.S.Ch.E., Washington University, '75—Kansas City, Missouri
Schwoh, James Edward, B.S., University of Iowa, '75—Iowa City, Iowa
Scissors, Kenneth Neil, A.B., Washington University, '75—Omaha, Nebraska
Secor, Mark Richard, B.A., Johns Hopkins University, '75—St. Louis, Missouri
Sedman, Allen Jeffrey, B.S.Ch.E., University of Michigan, '69; B.S., '69; M.S., '73; Ph.D., '74—Southfield, Michigan
Shapiro, Martin Robert, A.B., Hamilton College, '75—Sands Point, New York
Sheffner, Steven Elliott, B.S., Tulane University, '75—Livingston, New Jersey
Shipp, Margaret Ann, B.S., Southern Methodist University, '75—Houston, Texas
Sidorow, Barry Jay, A.B., Washington University, '74—Oceanside, New York

Silverman, Howard Jay, B.A., Skidmore College, '75—Massapequa, New York
Smith, Gary Mark, B.S., U.S. Air Force Academy, '64; M.S.Astr., Purdue University, '65—Duarte, California
Sortwell, Cynthia Gerry, B.A., Boston University, '75—Sherborn, Massachusetts
Spratt, Lorenzo, B.S., Prairie View A & M College, '69—McCamey, Texas
Stergis, George Nicholas, B.S., Duke University, '75—Kennett Square, Pennsylvania
Stiverson, Richard Kent, B.S., Colorado State University, '74—Northglenn, Colorado
Stuart, Catherine Hyde, A.B., Cornell University, '74—Garden City, New York
Sundermann, Richard Henry, Jr., B.A., Vanderbilt University, '74—Little Rock, Arkansas
Swenson, Erik Carl, A.B., Drury College, '75—Springfield, Missouri
Tabas, Ira Abram, B.S., Tufts College, '75—Cheltenham, Pennsylvania
Terrell, Wanda Tyrone, A.B., Washington University, '75—Memphis, Tennessee
Trout, Anne Carla, A.B., Washington University, '75—Denver, Colorado
Udey, Mark Charles, B.S., University of Wisconsin at Madison, '75—Fort Atkinson, Wisconsin
Weinstein, James Barry, A.B., Washington University, '74—Pittsburgh, Pennsylvania
Weltin, Gregory Gerhardt, B.S.E.E., Washington University, '75—St. Louis, Missouri
Wen, Julia Youkar, B.A., Wellesley College, '75—Hong Kong
Wershil, Barry Kent, A.B., Washington University, '75—East Massapequa, New York
Wheeler, Dawn Elaine, B.S., University of Minnesota, '75—St. Paul, Minnesota
Willer, Gary Alan, A.B., Washington University, '74—St. Louis, Missouri
Winokur, Thomas Seth, B.S., Stanford University, '75—Iowa City, Iowa
Wright, Jeffrey Mason, B.S., Vanderbilt University, '75—St. Louis, Missouri
Yeh, Shirley, B.S., Purdue University, '75—West Lafayette, Indiana
Zakem, James Francis, B.S., University of Michigan, '74—Grosse Pointe Park, Michigan
<table>
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<tr>
<th>Name</th>
<th>Degree</th>
<th>College/University</th>
<th>City, State</th>
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<tr>
<td>Adams, Ava Marie</td>
<td>B.S.</td>
<td>Loyola University</td>
<td>Chicago, Illinois</td>
</tr>
<tr>
<td>Adler, Steven Jay</td>
<td>B.A.</td>
<td>Swarthmore College</td>
<td>Spring Valley, New York</td>
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<td>Aeder, Mark Irwin</td>
<td>B.S.</td>
<td>Bucknell University</td>
<td>Bergenfield, New Jersey</td>
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<td>Akright, Bruce Donald</td>
<td>B.S.</td>
<td>Southern Methodist University</td>
<td>Leawood, Kansas</td>
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<td>Albi, Joyce Adelle</td>
<td>B.A.</td>
<td>Colorado College</td>
<td>Longmont, Colorado</td>
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<td>Allen, Gregory James</td>
<td>B.S.E.E.</td>
<td>Massachusetts Institute of Technology</td>
<td>Mercer Island, Washington</td>
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<td>Aronson, Thomas Alan</td>
<td>B.A.</td>
<td>Amherst College</td>
<td>St. Louis, Missouri</td>
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<td>Auer, Roy Raymond, Jr.</td>
<td>B.S.E.E.</td>
<td>Washington University</td>
<td>St. Louis, Missouri</td>
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<td>Bader, Teddy Fritz</td>
<td>B.S.</td>
<td>Bethany Nazarene</td>
<td>Colorado Springs, Colorado</td>
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<td>Barshop, Bruce Allen</td>
<td>A.B.</td>
<td>Brandeis University</td>
<td>Freehold, New Jersey</td>
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<td>Bell, Patricia Evelyn</td>
<td>B.A.</td>
<td>Emory University</td>
<td>Nashville, Tennessee</td>
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<td>Bevan, Herbert Everett</td>
<td>B.A.</td>
<td>University of Kansas</td>
<td>Wichita, Kansas</td>
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<td>Blair, Harry Colbert</td>
<td>A.B.</td>
<td>Washington University</td>
<td>Boulder, Colorado</td>
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<td>Bloch, Michelle Helene</td>
<td>B.S.</td>
<td>Cornell University</td>
<td>Flushing, New York</td>
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<td>Bodner, Matthew Scott</td>
<td>A.B.</td>
<td>Washington University</td>
<td>Rego Park, New York</td>
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<td>Boothby, Mark Robin</td>
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<td>St. Louis, Missouri</td>
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<td>Bricker, Dale Paige</td>
<td>B.A.</td>
<td>Brown University</td>
<td>Scarsdale, New York</td>
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<td>Brodsky, Lisa</td>
<td>B.S.</td>
<td>Washington University</td>
<td>Larchmont, New York</td>
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<td>Brooks, Rodney Wayne</td>
<td>B.S.</td>
<td>Stanford University</td>
<td>Little Rock, Arkansas</td>
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<td>Brown, Harry William</td>
<td>B.A.</td>
<td>Grand Valley State College</td>
<td>Muskegon, Michigan</td>
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<td>Butler, John Cecil</td>
<td>B.S.</td>
<td>University of Notre Dame</td>
<td>Bluffton, Indiana</td>
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<td>Calvin, Steven Earl</td>
<td>B.A.</td>
<td>Bethel College</td>
<td>Tucson, Arizona</td>
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<td>Caras, Marie Alexandra</td>
<td>A.B.</td>
<td>Washington University</td>
<td>St. Louis, Missouri</td>
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<td>Cobb, Audrey Denise</td>
<td>A.B.</td>
<td>Mount Holyoke College</td>
<td>Boston, Massachusetts</td>
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<td>Cooper, Robert Alan</td>
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<td>Washington University</td>
<td>Chicago, Illinois</td>
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<td>Cox, Jefferson Dee</td>
<td>B.A.</td>
<td>University of Oregon</td>
<td>Eugene, Oregon</td>
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<td>Cutler, John Robert</td>
<td>A.B.</td>
<td>Washington University</td>
<td>St. Louis, Missouri</td>
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<td>Dinerman, Harry</td>
<td>B.S.</td>
<td>State University of New York at Stony Brook</td>
<td>Howard Beach, New York</td>
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<td>Douyon, Karl Emanuel</td>
<td>B.A.</td>
<td>State University of New York at Buffalo</td>
<td>M.S., State University of New York at Roswell Park, Graduate Division, New York, New York</td>
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<td>Droge, Elizabeth Ann</td>
<td>B.A.</td>
<td>St. Louis University</td>
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<td>Fleshman, James Walter, Jr.</td>
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<td>Fried, Robert Carey</td>
<td>A.B.</td>
<td>Washington University</td>
<td>Short Hills, New Jersey</td>
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<td>Fyfe, Gwendolyn Ann</td>
<td>A.B.</td>
<td>Washington University</td>
<td>Terre Haute, Indiana</td>
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<td>George, Samuel Everett</td>
<td>A.B.</td>
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<td>Gibson, Ronald Lyne, Jr.</td>
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<td>Goebel, Joel Alan</td>
<td>B.S.</td>
<td>University of Notre Dame</td>
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<td>Graboyses, Joseph Hillel</td>
<td>B.S.</td>
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<td>Broomall, Pennsylvania</td>
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<td>Gregg, Mary Grace</td>
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<td>University of Pittsburgh</td>
<td>Pittsburgh, Pennsylvania</td>
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<td>Gross, Goldey Hanna</td>
<td>B.A.</td>
<td>University of the Pacific</td>
<td>M.S., San Diego State University, Lafayette, California</td>
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<td>Grossrode, Robert Stephen</td>
<td>A.B.</td>
<td>University of Nebraska</td>
<td>Lincoln, Nebraska</td>
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</table>
Grubbs, David Scott, B.S., Wheaton College, '76—Atlanta, Georgia
Haladay, George Jeffrey, Brown University—Brecksville, Ohio
Heise, Robin Lee, B.S., University of Akron, '76—Akron, Ohio
Hempstead, Barbara Louise, B.A., Tufts University, '76—Andover, Massachusetts
Herbst, Timothy John, B.S., California Institute of Technology, '76—Phoenix, Arizona
Holcombe, Faith Hollowell, B.A., Radcliffe College, '76—Alexander, Virginia
Hortin, Glen Lee, B.S., Illinois State University, '76—Zion, Illinois
Hudlin, Irving Christopher, Jr., B.S., Michigan State University, '76—Columbus, Georgia
Ibsen, Mark Stephen, Williams College—Geneva, Illinois
Kane, William Harrison, B.S., University of Iowa, '76—Iowa City, Iowa
Kappelman, Michael Porter, B.A., Carleton College, '74—Wichita, Kansas
Knight, Shirley Mae, B.A., Dillard University, '76—Dublin, Georgia
Kono, Donna Aiko, B.S., University of California, '76—Davis, California
Kowaleski, Kevin Robert, B.A., St. Louis University, '76—Elyria, Ohio
Kramer, Jeffrey Bruce, B.A., Haverford College, '76—Shawnee Mission, Kansas
Kuwata, John Hiroshi, B.S., University of California, '76—Rolling Hills Estates, California
Laakman, Robert William, B.S., Indiana University, '76—St. Louis, Missouri
Lacy, Stephen Talbot, B.A., Oberlin College, '76—St. Louis, Missouri
Lage, Janice Marie, B.S., California State University, '73—Clovis, California
Leong, Ronald Wing, A.B., Washington University, '76—Tehran, Iran
Levite, Howard Allen, B.A., Yale University, '76—Brooklyn, New York
Lewis, Karen, B.A., Brigham Young University, '75—Wilmette, Illinois
Littman-Perlmutter, Steven Barry, A.B., Sarah Lawrence College, '76—North Woodmere, New York
Loder, Randall Thomas, B.A., University of Colorado, '76—Golden, Colorado

Loeb, Thomas Wolf, B.A., Northwestern University, '76—Birmingham, Alabama
Lovejoy, Bette Anne, B.S., Tufts University, '75—Pittsfield, Massachusetts
Mark, Stephen David, B.S., Massachusetts Institute of Technology, '74—Baltimore, Maryland
Meuleman, John Robert, University of Notre Dame—St. Louis, Missouri
Morgan, William Stephen, A.B., Washington University, '76—Louisiana, Missouri
Morris, Robert Charles, B.S., University of Notre Dame, '76—Pascagoula, Mississippi
Myers, Maxine Tabas, B.A., Washington University, '76—Cynwyd, Pennsylvania
Nash, Darryl Harrington, B.A., Yale University, '76—El Cerrito, California
Natowicz, Marvin Roy, A.B., Washington University, '76—Oak Park, Michigan
Neely, Claire Suzanne, B.S., University of Illinois, '76—Urbana, Illinois
Newell, Anthony Maurice, B.A., Lawrence University, '76—Chicago, Illinois
Nickol, Thomas Edward, B.A., Carroll College, '76—Ledger, Montana
Olson, David Lewis, B.S., Southern Methodist University, '75—Brookfield, Wisconsin
O'Quinn, Bancroft, Jr., A.B., Princeton University, '76—Chicago, Illinois

Panullo, Wayne Thomas, B.A., Johns Hopkins University, '76—Plainview, New York

Pavlovitz, Gwenn Karen, B.A., Johns Hopkins University, '76; M.A., '76—Lancadale, Pennsylvania

Phillips, Daniel, B.S., Northwestern University, '75—Rego Park, New York

Poiidexter, James Milton, Jr., B.A., Northwestern University, '75—Chicago, Illinois

Pransky, Seth Marc, B.A., University of Pennsylvania, '76—Philadelphia, Pennsylvania

Press, Gary Allen, B.S., Yale University, '75—New York, New York

Prince, Charles Roderick, B.S., University of Alabama, '75—Birmingham, Alabama

Quagliarello, Vincent James, B.A., Johns Hopkins University, '76—Mineola, New York

Raish, Robert John, A.B., Washington University, '76—St. Louis, Missouri

Rath, Richard, B.A., Yale University, '76—Clearwater, Florida

Robert, Lee Ann Rhudy, B.S., University of North Carolina, '76—Raleigh, North Carolina

Saint, John Gardner, A.B., Oberlin College, '76—Winnetka, Illinois

Saltman, Robert Jon, B.A., Yale University, '76—Holyoke, Massachusetts

Schlafly, Bruce Stewart, B.S.E.E., Washington University, '76—Alton, Illinois

Schlafly, Edward Frauenhein, Jr., B.S., Stanford University, '76—St. Louis, Missouri

Schul, Jeffrey Lynn, B.A., University of Kansas, '76—Lawrence, Kansas

Shapiro, Michael Barry, Emory University—Oceanside, New York

Shayman, James Alan, A.B., Cornell University, '76—Highland Park, Illinois

Siegel, Alan David, B.A., University of Wisconsin, '76—Fox Point, Wisconsin

Silverstein, Barry Owen, A.B., Cornell University, '76—East Brunswick, New Jersey

Smith, Steve Allen, B.S., University of Southern California, '76—Long Beach, California

Sommer, Rand Washburn, B.S., Davidson College, '76—St. Louis, Missouri

Sorokin, Rachel Bernice, B.S., Yale University, '76—West Hartford, Connecticut

Spratt, John Arthur, B.A., University of Colorado, '75; M.S., University of Missouri at Columbia, '76—Columbia, Missouri

Spurrier, Mark H., B.A., Kansas State University, '76—Manhattan, Kansas

Steinman, Howard Kenneth, B.A., Pomona College, '76—Los Angeles, California

Stevens, William Grant, B.S., University of Oregon, '76—Eugene, Oregon

Sullivan, Mark Daniel, B.S., University of Michigan, '76—Elmhurst, Illinois

Taylor, Ellis Reneau, Jr., B.S., University of Florida, '76—Gainesville, Florida

Thaler, Fred Joseph, B.A., Wesleyan University, '76—Laurel Hollow, New York

Tillinghast, Jeffrey Paul, B.S., State University of New York at Albany, '76—Port Chester, New York

Tweedt, Kenneth George, B.A., California State College at Sonoma, '75—Petaluma, California

Watts, Ray Lannon, B.S.E., University of Alabama at Birmingham, '76—Birmingham, Alabama

Weaver, Daniel Carl, B.S., Indiana University, '72—Danville, Indiana

Wheelan, Kevin Robert, University of Texas at Austin—Dallas, Texas

Whitehead, Daniel William, Jr., B.S., Drexel University, '75—Sharon Hill, Pennsylvania

Williams, John, B.A., St. Louis University, '76—St. Louis, Missouri

Wilson, Cynthia, B.S., Pacific Lutheran University, '76—Tacoma, Washington

Wolff, Andrew Aloysius, B.A., University of Dayton, '76—Dayton, Ohio

SUMMARY OF STUDENTS IN THE SCHOOL OF MEDICINE

First-year Class .......................... 126
Second-year Class .......................... 128
M.S.T.P. Students in Graduate Phase of Program .......................... 17
Third-year Class .......................... 142
Fourth-year Class .......................... 138
Total ..................................... 551
DOCTOR OF MEDICINE AND
DOCTOR OF PHILOSOPHY DEGREES

Medical Scientist Training Program

Graduate 1975-76 (August)
Schmidt, Robert Edward, A.B., Washington University, '69—St. Louis, Missouri

Graduates 1976-77
Boron, Walter Frank, B.A., St. Louis University, '71—Elyria, Ohio
Frost, John James, A.B., Washington University, '71—Tulsa, Oklahoma
Greene, Warner Craig, A.B., Stanford University, '71—Mesa, Arizona
Nelson, Donald Michael, B.A., Cornell College, '71—Oneida, Illinois
Saper, Clifford Baird, B.S., University of Illinois, '72; M.S., '72—Highland Park, Illinois
Siegel, Richard Lawrence, A.B., Washington University, '70—Miami, Florida
Tollefsen, Douglas Meyer, A.B., Grinnell College, '70—St. Louis, Missouri

Seventh-Year Trainee 1976-77
Clark Howard Brent, B.A., Macalester College, '70—Truman, Minnesota

Sixth-Year Trainees 1976-77
Mayers, Douglas Bruce, A.B., Washington University, '71—Coral Gables, Florida
Rubin, Eugene Harold, B.A., University of Rochester, '71—Brookline, Massachusetts
Stricklin, George Putnam, B.A., David Lipscomb College, '71—Palatka, Florida

Fifth-Year Trainees 1976-77
Estridge, Mitchel Gene, B.A., Berea College, '72—Berea, Kentucky
Leavitt, Randi Yvette, B.S., Brooklyn College, '72—Brooklyn, New York
Pischell, Ken Donald, B.S., California Institute of Technology, '72—Santa Barbara, California
Silverman, Robert Elliot, B.A., University of Pennsylvania, '72—Silver Spring, Maryland
Warren, Robert Wells, B.A., Yale University, '72—Athens, Georgia

Fourth-Year Trainees 1976-77
Chaplin, David Dunbar, A.B., Harvard College, '73—St. Louis, Missouri
Gorin, Fredric Austin, B.S., University of California at Davis, '73—Hillsborough, California
King, Gregory Steven, B.A., University of Kansas, '73—Lenexa, Kansas
Lichtman, Jeff William, A.B., Bowdoin College, '73—Rehoboth, Massachusetts
Miletich, Joseph Paul, B.S., Michigan State University, '72—Akron, Ohio
Perlmuter, Roger Matthew, B.A., Reed College, '73—Denver, Colorado
Salzer, James Lawrence, B.S., Stanford University, '74—Worcester, Massachusetts
Whittenberger, Brock Poston, B.A., Amherst College, '73—Grand Rapids, Michigan

Third-Year Trainees 1976-77
Brown, Laura Jane, B.A., Vassar College, '74—Madison, Wisconsin
Hoover, Richard Glenn, B.S., University of Notre Dame, '74—Ramsey, New Jersey
Kenmerly, Donald Alan, A.B., Harvard College, '74—Darien, Connecticut
Laux, Brian Edward, B.A., University of Delaware, '74; B.S., '74—Wilmington, Delaware
Li, Ellen, B.S., Stanford University, '74—Chicago, Illinois
Littman, Dan Rudolf, A.B., Princeton University, '74—Wynnewood, Pennsylvania
Ludvigsen, Carl William, Jr., B.A., University of Colorado at Boulder, '74—Littleton, Colorado
Rubin, Jeffrey Steven, A.B., Harvard University, '74; A.M., '74—New City, New York
Schieber, Marc Hudson, A.B., Washington University, '74—Winter Park, Florida
Sweeney, Thomas Kevin, A.B., Cornell University, '74—Ithaca, New York

Second-Year Trainees 1976-77
Breitmeyer, James Bradley, A.B., University of California at Santa Cruz, '75—Atherton, California
Bucy, Ralph Patterson, B.A., Austin College, '75—Sherman, Texas
Freter, Carl Ernest, B.A., University of California at San Diego, '75—San Diego, California
Green, Michael Richard, B.S., University of Wisconsin, ’74—St. Louis, Missouri
Gross, Robert Alan, A.B., Harvard College, ’75—Worcester, Massachusetts
Lebowitz, Russell Martin, University of Michigan—Pittsburgh, Pennsylvania
Parker, Keith Langston, Williams College—St. Louis, Missouri
Schwob, James Edward, B.S., University of Iowa, ’75—Iowa City, Iowa
Tabas, Ira Abram, B.S., Tufts University, ’75—Cheltenham, Pennsylvania
Udey, Mark Charles, B.S., University of Wisconsin at Madison, ’75—Fort Atkinson, Wisconsin

First-Year Trainees 1976-77
Barshop, Bruce Allen, A.B., Brandeis University, ’76—Freehold, New Jersey
Bloch, Michelle Helene, B.S., Cornell University, ’76—Flushing, New York
Boothby, Mark Robin, B.S., University of Wisconsin, ’76—St. Louis, Missouri
Gibson, Ronald Lyne, Jr., B.S., University of Washington, ’75—Seattle, Washington
Hempstead, Barbara Louise, B.A., Tufts University, ’76—Andover, Massachusetts
Hortin, Glen Lee, B.S., Illinois State University, ’76—Zion, Illinois
Kane, William Harrison, B.S., University of Iowa, ’76—Iowa City, Iowa
Natowicz, Marvin Roy, A.B., Washington University, ’76—Oak Park, Michigan

Call, Scott J., B.S., Brigham Young University, ’69—Soda Springs, Idaho
Callahan, Keith Laurence, B.A., Trinity College, ’74—Detroit, Michigan
Carlson, Leslie Diane, B.S., Elmhurst College, ’75—Chicago, Illinois
Dick, Marvin Edward, A.B., St. Meinrad College, ’57; A.M., Indiana University, ’64—Evansville, Indiana
Fale, Randall James, B.S., University of Wisconsin, ’69—Sheboygan, Wisconsin
Flanders, William Russell, B.S., Arizona State University, ’71—Oak Park, Illinois
Frank, Russell Alan, B.A., Washington University, ’74—Baltimore, Maryland
Gustafson, Philip Pond, A.B., MacMurray College, ’69; M.S., Southern Illinois University, ’72—Clinton, Massachusetts
Hines, Chester, Jr., B.A., Harris Teachers College, ’59; M.A., Washington University, ’74—Macon, Mississippi
Hutchinson, Arless Emroy, II, B.S., Louisiana State University, ’74—Baton Rouge, Louisiana
Jordan, Stephen Michael, B.A., University of Texas, ’74—Dallas, Texas
Kaja, Stephen William, B.S., University of Missouri, ’72—Topeka, Kansas
Keller-Siegel, Suellen Marian, B.S., Washington University, ’75—Fort Dodge, Iowa
Kilani, Rawhi Zaid, B.S., University of Madrid, ’71—Nazareth, Jordan
Kling, Ian Andrew, B.S., California Institute of Technology, ’71; M.D., Washington University, ’76—Edinburgh, Scotland
Kreckeler, Barbara Sue, A.B., Washington University, ’73—Valparaiso, Indiana
Kretchmer, Keith Robert, A.B., Washington University, ’73—Evanston, Illinois
Kulesher, Robert Roy, B.A., Villanova University, ’74—Washington, D.C.
Luehrs, Paul Richard, B.S., North Dakota State University, ’72—Sheboygan, Wisconsin
McKean, Sister Mary Faith, B.A., Mount St. Agnes, ’51; M.A., University of Michigan, ’52; Ph.D., Catholic University of America, ’59—Washington, D.C.
Menard, Dennis Alan, B.S., University of New Hampshire, ’71—Woonsocket, Rhode Island

GRADUATE PROGRAM IN HEALTH CARE ADMINISTRATION
Second-Year Class 1976-77
Ambrosius, Mark Ralph, B.B.A., University of Cincinnati, ’73—Cincinnati, Ohio
Breckenridge, Mary Ethel, B.S.N., St. Louis University, ’72—Charleston, Missouri
Brinkers, John Aloysius, B.S., University of Cincinnati, ’65; M.S., ’69—Cincinnati, Ohio
Brown, Scott Ellsworth, B.S., Brigham Young University, ’70; M.S., ’72—Provo, Utah
Burleson, Roger Dean, B.A., Ohio State University, ’72—Eccles, West Virginia

Call, Scott J., B.S., Brigham Young University, ’69—Soda Springs, Idaho
Callahan, Keith Laurence, B.A., Trinity College, ’74—Detroit, Michigan
Carlson, Leslie Diane, B.S., Elmhurst College, ’75—Chicago, Illinois
Dick, Marvin Edward, A.B., St. Meinrad College, ’57; A.M., Indiana University, ’64—Evansville, Indiana
Fale, Randall James, B.S., University of Wisconsin, ’69—Sheboygan, Wisconsin
Flanders, William Russell, B.S., Arizona State University, ’71—Oak Park, Illinois
Frank, Russell Alan, B.A., Washington University, ’74—Baltimore, Maryland
Gustafson, Philip Pond, A.B., MacMurray College, ’69; M.S., Southern Illinois University, ’72—Clinton, Massachusetts
Hines, Chester, Jr., B.A., Harris Teachers College, ’59; M.A., Washington University, ’74—Macon, Mississippi
Hutchinson, Arless Emroy, II, B.S., Louisiana State University, ’74—Baton Rouge, Louisiana
Jordan, Stephen Michael, B.A., University of Texas, ’74—Dallas, Texas
Kaja, Stephen William, B.S., University of Missouri, ’72—Topeka, Kansas
Keller-Siegel, Suellen Marian, B.S., Washington University, ’75—Fort Dodge, Iowa
Kilani, Rawhi Zaid, B.S., University of Madrid, ’71—Nazareth, Jordan
Kling, Ian Andrew, B.S., California Institute of Technology, ’71; M.D., Washington University, ’76—Edinburgh, Scotland
Kreckeler, Barbara Sue, A.B., Washington University, ’73—Valparaiso, Indiana
Kretchmer, Keith Robert, A.B., Washington University, ’73—Evanston, Illinois
Kulesher, Robert Roy, B.A., Villanova University, ’74—Washington, D.C.
Luehrs, Paul Richard, B.S., North Dakota State University, ’72—Sheboygan, Wisconsin
McKean, Sister Mary Faith, B.A., Mount St. Agnes, ’51; M.A., University of Michigan, ’52; Ph.D., Catholic University of America, ’59—Washington, D.C.
Menard, Dennis Alan, B.S., University of New Hampshire, ’71—Woonsocket, Rhode Island
Nelson, Victoria Elizabeth, B.A., Washburn University, '75—St. Louis, Missouri
Pence, Roger Lewis, B.B.A., University of Cincinnati, '74—Sidney, Ohio
Person, James Manning, B.A., Macalester College, '73—Springfield, Missouri
Rabideau, Meredith Anita, B.A., Occidental College, '75—Los Alamos, New Mexico
Rallison, Stephen Jay, B.S., Brigham Young University, '73—Logan, Utah
Ramer, James Edgar, B.S., Lambuth College, '74—Jackson, Tennessee
Richardson, Darrel C., B.S., University of Missouri, '75—Brookfield, Missouri
Ripcho, Stanley William, B.A., University of Notre Dame, '75—Cleveland, Ohio
Rosenbaum, Donald Herman, Jr., B.A., DePauw University, '74—Gary, Indiana
Schopp, David Norman, B.S., Iowa State University, '75—Milwaukee, Wisconsin
Scott, Thomas Dwayne, B.M.E., University of Evansville, '55; B.S., '72—Sturgis, Kentucky
Sensenbrenner, Peter, B.A., Denison University, '75—Appleton, Wisconsin
Shafer, Jerald Earl, B.S., South Dakota State University, '69; M.S., University of Arkansas, '74—Burke, South Dakota
Small, Norma Frances, B.A., Miami University, '56—Cleveland, Ohio
Suellentrop, Blair Robert, B.S., Oklahoma State University, '74—San Bernardino, California
Syron, Edward Philip, B.S., Ithaca College, '71—Schenectady, New York
Thornton, Daryl Wayne, B.S., Wichita State University, '75—Wichita, Kansas
Wintringham, Karen, B.A., Colby College, '73—Somerville, New Jersey
Wolfgang, Rodney Bishop, Jr., B.A., University of Oklahoma, '68—Charleston, West Virginia

First-Year Class 1976-77
Allen, Richard Lee, Jr., B.A., Drake University, '75—Bloomfield, Iowa
Andersson, Eric Christopher, A.B., University of California, Berkeley, '75—Walnut Creek, California
Barron, Eugene Devine, Jr., B.S., Washington University, '74—Glenview, Illinois
Bezanson, Robert Howard, B.S., University of Maryland, '69—Timonium, Maryland
Bigogno, James Craig, A.B., Washington University, '76—Affton, Missouri
Brown, Patricia Jean, B.A., University of Missouri, Columbia, '71; M.S., '73—St. Louis, Missouri
Burns, Michael James, B.A., State University of New York, Cortland, '74—Jamaica, New York
Cook, LaRue Earl, B.S., Western Illinois University, '74—Chicago, Illinois
Cooper, Galen Morgan, B.S., Ohio State University, '67—Newark, Ohio
Dawkins, Jeffrey Hunt, B.A., Eureka College, '75—Hazelcrest, Illinois
DeSalvo, Genyth Smith, B.S., Southwestern at Memphis, '71—Natchez, Mississippi
Dunn, Sister Mary Edel, B.S.N., St. Louis University, '67—Wexford, England
Eisele, John Greg, B.S., University of Illinois, '74—Springfield, Illinois
Eurek, Thomas Anthony, B.S., Ithaca College, '73—Belvidere, Illinois
Fraser, John Martin, B.A., Washington University, '76—St. Louis, Missouri
Friedman, Marc Michael, B.A., Wayne State University, '73—Detroit, Michigan
Gee, Thomas Harold, B.A., DePauw University, '73—Chesterfield, Missouri
Gelb, Randy, B.A., Queens College, '75—New York City, New York
Gilmore, Phillip King, B.S., University of Southern Mississippi, '71; M.S., '73—Lena, Mississippi
Glosenger, Sister Katherine Marie, A.B., Fontbonne College, '71—Fort Smith, Arkansas
Goldberg, Sylvan Lee, B.S., Washington University, '62; M.B.A., '68—St. Louis, Missouri
Gordon, Robert Steven, B.A., University of Kentucky, '75—Louisville, Kentucky
Gray, Paul Eugene, B.S., Colorado State University, '69—Shawnee, Kansas
Holmes, Sandra Johnson, B.S., Washington University, '76—Milwaukee, Wisconsin
Kling, Debra Wohlschlager, A.B., Washington University, '76—St. Louis, Missouri
Lampkin, Steven Bradley, B.S., Oklahoma State University, '75—Broken Arrow, Oklahoma
Levitan, Howard Louis, B.S.B.A., Washington University, '76—St. Louis, Missouri
Quartier, Michael Joseph, B.S., St. Bonaventure University, '75—Syracuse, New York
Resnick, Lindsay Ross, B.S., Northeastern University, '76—Oceanside, New Jersey
Ross, James Herschel, B.B.A., Memphis State University, '75—Nashville, Tennessee
Smith, Robert Lynn, B.A., University of Missouri, St. Louis, '73—St. Louis, Missouri
Strassion, Martin John, B.S., St. Louis University, '69—Shadyside, Ohio
Thigpen, Rosalind Frances, B.A., Washington University, '76—St. Louis, Missouri
Vasquez, Lloyd John, Jr., B.A., University of Missouri, St. Louis, '74—St. Louis, Missouri
Wallace, Mark Allen, B.S.H.A., Oklahoma Baptist University, '75—Oklahoma City, Oklahoma
Wells, Wendy Martin, B.S., University of Kansas, '76—Leawood, Kansas

PROGRAM IN OCCUPATIONAL THERAPY

Senior Class 1976-77

Bascomb, Sara Anne, Cornell College—St. Louis, Missouri
Bertram, Cynthia Kreiter, Kellogg Community College—Battle Creek, Michigan
Bogy, Doris Lue, Washington University—Pine Bluff, Arkansas
Caruso, Lynn Anne, University of South Florida—Mt. Kisco, New York
Costa, Martha Mary, Maryville College—Springfield, Illinois
Eichler, Linda Carolynn, Washington University—St. Louis, Missouri
Harder, Linda Susan, University of Delaware—Wilmington, Delaware
Hatcher, Mary Geders, Meramec Community College—St. Louis, Missouri
Januschka, Susan Rose, B.A., University of Minnesota, '75—LeSueur, Minnesota
Kagen, Cheryl Sue, Washington University—Milwaukee, Wisconsin
Leighton, Judith Louise, Rockland Community College—Spring Valley, New York
McCarthy, Mary Elizabeth, University of Missouri, Columbia and St. Louis—St. Louis, Missouri
McClosey, Ellen Brooke, Tulsa Junior College—Tulsa, Oklahoma
Mandel, Robin Joy, University of Missouri, Columbia and St. Louis—St. Louis, Missouri
Meyers, Susan Kay, Washington University—St. Louis, Missouri
Moxey, Daniel, MacMurray College—Nassau, Bahamas
Rothstein, Anne Therese, Washington University—Rockford, Illinois
Staenberg, Beth, Colorado State University—Omaha, Nebraska
Topolewski, Carol Sue, Elgin Community College—Elgin, Illinois
Toyne, Mary Ann, Iowa State University—Pilot Mound, Iowa
Wolff, Tziona Rae, Northwestern Illinois University—Chicago, Illinois

Junior Class 1976-77
Abrams, Cathy Joy, B.A., University of Missouri, St. Louis, '75—St. Louis, Missouri
Bates, Theresa Marie, University of Arizona—Tucson, Arizona
Bloom, Nancy Jo, B.A., University of Virginia, 1976—St. Louis, Missouri
Bloom, Nancy Jo, B.A., University of Virginia, '76—St. Louis, Missouri
Braxton, Sally Barrows, Jr., Emory University—St. Louis, Missouri
Bruns, Kathleen Auburn, Saint Louis University—St. Louis, Missouri
Carnett, Janis Lynell, Southeastern Illinois College—Harrisburg, Illinois
Egan, Anne Marie, Cornell College—Mt. Vernon, Iowa
Flavin, Peggy Anne, Meramec Community College—St. Louis, Missouri
Formby, Mary Childs, Memphis State University—Hartford, Alabama
Haffner, Cynthia Kathryn, University of Missouri—St. Louis—St. Louis, Missouri
Imboden, Shirley Inez, University of Missouri, St. Louis—St. Louis, Missouri
Levit, Jan Alyse, Washington University—Houston, Texas
Lidsky, Karen Beth, Purdue University—Beachwood, Ohio
Meier, Lynn Marie, University of Missouri, Columbia—St. Louis, Mo.
Rapp, Rebecca Elaine, University of Virginia—Weyers Cave, Virginia
Shumow, Amy Beth, Washington University—Milwaukee, Wisconsin
Smith, Randall Edward, McKendree College—Caseyville, Illinois
Solomon, Janet Ellen, Washington University—Washington, Missouri
Stamper, Mary Beth, B.S., University of Iowa, '76—Wever, Iowa
Ver Ploeg, Gretchen Ann, Macalester College—West Des Moines, Iowa

PROGRAM IN PHYSICAL THERAPY
Senior Class 1976-77
Auslander, Abbey Fern, Washington University—Great Neck, New York
Bowser, Ruth Marie, Washington University—Kansas City, Missouri
Bryant, Leslie Lynne, Washington University—Columbus, Ohio
Chapman, Louise Anne, Washington University—Peterborough, New Hampshire
Decker, Colette Ann, Wartburg College—Westerly, Iowa
Greek, Holly Jane, Heidelberg College—Pepper Pike, Ohio
Gyllenhaal, Dennis Keith, Washington University—Huntingdon, Pennsylvania
Harris, Jacalyn Denise, B.A., State University of New York at Stony Brook, '75—Oakland, California
Hughes, Sallie Caton, University of Colorado at Boulder—Aurora, Colorado
Jevey, Deborah Lynn, Washington University—Forest Park, Illinois
Labrie, Jane Joan, Montana State University—Butte, Montana
Marentette, Joan Brockman, University of Missouri at St. Louis—St. Louis, Missouri
Miller, Barbara Ellen, Washington University—Great Neck, New York
Parsons, Kimberly Sue, Washington University—St. Louis, Missouri
Perkins, Elaine Louise, Washington University—Cincinnati, Ohio
Sloboda, Josephine Mary, Washington University—St. Louis, Missouri
Sloss, Katherine Middleton, University of Tulsa—St. Louis, Missouri
Vogt, Lori Lynn, Washington University—Metairie, Louisiana
Weiss, Brad Richard, Bemidji State College—Granite City, Illinois
Willner, Ellen Barbara, Washington University—Roslyn, New York

Junior Class 1976-77

Biehler, Sandra Kay, B.S., Eastern Illinois University—Shelbyville, Illinois
Chinworth, Susan Anette, Washington University—Fort Worth, Texas
Cronstein, Frances Beth, Washington University—Cincinnati, Ohio
Davis, Nancy Jo, Southern Methodist University—Mt. Vernon, Illinois
Flentje, Linda Lorraine, Millikin University—Auburn, Illinois
Johannsdottir, Solveig Margret, Washington University—Akureyri, Iceland
Johnson, Diane Zeta, University of Washington—Grandview, Washington
Kayhoe, Valle Michelle, University of North Carolina—Kensington, Maryland
Kingery, Marilyn Dean, Wartburg College—Charles City, Iowa

McKibbin, Amy Jo, Wayne State College—Madison, Nebraska
Millea, Timothy Patrick, Briar Cliff College—Graettinger, Iowa
Rosenblum, Nancy Ilene, Washington University—St. Louis, Missouri
Sattgast, Deborah Rae, Concordia College, Portland—Rupert, Idaho
Strasburg, Debra Mundinger, Washington University—Jacksonville, Illinois
Theel, Karen Lynn, Washington University—St. Louis, Missouri
Travis, Debra Lynn, University of Iowa—Creston, Iowa
Verbrugge, Clarence John, B.A., Dordt College—Rock Valley, Iowa
Villars, Patricia Jo, Nebraska Wesleyan University—Mindem, Nebraska
Weesner, Elizabeth, Olney Central College—Olney, Illinois
Zabel, Carolyn Rae, Nebraska Wesleyan University—Cook, Nebraska
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All schools are located on the main campus at Lindell and Skinker Boulevards, St. Louis, Missouri 63130, except Medicine (660 South Euclid Avenue, 63110) and Dental Medicine (4559 Scott Avenue, 63110).

The College of Arts and Sciences
The Graduate School of Arts and Sciences
The School of Engineering and Applied Science
The Sever Institute of Technology
The School of Architecture
The School of Business and Public Administration
The Graduate School of Business Administration
The School of Fine Arts
The School of Social Work
The School of Law
The School of Medicine
The School of Dental Medicine
University College
The Summer School