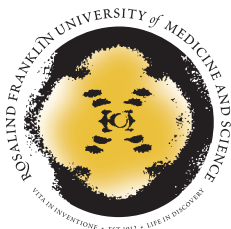




School of Graduate and
Postdoctoral Studies

ACADEMIC CATALOGUE 2006-2007





School of Graduate and Postdoctoral Studies

Academic Catalogue 2006–2007

Rosalind Franklin University of Medicine and Science and the School of Graduate and Postdoctoral Studies reserve the right to change, at any time and without notice, their requirements, regulations, course and program offerings, fees, charges, and other matters addressed in this catalogue. RFUMS must reserve the right to modify or terminate programs described herein. However, modification of program requirements will not adversely affect those students already enrolled in a program, nor will termination of a program affect anything other than the closure of admission thereto.

Table of Contents

General Content

Letter from the Dean	4
History	5
Mission	6
Equal Opportunity	7
Location	7
Classification of Students in Relation to Fields of Study	7
Admission	8
Non-Immigrant International Students	13
Postdoctoral Fellows	13
Degree Requirements	14
DPM/PhD Dual Degree Program	16
Academic Performance Standards and Their Measurement	17
Non-Academic Performance Standards	18
Rules Governing Records, Leave, Withdrawal and Transfer	21
Educational Expenses	22
Financial Assistance	23
Campus and Student Life	24
Student Organizations	25
Services	26
Resources	27

Departmental Information


Department of Biochemistry and Molecular Biology	29
Department of Cell Biology and Anatomy	33
Department of Cellular and Molecular Pharmacology	36
Department of Microbiology and Immunology	39
Department of Neuroscience	46
Department of Pathology	49
Department of Physiology and Biophysics	55
Department of Psychology	59
Program in Molecular and Cellular Science	71

Dear Prospective Student:

The School of Graduate and Postdoctoral Studies at Rosalind Franklin University has a proud tradition of training students in the biomedical sciences. With the ongoing evolution of Rosalind Franklin University of Medicine and Science, the graduate school looks forward to an expansion of its research and education programs. Current research programs span from structural biology of proteins at the atomic level to mechanistic analysis of higher brain level functions.

We hope that you will be inspired to join us in this exciting new phase of our existence, and be part of our long legacy of discovery and educational excellence.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael P. Sarras, Jr.", with a stylized flourish at the end.

Michael P. Sarras, Jr., PhD

Dean

Vice President for Research

History

Rosalind Franklin University of Medicine and Science is a four-college University that was built around the Chicago Medical School (CMS), which has been educating physicians and furthering biomedical research for 93 years. From the first days in 1912, the physician and citizen founders of CMS aimed to establish a combined medical school and hospital in which employed men and women could study medicine at night, a common practice at the time. The School's noteworthy period of development took place under the direction of John J. Sheinin, MD, PhD, DSc, who served as dean and president from 1932 to 1966. It was during his administration that CMS successfully met the challenges arising from the revolutionary restructuring of American medical education following the Flexner Report.

In 1930, the Medical School moved to what was to become one of the world's largest aggregations of medical facilities. Located just west of downtown Chicago, this complex contained three medical schools, seven hospitals, colleges of dentistry, pharmacy and nursing, and two undergraduate universities. CMS occupied an 11-story facility in the renowned research and educational center.

In 1967, the University of Health Sciences (UHS) was established. The University comprised the Chicago Medical School (CMS), the School of Related Health Sciences (SRHS, now College of Health Professions), and the School of Graduate and Postdoctoral Studies (SGPS). The College of Health Professions first opened its doors in 1970, when two baccalaureate programs, Physical Therapy and Medical Technology (now Clinical Laboratory Sciences), were established. Since that time, the College has expanded its offerings to include master or doctoral level programs in the following areas: Nutrition, Physician Assistant, Pathologists' Assistant, and Physical Therapy.

In 1980, the University relocated to its current campus in North Chicago, IL, adjacent to the North Chicago Veterans Affairs Medical Center and Naval Station Great Lakes. In 1993, the institution was renamed for its long-time leader and Chairman of the Board of Trustees, Mr. Herman M. Finch. Finch University of Health Sciences/The Chicago Medical School, granted full accreditation by the North Central Association of Colleges and Schools in 1980, represented one of the first educational institutions in the country devoted exclusively to educating men and women for a broad range of professional careers in health care and research. In 2001, The Dr. William M. Scholl College of Podiatric Medicine (established in 1912) became part of the University structure, which now comprises four colleges. On January 27, 2004, the University publicly announced its intent to change its name to Rosalind Franklin University of Medicine and Science, in honor of Rosalind Franklin, PhD, a pioneer in the field of DNA research. The name change became legal on March 1, 2004, at which time the School of Related Health Sciences also changed its name to College of Health Professions.

In addition to the name change and the announcement of several new strategic initiatives, the University is currently in the midst of profound physical growth. In October 2002, the University opened its Health Sciences Building, a 140,000-square-foot state-of-the-art facility that houses laboratories, auditoriums, classrooms, departmental offices, a student union, the Feet First Exhibition, University bookstore, recreational game room, exercise facility, and a café. The University became a residential campus for the first time in its history when three student housing facilities, totaling 180 apartments, opened in July 2003.

The University's Basic Sciences Building is a 400,000-square-foot facility that houses a 52,000-square-foot Library and The Daniel Solomon, M.D., and Mary Ann Solomon Learning Resource Center, as well as administrative offices, classrooms, auditoriums, basic science departments, research and teaching laboratories, and dining areas. Located on the north end of campus is the Heather Margaret Bligh Cancer Research Laboratory, a cancer immunology research and treatment complex.

University enrollment is 1,687, with the bulk of its students enrolled in CMS. The University's total faculty is 804. Major hospital affiliates include: North Chicago Veterans Affairs Medical Center, John H. Stroger, Jr., Hospital of Cook County, Mount Sinai Hospital and Medical Center, and Advocate Lutheran General Hospital. The University's clinical campus consists of the North Chicago Veterans Affairs Medical Center, The Clinics at Rosalind Franklin University, and the Rosalind Franklin University Center for Women's Health.

Dr. Rosalind Franklin, through her pioneering work in the science of life and through her unflagging perseverance, serves as a role model for our faculty and students, and represents the future of biomedical science and integrated health care. Her history mirrors our own in many profound ways, marked by dedication to discovery even in the midst of difficult times. Upon that history, her legacy guides the future of the University itself.

After 93 years of excellence in healthcare education, Rosalind Franklin University of Medicine and Science has only just begun to write its history. We hope you will join us in creating bold visions for an ambitious future. To learn more about Dr. Rosalind Franklin and the University's dedication to her legacy, visit www.lifeindiscovery.com.

Mission

The School of Graduate and Postdoctoral Studies was established to provide graduate-level education to meet the need for highly qualified biomedical teachers and research workers in the rapidly expanding health care field. Goals of the school have been enlarged to provide graduate education for specialized clinical and administrative services in health care. Graduate School programs are designed to prepare a student for a lifetime of scholarly pursuits in life sciences teaching, research, administration and care. This includes:

- Training for a career in basic biomedical research, which may be combined with teaching in medical or other health professions.
- Training for an investigative, teaching and clinical care career in the health sciences.
- Preparation for administration in institutions concerned with health care, planning and research.
- Provision of opportunities for practicing health professionals to keep abreast of new developments, learn new methodologies, or gain additional research experiences.

Equal Opportunity

It is the policy of Rosalind Franklin University of Medicine and Science not to discriminate on the basis of race, color, national origin, sex, sexual orientation, disability, age, religion, or veteran status in its programs and activities, including, but not limited to, recruitment, admissions and employment. Inquiries regarding this policy may be directed to the Executive Director of Student Affairs, 3333 Green Bay Road, North Chicago, IL 60064; 847-578-8351.

Location

The School of Graduate and Postdoctoral Studies is located on the campus of Rosalind Franklin University of Medicine and Science, at 3333 Green Bay Road, North Chicago, IL 60064. The University is situated in the northern suburbs of Chicago, with easy access to downtown Chicago and the surrounding areas by car or public transportation. Chicago is arguably one of the foremost cultural, educational and scientific centers of the world. University students enjoy an environment rich in cultural and leisure activities, with neighboring communities that boast award-winning restaurants, museums and more.

For directions and a map, visit www.rosalindfranklin.edu/map.pdf.

Accreditation



Rosalind Franklin University of Medicine and Science receives its degree granting authority from the Illinois Board of Higher Education and is accredited through the North Central Association of Colleges and Schools.

North Central Association of Colleges and Schools
Higher Learning Commission
30 North LaSalle Street, Suite 2400
Chicago, IL 60602-2504
1-800-621-7440; 1-312-263-0456

Classification of Students in Relation to Fields of Study

Applicants are admitted to the School of Graduate and Postdoctoral Studies in one of three categories: graduate student, combined MS/MD or MD/PhD degree student, or special student.

Graduate Student

This student intends to seek either an MS or PhD degree and pursues no other academic goal until degree requirements are completed. Further, the student has been judged by the School of Graduate and Postdoctoral Studies to have met the admissions requirements and to be qualified to pursue a graduate degree. The graduate student is expected to maintain all performance requirements of the School of Graduate and Postdoctoral Studies as well as any special requirements of the department for the duration of their graduate education.

Combined MD/Graduate Student

This student pursues a combined degree and has been judged by the admission committees of both the graduate and medical schools to have met their respective admission requirements. The program is designed for individuals who are strongly motivated to have a career in academic medicine and research. Application may be made simultaneously to both schools or after the completion of the first year of medical education at the Chicago Medical School.

Combined DPM/PhD Program

The program is designed for individuals who are strongly motivated to have a career in academic medicine and research. Application may be made only after completion of the first year of podiatric medical education at Dr. William M. Scholl College of Podiatric Medicine. After studying for two years in the DPM program at RFUMS, DPM/PhD students pursue their PhD through a funded program before finishing their third- and fourth-year DPM clinical rotations. In the PhD phase of the program, students are mentored by experienced primary investigators and train in cutting-edge laboratories. The PhD phase of the program must be completed before the student can return to their DPM studies.

MS/MD Student

The qualified medical student may enroll in these master's degree programs after completion of the first year of medical studies.

Special Student

This student intends to satisfy an intermediate academic or career goal by completing specific graduate school courses. This limited goal must be achieved in no more than three academic quarters and by itself does not result in a degree. This goal is stated and mutually agreed to as a condition for admission as a special student. Academic and other performance requirements related to the goal of the study program are also agreed to as a condition for admission as a special student. Students in good standing in another school may become special students in the School of Graduate and Postdoctoral Studies.

A student is classified as a special student for one or more of the following reasons:

1. The student is not a degree candidate at this graduate school and the student's objective is to take certain courses.
2. The student is lacking in one or more of the requirements of the graduate school or specific department.

Admission

Prospective graduate school applicants should discuss their educational and career interests with a departmental chair and/or the Dean before applying.

This section describes only the procedures and minimum requirements for admission to the Graduate School. It should be noted that some departments may have additional specific requirements for admission. Prospective applicants are urged to review these requirements in the individual department's section in this catalogue. Candidates are considered for admission without regard for disabilities, as required under the Americans with Disabilities Act and related legislation. However, the Graduate School has determined a series of abilities and skills that are required of all students. These Technical Standards are detailed in the Graduate School Handbook.

Making Application

Information about completing an application is available from:

Office of Graduate Admissions

Rosalind Franklin University of Medicine and Science

3333 Green Bay Road

North Chicago, Illinois 60064

Telephone: 847-578-3209

Application forms are available at:

www.rosalindfranklin.edu/sgpds/admissions

Completed applications should be returned only to the Office of Graduate Admissions. In general, graduate students are expected to begin their studies at the start of the fall quarter. However, when available resources permit, a student may begin their studies at the start of another academic quarter. Applicants who wish to investigate this alternative are invited to discuss the possibilities with the Dean of the School and the appropriate department head.

The following materials are required to complete an application as a degree candidate to the School of Graduate and Postdoctoral Studies:

1. Completed application form and transcripts from all colleges previously attended. International credentials submitted for certain programs may need to be evaluated for U.S. equivalency.
2. Current scores for the GRE (Graduate Record Examination). The subject score may be required by some Departments.
3. Three letters of recommendation from persons involved in the student's previous educational or work experience, whichever was more extensive and recent.
4. An application fee in the form of a check or money order payable to Rosalind Franklin University of Medicine and Science.
5. A personal interview is recommended when possible. When an interview is not possible, the requirement may be waived and emphasis is placed, instead, on personal references. The interview cannot be waived, however, for special students and MD/PhD students.
6. Proficiency in both written and verbal English language skills is required. A valid Test of English as a Foreign Language (TOEFL) and Test of Written English (TWE) or Computer Based TOEFL (CBT) is required of any international applicant from a country in which English is not the native language. Some programs require a Test of Spoken English (TSE). These requirements may be waived for applicants who have been studying, full-time, at a United States institution for two consecutive years. A financial statement for international students, with supporting documentation, is required of all foreign applicants.

How Decisions Are Made Concerning an Application

Once an application for admission as a regular student is complete, the Admissions Office reviews the credentials and forwards them to the Graduate School Admissions Committee. The Committee submits its recommendation to the Dean. Those applications that are found acceptable by the Committee are forwarded to the appropriate department for evaluation, since individual departments may have additional requirements for admission. The department reviews the application and makes its recommendation to the Dean. Notice of acceptance is issued only from the Office of the Dean.

A candidate for Special Student Status not seeking a degree must request permission to apply from the department of interest. The department will develop a statement of objectives for the course work the student seeks to complete and set performance standards that the student will be expected to meet. Once approved by the Dean, these standards and objectives constitute the conditions under which a student is admitted as a “special student.” Applications from students who are degree candidates are reviewed by the Graduate School Admissions Committee as well as the department chair. These candidates may be accepted as special students with specific academic parameters if their level of academic achievement is not consistent with minimum SGPS criteria. The parameters set for these students will be used to evaluate their candidacy as a regular student after a predetermined number of quarters have been completed.

Securing Information Concerning the Status of an Individual Application

The Admissions Office is glad to provide the applicant with information about the status of their application. In addition, the Office periodically notifies the applicant concerning items missing from their application.

Once an application is complete, it is forwarded to the appropriate University and Departmental admissions committees. Although the University cannot predict when a particular application will be decided upon, the applicant is notified of a decision as soon as possible. Applicant information is not released to third parties outside of the University admissions process without the applicant's written permission.

Minimum Requirements for Admission to the School of Graduate and Postdoctoral Studies

Candidates for admission must have a bachelor's degree or its equivalent from an accredited college or university. Applicants are selected on the basis of previous academic work, adequate preparation in the field of proposed graduate study (as determined by the graduate faculty in that field), grade point average, satisfactory scores on the required examinations, recommendations from persons involved in the student's previous educational and work experience, a personal interview whenever possible and such other considerations that the applicable University and departmental admissions committee deem appropriate. When an interview is not feasible (as in the case of students in foreign countries), emphasis is placed on letters of recommendation.

What Admissions Committees Look For in a Successful Applicant

NOTE: Departmental criteria for successful applicants are discussed in the appropriate departmental section of this bulletin.

In general, the graduate school's admissions committee considers criteria it deems appropriate in recommending applicants for admission. It looks for, among other things, the following demonstrated or potential characteristics in applicants it recommends for admission:

1. Evidence that the applicant can meet the scholastic requirements of the graduate school on the basis of past academic performances.
2. A high level of academic learning, especially a strong aptitude for abstract thought and conceptualization.
3. Capacity for conducting well-organized, independent scientific investigations.
4. Ability to cope successfully with the academic research and/or clinical performance required in a graduate school curriculum.
5. Motivation to make a lifetime commitment to academic study, scientific research, health administration, or clinical service.
6. Commitment to the highest standards of ethical and professional behavior.

Minimum Requirements for Admission as a Special Student

To be considered for admission as a special student, the applicant should:

1. Hold at least a bachelor's degree or its equivalent from an accredited college or university. A transcript from the institution where the applicant received the BS degree is required.
2. State clearly the objective the applicant seeks to achieve by completing, successfully, the special course work.
3. The TOEFL and TWE is required if you are a foreign applicant who is from a country where English is not the primary language and have not attended a United States university/college for two consecutive years.

What the School of Graduate and Postdoctoral Studies Looks For in Successful Applicants for Admission as a Special Student

In general, the Dean, the appropriate departmental chairs, and admissions committees consider criteria they deem important in deciding whether to admit an applicant as a special student. Among the criteria they look for are the following:

1. Evidence that the desired educational objective can realistically be achieved.
2. Evidence that the academic performance criteria chosen by the applicant realistically reflect the educational objective sought. (For example, if the objective of the special educational experience is to secure admission to a graduate school, then the criterion for academic performance should be at least a “B” average for a full academic load.)
3. A maximum of one academic year in the special student status is permitted.
4. A special student who intends to be a degree candidate must enroll for at least 10-12 units per quarter to permit a judgment of the candidate’s ability to carry a full course load successfully.
5. For students assigned to a department, their status must be reviewed at the end of the year by the Graduate Admissions Committee and appropriate recommendation made to the Dean. This may include one of the following:
 - a. That the student’s status be continued.
 - b. That the student’s status be changed to that of a regular graduate student.
 - c. That the student be dropped from school.

Minimum Requirements for Admission as a Combined MD/Graduate Degree Student

To be accepted as a combined MS/MD or MD/PhD student, the applicant must be accepted into both the Chicago Medical School as a regular full-time student and into the School of Graduate and Postdoctoral Studies as a regular graduate student. Application to the MD/PhD program may be made simultaneously to both schools, or after the completion of the first year of medical education at CMS. For MS/MD Programs, applications may be made during the last quarter of the first year of medical studies. Candidates who are accepted for Combined Degree programs while enrolled in the Medical or Podiatric Medicine schools will matriculate into the graduate phase of the programs after satisfactory completion of their second year of Medical Studies. Once in the graduate phase, students may not re-enroll in Medical or Podiatric Medicine studies until the satisfactory completion of the graduate program.

Students who have been accepted or are enrolled as students in the Chicago Medical School and are interested in the Combined Degree Program are invited to discuss their interest with the appropriate departmental chair in the Graduate School and the Director of the Combined Degree Program. Personal objectives and expectations for the combined degree should be discussed along with a tentative schedule for the educational sequence required for the Combined Program. Application should be made through the Admissions Office. Data supplied in the application for one school may be used in the application for the second school; other data may also be required.

Combined DPM/PhD Program

The program is designed for individuals who are strongly motivated to have a career in academic medicine and research. Application may be made only after the completion of the first year of podiatric medical education at William M. Scholl College of Podiatric Medicine. After studying for two years in the Doctor of Podiatric Medicine program at RFUMS, DPM/PhD students pursue their PhD through a funded program before finishing their third- and fourth-year DPM clinical rotations. In the PhD phase of the program, students are mentored by experienced primary investigators and train in cutting-edge laboratories. The PhD phase of the program must be completed before the student can return to their DPM studies.

Transferring Course Credit from Another School

The Dean and the appropriate departmental chair are glad to consider transferring course credits from another institution. Normally, such determination is made individually, based on available information concerning the course work at the outside institution.

For Additional Information

Because the University recognizes that interested persons need more information than this catalogue can provide, prospective applicants and their advisors are encouraged to contact department heads, the Dean of the School of Graduate and Postdoctoral Studies, or the Office of Admissions and Records.

Visit us on the Web at www.rosalindfranklin.edu. In addition, a student handbook which orients entering students and details the school's daily routine is provided to entering students.

Non-Immigrant International Students

The School of Graduate and Postdoctoral Studies is authorized under federal law to enroll non-immigrant international students. Information about appropriate certification of international students is available in the Office of Admissions and Records. This office also serves as advisor to foreign students on matters relating to admission and immigration.

Postdoctoral Fellows

The School of Graduate and Postdoctoral Studies encourages the appointment of postdoctoral fellows whenever worthwhile educational and research objectives can be achieved and the availability of resources can be established prior to the appointment. The postdoctoral student is appointed so that he/she can obtain advanced training in his/her chosen field and can develop as an independent investigator.

Persons interested in becoming postdoctoral fellows are encouraged to discuss the matter with a graduate school faculty member who is working in the candidate's field of interest. When a mutually satisfactory arrangement can be reached, the faculty member seeks the approval of the departmental chair and the Dean.

Degree Requirements

Doctor of Philosophy

The Doctor of Philosophy degree is awarded in recognition of proficiency in research and scholarship relating to a specific field. The candidate must demonstrate his/her ability in a field by passing preliminary examinations in both general and specialty areas, and by preparing a doctoral dissertation. This dissertation must demonstrate the student's ability to master the literature, to do independent research and to make an original contribution in his/her chosen field.

A minimum of three academic years of full-time graduate study is required. A minimum of 60 units of graduate course work and a minimum of 75 units of research credit are required for the degree. If the advisor and the advisory committee feel that additional courses will benefit the student, the student is advised to take them. It is anticipated that most students complete their studies within five years. A minimum of two academic years' full-time residence at Rosalind Franklin University of Medicine and Science is required.

At the time a student is admitted, a program of study is outlined and approved by the student's advisory committee and the Dean. The research plan that serves as the basis for a dissertation may be determined at a later date.

The student is required to take a preliminary examination, which is an oral and/or written comprehensive examination of the student's scholarly competence and knowledge of his/her field. The preliminary examination must be taken after all required course work has been completed but at least 12 months before the student's anticipated graduation date. The examination is given after the student and his/her advisor agree that the student is prepared and after the advisor petitions the Dean in writing to have the examination administered. If the student fails, he/she may be re-examined only once more and only if the advisory committee, departmental chair and the Dean approve. Once the student passes the preliminary examination and is recommended by the departmental chair and the advisory committee, he/she advances to the status of "Candidate for the PhD Degree." The student must present an acceptable dissertation based upon original investigation performed during his/her study at RFUMS. The dissertation must contribute new information to a field and should evidence independent thinking, scholarly ability and critical judgment. The work also must indicate the student's familiarity with research methods and techniques.

At least nine weeks before the student expects to graduate, he/she submits copies of the dissertation to the advisor, who distributes copies to the advisory committee for review and recommendation. When the advisory committee feels that the student is ready to defend the dissertation, the advisor submits a written request to the Dean for the final oral examination. Directions for preparing a dissertation may be obtained from the Dean's Office. The student must defend the dissertation satisfactorily before an examining committee of at least seven members selected by the student's advisory committee and approved by the Dean. The student must take the final oral examination no later than six weeks before his/her anticipated graduation. Oral examinations are open to the public as well as to faculty members. Suitably prepared copies of the dissertation must be in the Dean's Office no later than June 1 for the student to receive his/her degree in the annual graduation ceremony. No more than seven years may elapse between matriculation and completion of all requirements for the PhD degree. After this time, the student's advisory committee must petition the Dean for revalidation of the student's course work.

Master of Science Degree

There are two main categories of Master's degrees awarded.

Research Degree

The Master of Science is an intermediate degree that enables the student to improve his/her professional competence and to develop his/her capacity for continuing self-directed study in areas where specialized research and information techniques are required. A thesis is required for completion of this degree.

Clinical/Professional/Applied Degree

Some of the Master's degree programs do not require a thesis but emphasize acquisition of advanced knowledge of the theory and practice of the discipline. Specific requirements for a degree are outlined under the respective departmental requirements.

For full-time students, a minimum of one year's residence at the University is required for the MS degree. Whereas two academic years of graduate study is generally required for completion of the MS degree, it must be completed within six years. Students studying part-time may meet the residency requirements for the MS degree within the time period specified above. The minimum requirements for graduation include 30 units of graduate course work and 15 units of research, if research is required by the specific program. For the clinical, professional or applied degrees, consult the departmental requirements.

The research plan a student selects as the basis for his/her thesis must be approved by the student's advisor, the student's advisory committee and the Dean. The student is required to take a comprehensive examination in his/her field of study. The examination is given after the student and the advisor agree that the student is prepared and after the advisor petitions the Dean in writing to have the examination administered. The examination may be written and/or oral and must be taken at least two quarters before the student's anticipated graduation. Upon passing the comprehensive examination, the student advances to the status of "Candidate for the MS Degree." If a thesis is required, at least nine weeks before his/her anticipated graduation the student must submit six copies of the thesis to his/her advisor, who distributes them to the advisory committee for review and recommendation. When the advisory committee feels that the student is prepared to defend the thesis, the advisor submits a written request to the Dean for the final oral examination. Directions for preparing a thesis may be obtained from the Dean's Office. The student must defend his/her thesis satisfactorily before an examining committee of at least six members selected by the advisory committee and approved by the Dean.

The final oral examination must be taken no later than six weeks before the student's expected graduation. Oral examinations are open to the public as well as to members of the graduate faculty. Suitably prepared copies of the thesis must be in the Dean's Office no later than June 1 in order for the student to receive his/her degree in the Annual graduation ceremony.

Requirements for the Combined MS/MD and MD/PhD Degrees

In general, requirements for the combined degrees combine the requirements for each degree, with the following specifications:

1. A student in good standing in the Combined Program, with the approval of the Dean of the Medical School, may claim credit for 8 units of Sophomore or Senior Medical School elective time by substituting 8 units research work completed in the Graduate School, provided competency without reservation has been demonstrated in the third-year required clerkships. Combined MD/PhD and DPM/PhD students will be allowed to substitute graduate-level electives for medical-level sophomore electives.
2. University requirements for either the MD or MS degrees may be satisfied by courses taken in either the Medical School or Graduate School within the University.
3. As part of the didactic course requirements:
 - a) for the MS/MD program, at least 8–10 units credit in advanced Graduate School courses are required, as determined by the candidate's department.
 - b) for the MD/PhD program, at least 15–20 units credit in advanced Graduate School courses are required, as determined by the candidate's department.

DPM/PhD Dual Degree Program

Purpose: The DPM/PhD Dual Degree Program is specially designed for those students who are interested in pursuing a career in research or would like clinical or basic science research to play a significant role in their future practice. Each student participating in this program is required to meet the academic requirements of both Scholl College and the School of Graduate and Postdoctoral Studies. The purpose of the program is to provide the student with highly advanced research training to complement the clinical training provided at Scholl College. This program is geared toward individuals who are interested in careers in research or academics, in conjunction with podiatric medicine.

Applications: Students who are interested in this program should inquire to Dr. David Armstrong during their first year of education. Students applying for this program must meet all entrance requirements for the PhD program. The student is strongly encouraged to plan for this program well in advance.

Funding: Typically, PhD graduate students are provided a stipend by Scholl College.

Academic Performance Standards and Their Measurement

Grading

A pass/fail grading system customarily is used for seminar and research courses. All other course work is graded as follows:

A = High Achievement

B = Above Average Achievement

C = Average Achievement

F = Fail

P = Pass

I = Incomplete. Evidence required for a qualitative grade has not yet been submitted, but arrangements have been made with the instructor to do so. No quality points are awarded until a permanent grade is entered.

Note: The privilege of completing all work required to change a grade of I (Incomplete) cannot be extended beyond the end of the quarter following the quarter this grade is received. On or before this date, a final grade must be entered.

R = Registered for Research. Instructor received insufficient evidence to evaluate the student's quality and quantity of work. An R grade, once entered, cannot be changed. However, it carries no stigma. (No quality points awarded.)

A copy of each student's complete academic record at the University is furnished upon request to him/her after each academic quarter attended.

Course Credit

Course credit is measured in units. One unit is equal to one hour of lecture or conference per week per quarter, two or three hours of laboratory per week per quarter, or three hours of research per week per quarter. Unit requirements for the MS and PhD degrees are specified in the regulations for these specific degrees. Unit values are shown in the course listings.

Regular Graduate Students

The regular student in the School of Graduate and Postdoctoral Studies is expected to maintain a cumulative quality point average of 3.0 to remain in good academic standing.

In addition, certain departments require the student to maintain a specific quality point level in his/her major subject area to remain in good standing. The academic performance of the student is evaluated by the department at the end of each quarter, and a student who falls below any of the required standards in any given quarter is notified by the department chair of the status and the recommended course of action to be taken. The department chair also notifies the Dean of the departmental recommendation.

If a student's academic performance falls below the school or departmental standards for either two consecutive quarters or three nonconsecutive quarters, the following steps are taken:

1. The Dean of the Graduate School is notified in writing by the departmental chair of the student's status and of the departmental recommendation.
2. The Dean may refer the question of the student's future status at this school to the Committee on Academic Standards, requesting a recommendation.
3. The Dean decides, based on these recommendations, whether the student shall be dismissed or continued as a student on academic probation. The student is informed in writing of this decision.

The student has the right and the opportunity to present evidence and to discuss his/her situation with the departmental chair, the Committee on Academic Standards and the Dean before each submits a decision.

Special Students

Special students are expected to maintain the academic performance standards required of other regular graduate students.

Retaking Courses

The Graduate School discourages the retaking of courses or examinations to improve grades. Courses and examinations may be retaken only after approval of a petition to the Dean, endorsed by the course director, program director and chair of the student's department.

Non-Academic Performance Standards

Students in the School of Graduate and Postdoctoral Studies are subject to dismissal for unethical and/or unprofessional behavior in their student role.

Statement of Policy on Professionalism and Ethics

All students at Rosalind Franklin University are expected to exhibit professional, responsible and ethical behavior. Students should display this behavior as students in the University, as health care providers in the clinical setting and as researchers in the laboratory or clinic. All students should, therefore, possess the highest degree of personal integrity and be able to reason about ethical issues in their professional life. Students are expected to treat patients and research subjects with respect, compassion and sincerity, irrespective of race, color, creed, ethnic origin, religion, disability, gender, sexual orientation, or socioeconomic class, and to maintain strict confidentiality. Students are expected to be honest and trustworthy, to respect the property of others, and to follow the code of professional ethics appropriate to their discipline. Any departures from these standards may result in disciplinary action.

Procedures for Consideration of Violations of Ethical and Professional Standards

A student under suspicion of ethical or professional misconduct shall be afforded appropriate notice and an expedient process in the investigation, deliberation, and decision about such allegations and potential penalties. The student shall also be afforded the right to appeal any negative outcomes to the Dean of the School in which the student is enrolled. The procedures described below are designed to ensure such rights for the student and the University.

Investigation and Recommendation

Allegations of ethical or professional misconduct by a student shall be referred to, and investigated by, a faculty committee with student representation. In the medical school this committee shall be the Student Evaluation, Promotions, and Awards Committee (SEPAC). In the School of Graduate and Postdoctoral Studies, the matter shall be referred to the chair of the department in which the student is enrolled. The department chair shall appoint an ad hoc Investigating Committee of faculty to investigate the charges. Student representation shall be provided on the Investigating Committee. The department chair is encouraged to recruit faculty from other departments in situations where availability of disinterested faculty within the department is limited. The Director for Student Affairs of the University, or his or her designee shall be an ex officio member of the Investigating Committee and shall serve as the student's advocate in committee deliberations. The committee shall be charged with receiving evidence, hearing the accused student, and making recommendation based upon such information. A student charged with violations of ethical or professional standards shall be presumed innocent. Such violations shall be established by clear and convincing evidence. The student shall be given written notice of the accusations and the time and place of the Investigating Committee deliberations. Both the student and the Director for Student Affairs (or designee) shall have the right to present evidence before the committee on behalf of the student. Subsequent deliberations of the Investigating Committee shall be attended by committee members only. The recommendations of SEPAC shall be transmitted by the committee chair to the Dean of the Medical School. Recommendations of the Investigating Committees of the other schools shall be made from the committee chair to the department chair. Upon consideration of the committee recommendation the department chair shall make recommendation to the Dean of the School. Upon receipt of such recommendation, the Dean shall decide upon appropriate action and so notify the student in writing.

Right of Student Appeal

The decision of the Dean shall be final, except that the student shall retain the right to appeal such decision, in writing, to the Dean. At the discretion of the Dean, the issue may be referred to an Appeals Committee. In the Medical School, the Appeals Committee shall be an ad hoc committee appointed by the Dean as described in the Student Handbook. In the School of Graduate and Postdoctoral Studies and the College of Health Professions, the matter shall be referred to the standing Academic Standards Committees of the respective schools. The Director for Student Affairs (or designee) shall be an ex officio member of the appeals committee. Both the student and the Director for Student Affairs shall be notified of the referral to the Appeals Committee as well as the time and date of such deliberations. Such committee shall hear the student appeal and all new evidence or argument presented by the student or Director for Student Affairs (or designee). The Appeals Committee shall make its recommendation directly to the Dean of the school. The Dean's decision shall be final and shall be transmitted in writing to the student, with notice to the Director for Student Affairs.

Student Treatment

Students have a right to work and study in an environment free from harassment; as such, the University will not tolerate student mistreatment. A primary goal of RFUMS is the education of students who will meet the health care needs of society in a caring, competent, and professional manner. Insensitivity during training/education runs counter to the fundamental tenets of health care and impairs the ability of many students to maintain their idealism, caring, and compassion past training into their careers. Examples of mistreatment include sexual harassment*; discrimination or harassment based on race, religion, ethnicity, gender, sexual orientation, physical disability or age; humiliation, psychological or physical punishment, and the use of grading and other forms of assessment in a punitive manner. The occurrence, either intentional or unintentional, of such incidents results in a disruption of integrity, trust, and the spirit of learning. Students who experience mistreatment should report the specific incident(s) to the offender's supervisor and to the Associate Dean for Student Affairs (ADS). All incidents will be handled in an equitable manner with the guarantee of each student's rights with appropriate protection for complainant and accused. Appropriate counseling can be arranged by contacting either the RFUMS Counseling Center (847-578-3305) or the ADS (847-578-3295).

*For the entire RFUMS Sexual Harassment Prevention and Resolution Policy, please see www.rosalindfranklin.edu/policies/shpolicy.cfm.

Rules Governing Records, Leave, Withdrawal and Transfer

Student Records

All documents and records pertaining to a student's admission and academic performance in the University are filed in the Office of the Registrar (telephone 847-578-3228). The student has the right to inspect items in his/her file in the Registrar's Office on any regular working day. The Dean of the school and the Director of Student Affairs also have access to these files. University faculty, committees, and other administrators may secure access to these files only through the Dean of the school. The University complies with the requirements of the Family Educational Rights and Privacy Act of 1974 as amended. Copies of University policy are available at the Office of the Registrar.

The counseling records of the Director of Student Affairs are not available to anyone except the student. Only with permission of the student will the Director of Student Affairs make necessary records available to appropriate faculty, committees, or other administrators.

The student counselor's records are confidential. No faculty, administrator, or other person may request or receive any information concerning a student from the student counselor. Records of the student health care units and the financial aid counselor are available only to those professionals directly concerned. The Registrar is authorized to supply transcripts of a student's grades earned at the University only with the written permission of the student.

Leave-of-Absence

Regular students in the School of Graduate and Postdoctoral Studies are expected to maintain continuity and diligence in pursuing a specified advanced degree. When a student must be absent from academic work at the University for any reason, departmental approval must be obtained. For periods longer than three weeks, the student shall petition the Dean for a leave-of-absence, and receive approval before leaving.

Unauthorized leave may be considered as withdrawal from graduate school. Graduate students may be allowed a leave-of-absence for a period of up to one year by the Dean, upon the recommendation of the chair of the department (or Committee). Registration after an absence of more than one year shall require resubmission of a new application for admission. Time spent on an approved leave-of-absence will not be included within the maximum period in which a degree program must be completed.

Student Petitions

Students may petition the Dean to waive or deviate from the stated requirements or for any other academic matter requiring resolution by the Dean. Petitions may be submitted on the forms procurable in the Dean's Office.

Withdrawal from a Course

With written approval from the instructor and the Dean, a student may withdraw from a course by petitioning the Dean at any time within six weeks after registration. The student's grade is recorded as W (withdrawn). Full tuition for the course may be refunded up to the end of the first week following registration. A 75 percent refund is allowed up to the end of the second week; a 50 percent refund, up to the end of the third week; and no refund, after the end of the third week.

Permanent Withdrawal from Graduate School

If a student permanently withdraws from graduate school (does not seek and receive a leave-of-absence), full tuition is refunded only if the withdrawal occurs during the first week following registration. A 75 percent refund is allowed up to two weeks following the registration deadline, a 50 percent refund up to three weeks following registration and before the end of the fourth week, a 25 percent refund. No tuition is refunded after the fourth week. As a condition for refund, the student must first file with the Dean a letter stating his/her withdrawal.

Educational Expenses, 2006–2007[†]

	<i>Per Year Tuition</i>
Basic Medical Sciences	\$20,496*
Psychology	\$16,872
Student Council Fee	\$40
Student Health Insurance [†] (also see page 26)	**
Single Plan	\$173.00 per month
Family Plan	\$493.50 per month
Student Dental Insurance	
Single Plan PPO	\$24.89 per month
Single Plan HMO	\$13.84 per month
Family Plan PPO	\$76.72 per month
Family Plan HMO	\$42.74 per month
Student Vision Insurance	
Single Plan	\$6.43 per month
Family Plan	\$10.83 per month
Books and Supplies (Estimate)	\$859

*Waived for a limited number of graduating students receiving University fellowships.

**Your own.

[†]Subject to change.

The premiums shown are examples. Actual premium will be determined by the specific plan chosen by the student.

Tuition

The number of hours credited for any course in The School of Graduate and Postdoctoral Studies is determined by the individual department. Such determination is based on the time a student is expected to spend preparing for and participating in a particular course. Twelve units or more of course work constitute a full-time academic load in the School of Graduate and Postdoctoral Studies, and full-time tuition is assessed. In general, tuition for students taking a part-time academic load is assessed by units.

The University reserves the right to assess special students a higher tuition rate per unit than is assessed regular graduate students.

In general, students auditing a course are charged the same tuition as those taking the course for credit. The University does distinguish, however, between a passive audit (participating only by listening, viewing and reading) and an active audit (discussing, conducting laboratory work, practice teaching and the like) and may assess a passive audit at a different rate of tuition than an active audit for the same course.

Tuition and Fee Payment Policy

Tuition and fees are due on the designated registration day (first Monday) for each quarter. Beginning on the first day of each quarter, an interest fee calculated on a daily basis at the rate of 18% per annum is assessed to each student's account which is not yet paid. A late fee of \$150.00 will be charged for late registration. Students with outstanding balances still remaining at the end of the quarter may receive an incomplete grade in all courses for the quarter, and are not allowed to register for the subsequent quarter.

Refund Policy

If a student withdraws from the Program before the end of the first week of classes, 100% refund of tuition is made. When withdrawal is made before the end of the second week, the refund is 75%; before the end of the third week, 50%, and before the end of the fourth week, 25%. After that time, no refund is granted.

Financial Assistance

University Fellowships and Tuition Waivers

The School of Graduate and Postdoctoral Studies offers a limited number of research assistantships, graduate student tuition waivers and graduate student fellowships or stipends to full-time students in good standing. University fellowships may be supplemented by individual departments. The particular form and amounts of graduate student support available vary among different departments. Prospective students are invited to explore this subject with their departmental chairperson at their earliest opportunity. In general, financial support to individual graduate students is based on academic excellence and economic need. When resources are limited, doctoral students are given preference over masters' degree students. At present, the University does not provide a stipend to all regular students, but most regular students in good standing are receiving financial support in some form.

Student Loan Programs

To meet the cost of attending The School of Graduate and Postdoctoral Studies, students, spouses and parents are expected to provide financial support to the extent that they are able. When family resources are insufficient to meet college costs, students are encouraged to seek assistance from the following currently existing loan programs:

Federal Subsidized Stafford Loan Program

Graduate students may borrow up to \$8,500 per academic year, but are limited to the combined undergraduate/graduate program maximum of \$65,500. The interest rate varies annually; adjusted July 1; capped at 8.25%. During the student's enrollment in school, the government pays the interest to his or her lender. Borrowers have a maximum of 10 years to repay. There is no penalty for early pre-payment.

Federal Unsubsidized Stafford Loan Program

The Unsubsidized Federal Stafford Loan has a loan limit of \$10,000 per year with an annual variable interest rate, adjusted July 1; capped at 8.25%. Interest is accruing while the student is enrolled (unlike the Federal Stafford, above) but payment can be deferred until after graduation. The limit the student can borrow through both Stafford programs during undergrad and grad school is \$138,500.

Federal Perkins Loan

The Perkins Loan is a federal program to provide need-based, low-interest educational loans for those attending graduate and professional schools. The interest rate is 5% during repayment. Allocations of the Perkins are based on the availability of funds and are awarded by the institution.

Veterans Educational Benefits

The School of Graduate and Postdoctoral Studies is approved for veterans' educational benefits by the State Approval Agency of the State of Illinois.

Campus and Student Life

Rosalind Franklin University of Medicine and Science is located adjacent to the nation's third largest Veteran's Administration Medical Center, situated in North Chicago. The facility is readily accessible by commuter train and interstate highways. It is also located close to some of the most attractive residential neighborhoods in the Chicago metropolitan area. Free campus parking is available to students, faculty and staff.

Transportation

Metra commuter trains (Chicago and Northwestern line) stop at the Great Lakes and Lake Bluff stations, in close proximity to the campus. The ride from downtown Chicago takes approximately one hour. Service is provided at about 20 minute intervals during commuter hours and at about 60 minute intervals during other hours of the day and night. Monthly passes permit unlimited use to and from Chicago, North Shore, and Southern Wisconsin communities. The campus is accessible from Chicago by auto via Interstate 94 and U.S. Route 41 (Edens Expressway) or Interstate 294 (Tri-State Tollway). Commuting time from downtown Chicago is about 75 minutes during rush hours, under one hour at other times.

Housing

Rosalind Franklin University offers on-campus living for students in modern, state-of-the-art apartments. For more information about these one- and two-bedroom apartments, or to learn how the Office of Student Housing can assist you in locating off-campus housing, visit www.rosalindfranklin.edu/housing.

Cultural Activities

The cultural, sports and civic activities of the Chicago metropolitan area rival those of any large urban area in the United States. In addition to opera, symphony, orchestra and the legitimate stage, Chicago enjoys a richly developing experimental theatre movement, jazz and other music groups, and a full range of professional sports. Chicago's museums and art galleries offer a wide variety of exhibits.

Most of the Chicago area's cultural activities can be reached by commuter trains or auto from the campus area. In addition, the North Shore and inland communities have developed a characteristic set of cultural activities of their own. The Chicago Symphony's summer-long programs at Ravinia Festival (about 10 miles south of the campus) are well known. A large number of theatre groups have developed excellent programs that operate year-round.

Student Organizations

Student Participation in University Governance

Student representatives participate as active members on most committees of each school. A few of the committees on which students are serving include Admissions, Graduate Faculty Council, Curriculum, Academic Standards, Faculty Search Committees and the Financial Aid Committee.

Graduate Student Association

Graduate students at the University have organized a Graduate Student Association (GSA) to help meet their individual and group needs. The concerns of the GSA range from social and academic events to availability of library resources and evaluation of students' academic performance. Prospective students are invited to discuss GSA activities with its president, who may be reached through the Office of the Dean.

University Student Council

Students in all schools participate in the University Executive Student Council. This group, organized and run entirely by students, concerns itself with the overall policy and direction of the institution as these relate to student concerns. In addition, the Council plans and supports campus social events and student delegate trips to national professional group meetings. It also names student representatives to school committees.

The Student Council meets each month. In addition to selected representatives from each school, all interested students in any of the schools are welcome to participate in the Council's activities.

Services

Health Insurance

All students are required to obtain and maintain health insurance while they are enrolled in the University. Students may purchase coverage, under the University's group policy, for themselves and their family while attending the University. Contact the Business Office to discuss plan options and to obtain an application. Please note that if the student withdraws or is dismissed from the University, his/her coverage under the University's policy will be cancelled. Also, group coverage will terminate upon graduation. If the student elects to purchase coverage from another source or continue other current coverage, he/she will be required to provide proof of insurance at the time of registration. In the case where such insurance is provided through a managed care plan, the student should verify that he/she will be entitled to benefits coverage for services provided at The Clinics at Rosalind Franklin University. Many managed care plans provide coverage only in certain regional areas and for specific panels of contracted physicians. Questions regarding benefits coverage should be directed to the member services phone number on the student's insurance card.

- Students are encouraged to establish a patient billing account with The Clinics at Rosalind Franklin University. They may register and provide insurance information through The Clinics' reception office during normal business hours, which are posted at the entrance to the clinic. Then, when medical services are rendered, the University Patient Accounts Department will bill the student's health plan. After claims have been paid by insurance, the student will receive a statement indicating the level of payment on claims and any patient charges remaining on his/her account. Students will remain responsible for paying their plan deductibles.

Dental Insurance

RFUMS has available a dental plan which students may elect to join. Students will have the opportunity to enroll July 1 and August 1 (open enrollment). For additional information, please contact the Business Office.

Personal Advising and Counseling

The University provides a professional counseling service through the Departments of Psychology and Psychiatry to help students deal with personal and family problems. Student needs for this service are met promptly. Outside referral may be required to meet special needs or long-term therapy. All contacts with the counseling service are strictly confidential.

Tutoring and Other Academic Assistance

The Office for Student Affairs and the student's faculty advisors are interested in helping students maximize their academic performance. Every effort is made to detect potential academic difficulties as early as possible so that help can be given to correct these problems. Individuals are available to help graduate students improve their study skills and to provide tutoring assistance as needed. The Office for Student Affairs arranges for study skills assistance and the Curriculum Office arranges for tutoring assistance.

Resources

The Learning Resource Center and Boxer University Library

The Learning Resource Center provides a wide range of services to the students, faculty and staff of Rosalind Franklin University. The Boxer University Library collection holds nearly 120,000 volumes and currently receives more than 1,800 subscriptions to the world's leading biomedical journals, as well as access to more than 60 major medical information databases. Library services include reference assistance to identify and locate scientific and health related literature, online database searching, library instruction, interlibrary loans and fax service. Group study rooms, a 24-hour computer lab and network connectivity is available in the library. Orientations are available upon request. The Boxer University Library is open 103 hours each week.

Academic Computing Labs

There are three Academic Computing Labs located in the Boxer University Library. The labs are equipped with PCs and Macs, printers, scanners and Internet connectivity. Software appropriate to medical and graduate school education is located on each hard drive. The LRC staff provides academic computer instruction.

Audiovisual Services

The Audiovisual Lab located in front of the library houses a collection of non-print media including audiovisual programs in various formats as well as training models for practice in clinical and diagnostic skills. Study carrels and preview areas, equipped with appropriate hardware, are located in the library. Audiovisual Services video records special University events and sets up equipment for lectures and meetings.

Biomedical Photography

The Photography Department offers the full spectrum of photographic services, including specimen and clinical photos, photomacrography, photomicrography, B&W and color copying of research data, printing and slides from computer generation or research materials. In addition, ultraviolet and fluorographic photography as well as public relations and portrait photography are available.

Duplication Services

This service handles more than 5.5 million copies each year. Work order forms and other information about Duplications are available at the Library Circulation Desk.

Graphic Design

The Graphic Designer advises, prepares and produces illustrations for articles, lectures, exhibits, publications and research. Computer graphic slides, designing of curriculum vita, laser printing, laminating and picture framing are just some of the services available to students and staff.

Information Technology

The information Technology Department provides access to the University's computing, networking, centralized administrative systems and technical support resources to the faculty, students, staff and administration of the University. The department is also responsible for creating and maintaining a technology infrastructure to support computer networks and telecommunication.

Servers

The Information Technology Department is responsible for the installation, testing, maintenance and documentation of operating systems and application software on NT and UNIX platforms, as well as troubleshooting these systems in the event of failure. The systems on these servers include the firewall, electronic mail and administrative systems.

Help Desk (End-User Support)

The Help Desk provides the University community with a single point of contact for Information Technology's support services. When experiencing a problem with a computer, telephone, network or other peripheral equipment, a user must first contact the Help Desk in order for a technician to be dispatched.

Network Access

The Information Technology Department is responsible for the oversight of the University's local and wide area network. Administration of the network will aid in maintaining reliable network performance and continued information technology support for all educational, research and administrative objectives.

Database Administration

Database administration provides production support for centrally managed relational databases, including database backup, recovery and reorganization, database performance monitoring and tuning, and support for database-related problems.

Departmental Information

The chair of a department and the Dean may approve faculty and other professional staff members who are not members of the graduate faculty for teaching of appropriate graduate courses.

Department of Biochemistry and Molecular Biology

The fundamental goal of biochemistry is to understand life processes at the molecular level. In recent years, the tremendous strides forward in our knowledge of these molecular processes have made biochemistry the common language of the basic and clinical sciences. The ramifications of the information obtained from the study of genes and their products are rapidly finding their way into the study of the myriad of health problems still poorly understood. The acceptance of the central role of biochemistry has clearly resulted in ever-increasing, productively collaborative efforts between biochemists and investigators in many diverse fields.

Career Potential

Biochemistry is strongly research-oriented, and a career in the field requires skill as a laboratory investigator. In general, those who successfully embark upon a career in biochemistry have the intellectual satisfaction of working with highly challenging problems dealing with the basic life processes. Those who enter upon an academic career have the additional satisfaction of teaching the application of biochemical knowledge and techniques to students in a variety of disciplines. Because of the extensive training of graduates in the 1960s and the subsequent reorientation in federal research support policies, the competition is keen for academic positions in biochemistry. At the same time, there has been a rapid increase in the number of positions available for biochemists in research institutes and the biotechnology industry. Highly skilled and motivated biochemists will find their talents sought in widely divergent situations.

Graduate Training

The aim of the graduate program in biochemistry is to train individuals who, with continued work at the postdoctoral level, will have the background to secure biomedically-related positions in universities, industry or research institutes. Biochemistry graduate training exposes the student to an active research teaching environment. The research training is built around problem solving, from the formulation of the problem to be solved to the research reports and the recommendations for future research. Graduate students admitted to the program are limited in number to allow one-to-one relationships with faculty, and central involvement with research problems. In addition to the specific lines of research in progress within the department, further exposure to research in biochemistry is provided through weekly seminars presented by investigators from other institutions.

Like the research expertise, the student's teaching skills are developed by participation. Students learn to organize and to present material effectively through active participation in seminars, journal clubs and teaching activities. In each of these activities, the department tries to develop in the graduate student the skills required to both understand a subject thoroughly and present information clearly and accurately.

Course of Study

The first year of graduate study combines course work, seminars and laboratory experience. Succeeding years are devoted primarily to dissertation research. The selection of the thesis advisor usually is made by the end of the first year. Until that time, the department's graduate student advisor counsels the student in his/her course of study. During this period, opportunities are available for students to work in various laboratories to acquaint themselves with the department's research projects.

Admission to candidacy for the PhD degree requires the successful completion of a comprehensive examination consisting of both written and oral sections, usually taken in the third year of study. The final preparation and defense of the PhD thesis is performed in accordance with the rules and regulations of the School of Graduate and Postdoctoral Studies. Candidates for the PhD Degree in biochemistry are required to be proficient in the use of computers. There are no foreign language requirements.

The department, in conjunction with the Medical and Podiatric Medicine Schools, offers combined degree programs leading to the MS/MD, MD/PhD, or DPM/PhD degrees. These programs are designed to prepare individuals for a career in biochemistry as applied to clinical and/or pre-clinical medical research. Participation in these programs depends upon acceptance by both the medical/podiatric and graduate schools. The requirements for the combined degrees include those for the MS or PhD degree and those for the MD or DPM degree. In general, the attainment of the MS/MD degree requires six academic quarters in addition to those required for the MD degree. The MD/PhD or DPM/PhD degree usually requires two to three years in addition to the time required for the MD or DPM degree.

Entrance Requirements

A baccalaureate degree is required from an accredited college or university. Better than a 3.0 grade point average on a 4.0 scale in the science courses is considered competitive. No field of undergraduate major is specified, but the following courses are required: general biology, general chemistry (including quantitative analysis), organic chemistry, physical chemistry, physics and calculus. Deficiencies in these courses can be corrected by enrollment in neighboring colleges during the first year. Other entrance requirements include satisfactory scores on the verbal, analytical and quantitative portions of the Graduate Record Examination (GRE), and three letters of recommendation from persons familiar with the applicant's academic background. A prospective student should apply as early as possible in the academic year preceding the year of entrance. Please refer also to the general section on School entrance requirements in this catalogue. For additional information and application forms contact:

Graduate Student Advisor

Department of Biochemistry and Molecular Biology

Rosalind Franklin University of Medicine and Science

3333 Green Bay Road

North Chicago, IL 60064

Course Descriptions

MBCH 505A, B Medical Biochemistry

The fundamental chemical properties and biological reactions of the various compounds important to the normally functioning human organism are studied. As far as possible, mechanisms of life processes at the cellular and molecular level are explained in terms of these properties. Original literature is discussed in conference groups. Winter Quarter, five lecture hours and one conference hour per week for four weeks, Spring Quarter, three lecture hours and two conference hours per week (total of 7 units). Dr. Kaplan and Faculty.

MBCH 502 Molecular Cell Biology

In this course, the molecular and cellular processes common to all eukaryotic cells are studied and, where appropriate, comparisons to prokaryotic cells are made. The molecular and cellular processes of specific cell types and tissue types are also considered, and related to their morphological appearance. Fall Quarter, three lecture hours and one conference hour per week (5 units). Dr. Walters and Faculty.

GBCH 530 Master's Thesis in Biochemistry

All quarters. Prerequisite: Offered only to graduate students in the Department of Biochemistry and Molecular Biology. Hours and units of credit to be arranged; can be repeated for credit. All Faculty.

GBCH 532 Biochemistry/Molecular Biology Journal Club

Presentations on current literature of personal research by faculty, staff and students. All quarters, one hour per week, can be repeated for credit. Prerequisite: Offered only to graduate students in the Department of Biochemistry and Molecular Biology. (1 unit) Dr. Kaplan and Faculty.

GBCH 533 Seminar

Presentations on current research by invited speakers. Fall, Winter and Spring Quarters, one hour per week, can be repeated for credit. Prerequisite: Graduate student in the Department of Biochemistry and Molecular Biology. (1 unit) Dr. Kaplan and Faculty.

GBCH 535 Doctoral Dissertation in Biochemistry

All quarters. Prerequisite: Graduate student in the Program in Biochemistry and Molecular Biology. Hours and unit of credit to be arranged; can be repeated for credit. All Faculty.

GBCH 537 Methods in Research

Graduate students are introduced to research methods by working in faculty members' laboratories for periods of six to eight weeks. The rotation is tailored to the individual needs and desires of the student. Additional supplementary lecture-demonstrations are offered to ensure that each student is acquainted with all special instrumentation available in the department. All quarters. Prerequisite: Offered only to graduate students in the Department of Biochemistry and Molecular Biology. Hours and units of credit to be arranged; can be repeated for credit. Dr. Walters and Faculty.

GBCH 538A, B Advanced Molecular Biology

The current status of knowledge on the structure, function, expression and manipulation of prokaryotic and eukaryotic genes and genomes is examined in detail in this two quarter course. Emphasis is placed on primary source materials. Part of Winter and Spring Quarters, three hours per week (5 units). Prerequisites: BC 5200 and BC 5201. Drs. Potashkin, Fennewald and Faculty.

GBCH 539 The Art of Scientific Presentation

The successful scientific career requires clear communication of scientific results. Participants in this course practice giving and evaluating oral presentations of technical material. Topics to be covered include organization of a talk, targeting the material to the appropriate level for the audience, overcoming "stage fright," effective visual aids, developing eye contact, effective use of voice, overcoming language barriers, and handling question-and-answer sessions. Spring Quarter: 2 hours per week. Maximum 8 students. (2 units) Dr. Walters.

MBCH 508 Human Genetics

The purpose of this course is to provide the student with an understanding of basic genetic principles, as well as to stress those concepts that are responsible for the central role of genetics in virtually all biological disciplines. Among the topics to be considered are chromosome abnormalities, pedigree construction, Mendelian inheritance patterns and risk assessment, the role of linkage and restriction length polymorphisms in diagnosis, and genetic aspects of cancer. Fall Quarter, nine hours of lecture and six hours of conference in first three weeks of Fall Quarter (3 units). Dr. Neet and Faculty.

GBCH 543 Enzyme Structure and Mechanism

This is a course of lectures, student presentations and seminars by outside speakers on aspects of enzymology. The following subjects are covered: protein sequence methodology, chemical and enzyme kinetics including regulatory kinetics, enzyme mechanisms, chemical modification of enzymes and site-directed mutagenesis. Spring Quarter, three hours per week (3 units). Not offered every year. Prerequisite: BC 5200. Drs. Glucksman, Mueller, Neet, and faculty.

GBCH 544 Physical Biochemistry

This course deals with the physical chemical properties of biological macromolecules and the techniques used for their characterization. Molecular weight, hydrodynamic properties, and spectroscopic properties of proteins and nucleic acids; secondary structure, tertiary structure, and conformational changes of proteins; dynamics of protein-protein and protein-DNA interactions; kinetics and thermodynamics of protein folding. Lectures, seminars, and discussions. Spring Quarter, (3 units). Alternate years. Prerequisite: Undergraduate physical chemistry, BC 5200 Medical Biochemistry or the equivalent, and consent of the instructor. Drs. Harrison, Neet and Faculty.

GBCH 547 Current Topics in Biochemistry

This course reviews current topics in Biochemistry with special emphasis on molecular biology. The basis of the course is seminars presented by leading scientists who are participating in the Biochemistry and Molecular Sciences seminar series. One hour per week conference session with discussion of papers that are pertinent to the upcoming seminar and one hour of the seminar. Opportunities to meet the speakers. Offered with minimum number of students. Not offered every year. Fall/Winter/Spring Quarter (1 unit).

GBCH 554 Computer Applications in Biological Chemistry

This course focuses on the application of computers to biological research. Topics to be covered include: Internet and other networks; nucleic acid, protein carbohydrate and other databases; nucleic acid and protein sequence analysis; protein and nucleic acid modeling; data fitting. Winter Quarter, two hours per week, (2 units). Not offered every year. Prerequisite: Familiarity with PC and Macintosh computers. Dr. Walters and Faculty.

GBCH 590 Zero Credit Research

This designation is utilized for students who have completed all course and research requirements but are continuing with thesis/dissertation work.

General Course**GGCS 724 Ethics in Biomedical Research (1 unit).****Faculty and Associated Staff**

Carl Correll, PhD, Associate Professor
 Marc Glucksman, PhD, Professor
 David Harrison, PhD, Associate Professor
 Jack Henkin, PhD, Adjunct Assistant Professor
 Ronald Kaplan, PhD, Professor and Chair
 John Keller, PhD, Professor Emeritus
 Robert Kemp, PhD, Research Professor
 Edward McKee, PhD, Adjunct Associate Professor
 David Mueller, PhD, Professor
 Kenneth Neet, PhD, Professor and Associate Dean
 for Research
 Eric Walters, PhD, Professor
 Sang Woo, PhD, Research Assistant Professor
 Yuanda Zhang, PhD, Research Assistant Professor

Department of Cell Biology and Anatomy

Program in Cell Biology and Anatomy

Cell Biology and Anatomy has entered an exciting new era. Current research aims toward an understanding of the fundamental relationships between biological structure and function, and requires a sophisticated, interdisciplinary experimental approach. Powerful new research methods have been drawn from the fields of molecular biology, immunology and optical and computer sciences. The individual embarking on a career in Cell Biology and Anatomy must be prepared to embrace this diverse technology to effectively answer the many challenging questions now being asked about basic cellular processes.

Entrance Requirements

Prospective applicants for graduate studies in Cell Biology and Anatomy must hold a baccalaureate degree from an accredited college or university. To be competitive, an applicant should have an undergraduate grade point average higher than 3.0 on a 4.0 scale. No field of undergraduate major is specified, but the undergraduate record should include courses in: general biology, general chemistry, organic chemistry, physics and calculus. Also required are satisfactory scores on the Graduate Record Examination and three letters of recommendation from individuals familiar with the applicant's academic year preceding the desired year of entrance.

For additional information and application forms contact:

William N. Frost, PhD
Department of Cell Biology and Anatomy
Rosalind Franklin University of Medicine and Science
3333 Green Bay Road
North Chicago, IL 60064
william.frost@rosalindfranklin.edu

Graduate Training

The goal of the graduate program in Cell Biology and Anatomy is to train individuals who, after continued research at the postdoctoral level, secure biomedical research/teaching positions in universities, research institutes or industry. The graduate training period provides students with an active research environment and helps students focus their energies toward their own productive research experience. In order to permit extensive interactions between faculty and students, only a limited number of graduate students are admitted to the program.

Effective presentation skills are developed by student participation in journal clubs, seminars and student/faculty research colloquia. In addition, regular departmental seminars presented by investigators from other institutions provide further exposure to state-of-the-art research and foster professional interaction across institutional and disciplinary lines. To ensure that they have a competitive edge in postgraduate searches for academic positions, students participate in the teaching of one or more areas of anatomy and cell biology during the course of their graduate training.

Course of Study

Entering students begin graduate studies with a combination of basic course work, seminars and laboratory experiences. Students work in various laboratories in order to become acquainted with research projects and establish working relationships with faculty members in the department. Early in their second year, students are expected to develop an original research proposal cooperatively with faculty advisors. Students generally select a thesis advisor by the end of the first year. Subsequent years are spent primarily in dissertation research.

Students working toward the PhD degree take a preliminary examination at the beginning of the second or third year of study. This examination has both written and oral components. Students in the MS program typically take a preliminary examination at the end of the first year of study. Upon completion of dissertation research, the PhD student must prepare and defend his/her PhD thesis in accordance with the rules and regulations of the School of Graduate and Postdoctoral Studies. There are no foreign language requirements. Four calendar years after the baccalaureate degree are typically required to complete the PhD program. An MS degree may be completed within two years.

In conjunction with the Medical and Podiatric Medicine Schools, the department offers combined degree programs leading to the MS/MD, DPM/PhD, or MD/PhD degrees. The combined degree program in Cell Biology and Anatomy is designed to prepare individuals for a career in biomedical research that is clinically oriented. Participation in the combined degree programs requires acceptance by the medical, podiatric, and graduate schools, respectively. The MD/PhD or DPM/PhD degree typically requires two to three years in addition to the time required for the MD or DPM degree.

Career Potential

Modern Cell Biology and Anatomy are strongly research-oriented disciplines. In addition, they occupy a crucial position in medical and biomedical education. As a result, academic positions continue to be attainable for those who can teach in the anatomical sciences and do research. Furthermore, the demand from research institutes and from industry for well-trained cell biologists has increased in recent years. Skilled and strongly-motivated individuals trained in this discipline may find their research and teaching talents put to effective use in any of several challenging careers.

Course Descriptions

MCBA 500A, B Clinical Anatomy

In this course, human anatomy is studied by using a regional approach that also includes functional and clinical correlations. Laboratory time is devoted exclusively to the regional dissection of a human cadaver. Supplementary offerings within the course include computerized images, guides and videos, prosected cadavers and bone sets for individual study. A-Fall Quarter, three lectures and five laboratory hours per week (5 units), B-Winter Quarter, four lectures and five laboratory hours per week (6 units).

MCBA 502A, B Histology

The principal educational goal of this course is an understanding of organ structure and organ function, through the detailed study of light microscopic preparations and electron micrographs. Fall Quarter, 3 units; Winter Quarter (2 units).

GCBA 505 Developmental Biology

The course presents current topics focused on basic developmental processes in model systems ranging from lower eukaryotes to mammals. The course covers both cellular and molecular aspects of development. Medical applications of conclusions drawn from basic experimental systems will be discussed where appropriate; for example, understanding of birth defects. Spring Quarter, offered in alternate years (2 units).

GCBA 530 Master's Thesis in Cell Biology and Anatomy

Hours and units of credit to be arranged.

GCBA 535 Doctoral Dissertation in Cell Biology and Anatomy

Hours and units of credit to be arranged.

GCBA 532 Cell Biology/Anatomy Journal Club

Presentations on current literature or personal research by faculty, staff and students. Fall, Winter, Spring and Summer Quarters, one hour per week. Can be repeated for credit (1 unit).

GCBA 533 Cell Biology/Anatomy Seminar

Presentations on current research by invited speakers. Fall, Winter and Spring Quarters, one hour per week. Can be repeated for credit, (1 unit).

MCBA 504 Embryology

In this course, the development of the human from conception to delivery is examined. Emphasis is placed on both normal and abnormal development. Supplementary laboratory exercises are provided. Winter Quarter (3 units).

GCBA 537 Methods in Research

Graduate students are introduced to research methods by working in faculty members' laboratories for periods of six to eight weeks. The rotation is tailored to the individual needs and desires of the student. Additional supplementary lecture-demonstrations are offered to ensure that each student is acquainted with all special instrumentation available in the department. Hours and units of credit to be arranged.

MCBA 606 Advanced Topics in Cell Biology

This course focuses on selected topics concerning the structure and function of molecules and organelles within the cytoplasm and extracellular matrices. Emphasis placed on the use of primary source materials. Two hours per week (2 units). Not offered every year.

GCBA 551 Basic Electron Microscopy Technique

This course introduces the student to the technical aspects of conventional transmission electron microscopy, and combines lectures with laboratory exercises. Students carry out the following procedures: animal surgery and tissue fixation, epoxy embedding, thick- and thin-sectioning and examination and photography of sections with the light microscope and the electron microscope. One lecture and one laboratory session per week. Prerequisite: consent of the instructor. (2 units)

GCBA 590 Zero Credit Research

This designation is utilized for students who have completed all course and research requirements but are continuing with thesis/dissertation work.

Multidisciplinary Courses

GMTD 709 Molecular and Cellular Sciences Seminar
(1 unit per year).

GMTD 711 Cell Journal Club (1 unit).

GBCH 538A, B Advanced Molecular Biology (5 units).

MBCH 502 Molecular Cell Biology (5 units).

GCBA 536 The Neurobiology of Learning and Memory
(3 units). Offered alternate years. Prerequisite:
MNSC 501 Medical Neuroscience.

Faculty and Associated Staff

Marc Abel, PhD, Associate Professor
Christopher Brandon, PhD, Associate Professor
Tung-Ling Chen, PhD, Research Assistant Professor
Joseph DiMario, PhD, Associate Professor
Karen DiMario, MS, Instructor
Mirek Dundr, PhD, Assistant Professor
William Frost, PhD, Professor and Chair
Lakshmi Gollapudi, PhD, Adjunct Assistant Professor
Nasrin Haghighat, PhD, Instructor
David McCandless, PhD, Professor
John Minarcik, MD, Adjunct Instructor
Monica Oblinger, PhD, Professor
Michael Sarra, PhD, Professor
Greg Skladzien, MD, Adjunct Instructor
Thanos Tzounopoulos, PhD, Assistant Professor
Barbara Vertel, PhD, Professor

Department of Cellular and Molecular Pharmacology

The Department offers a PhD degree in Cellular and Molecular Pharmacology, as well as combined MD/PhD and DPM/PhD degrees. A well-rounded research and teaching program in Cellular and Molecular Pharmacology has been developed and the ratio of graduate students to faculty facilitates close interaction among them. Students are presented with numerous opportunities to participate in research seminars, journal clubs, discussion and collaboration with other research groups in this medical school and around the country.

Career Potential

Career opportunities for those holding the doctorate in Cellular and Molecular Pharmacology are excellent and cover a wider spectrum than those of most other medical sciences. In addition to academic teaching and research, pharmaceutical companies and government organizations are searching for graduates trained in these areas. To date, all graduates of our doctoral program have found responsible positions in a university or pharmaceutical company.

Graduate Training

The objective of the graduate program in Cellular and Molecular Pharmacology is to develop individuals highly skilled and knowledgeable in the field, capable of teaching and conducting significant research in an institution concerned with health care.

Course of Study

During the first two years of the doctorate program, students take formal coursework in Physiology and Biophysics, Biochemistry and Molecular Biology, Molecular Cell Biology, Advanced Molecular Biology, Neuroscience, Medical Pharmacology, Neuropharmacology, and Cellular and Molecular Pharmacology. Additional coursework is selected according to individual interests. Appropriate subject areas include gene regulation and neuroscience. Elective courses are offered in these and related areas. Effective presentation skills are developed, with frequent

participation in journal clubs and seminars. Students select a faculty advisor early in the second year; together they select a preliminary examination committee. Official candidacy for the PhD degree is awarded upon development of an original research proposal (of the student's own design, typically written in the form of an NIH grant) and successful oral defense of the proposal before the committee. In consultation with the faculty advisor, an appropriate research project is planned and carried out. When the thesis is successfully defended, the PhD is awarded.

Admission to the Program

Applicants must meet the minimum requirements of the graduate school for admission. Scores from the Graduate Record Examination (GRE) are required for admission. A bachelor's degree reflecting a reasonable background in general biology, mathematics and chemistry is required. A completed application includes three letters of recommendation and a description of career goals. Students are not usually accepted into the graduate program unless they are preparing for the doctorate degree.

Prospective applicants are invited to discuss their plans informally with the department chair, or the departmental Graduate Student Advisor.

Application materials may be secured by writing the departmental office or the Office of Graduate Admissions, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, Illinois 60064-3095. Application materials are also available online at www.rosalindfranklin.edu/admissions/sgpds/cmp.html.

Financial Aid

Qualified students are usually offered university fellowships and/or assistantships with full remission of tuition. Students are also encouraged to apply for external monetary awards that are available from various federal and private agencies.

Course Descriptions

MCMP 600A, B, C Foundations of Medical Pharmacology

The subject matter is covered in lectures, conferences and tutorials. The mechanism of action of drugs at subcellular, molecular and biochemical levels, and factors affecting drug absorption, distribution, metabolism and excretion are discussed. In addition, pharmacogenetics, drug interactions, therapeutic uses, contraindications and side effects, as well as toxicology of selected compounds are presented. Drs. Oltmans and Potashkin, and Faculty.

MCMP 600A Fall Quarter, four lecture hours per week, (3 units).

MCMP 600B Winter Quarter, four lecture hours per week, (4 units).

MCMP 600C Spring Quarter, three lecture hours per week, (4 units).

GCMP 600 and 601 Neuropharmacology I and II

This course focuses on the biochemistry of neurotransmitters in the CNS. Current knowledge and theories of the mechanisms by which major classes of drugs act at the cellular and molecular level to influence the biosynthesis, distribution, storage, uptake, release and metabolism of centrally active neurochemicals will be covered. Scholarly publications will accompany discussion lessons. GCMP 600I – Winter Quarter, 1–2 hours per week (1 unit); GCMP 601 – Spring Quarter, 2 hours per week (2 units). Dr. Mosnaim and Faculty.

GCMP 502 Cellular and Molecular Pharmacology Journal Club

Discussion of current literature or thesis research presented by graduate students. Given in all quarters, one hour in alternate weeks, may be repeated for credit (2 units per year). Dr. Mosnaim and Faculty.

GCMP 509 Seminar in Pharmacology

Given in all quarters, as scheduled (1 unit per year). Faculty.

GBCH 538A, B Advanced Molecular Biology

This course deals with advanced topics in molecular biology that are of current and fundamental interest. Recent advances in the expanding field and their implications are emphasized. Parts of Winter and Spring Quarters. Prerequisites: Biochemistry, Molecular Cell Biology, or related courses. Offered every other year (5 units). Dr. Fennewald and Faculty.

GCMP 535 Doctoral Dissertation in Pharmacology

Hours and units of credit to be arranged (5–15 hours per quarter). Faculty.

GCMP 539 Research in Pharmacology

Hours and units of credit to be arranged. Faculty.

GCMP 590 Zero Credit

This designation is utilized for students who have completed all course and research requirements but are continuing with thesis/dissertation work.

Multidisciplinary Courses

GMTD 707	Current Topics in Neurobiology (2 units)
GMTD 709	Molecular and Cellular Sciences Seminar (1 unit)
GBCH 538A, B	Advanced Molecular Biology (5 units)
MBCH 502	Molecular Cell Biology (6 units)
GMIC 580	Molecular and Genetic Basis of Disease (4 units)
GCBA 536	The Neurobiology of Learning and Memory (3 units)
GMTD 800	Seminar — MD/PhD (1 unit)
GMTD 805	Introduction to Research — MD/PhD

General Courses

GBCH 539	The Art of Scientific Presentation
GGCS 724	Ethics in Biomedical Research (1 unit)

Other Courses

(See departmental pages for a complete listing and full description.)

GBCH 539	The Art of Scientific Presentation (2 units)
MBCH 508	Human Genetics (1 unit)
GBCH 543	Enzyme Structure and Mechanism (3 units)
GBCH 544	Physical Biochemistry (3 units)
GBCH 554	Computer Applications in Biomedical Research (2 units)
MCBA 502A, B	Histology (5 units)
GCBA 505	Developmental Biology (2 units)
MMIC 600A, B, C	Medical Microbiology & Immunology (6 units-A; 5 units-B; 4 units-C)
GNSC 555	Plasticity in Brain Development (3 units)
GNSC 560	Cellular Neurobiology (3 units)
GNSC 563	Neurogenesis and Differentiation (3 units)
GNSC 564	Synaptic Transmission (3 units)
GNSC 575	Neurobiological Correlates of Psychiatric Disorders

MPHY 500B	Medical Physiology (7 units)
GPHY 512	Physiology of the Autonomic Nervous System (2 units)
MPHY 620	Integrative Physiology Through Computer Simulation (2 units)
GPSC 521	Theoretical Psychopathology (2 units)
GPSC 530	Introduction to Neuropsychology (4 units)
GPSC 540	Learning Theory (2 units)
GPSC 541	History and Philosophy of Science (3 units)
GPSC 570	Physiological Psychology (4 units)

Faculty and Associated Staff

Pastor Couceyro, PhD, Assistant Professor
 Rachid El Kouhen, PhD, Adjunct Professor
 Xiu-Ti Hu, MD, PhD, Research Associate Professor
 Michela Marinelli, PhD, Assistant Professor
 Gloria Meredith, PhD, Professor and Chair
 Aron Mosnaim, PhD, Professor
 Velayudhan Nair, PhD, Distinguished Professor Emeritus
 Gary Oltmans, PhD, Associate Professor
 Judith Potashkin, PhD, Associate Professor
 Barry Roberts, PhD, Adjunct Professor
 Ann Snyder, PhD, Research Associate Professor
 Heinz Steiner, PhD, Associate Professor
 Kuei-Yuan Tseng, PhD, Assistant Professor
 Francis White, PhD, Professor

Department of Microbiology and Immunology

The Department of Microbiology and Immunology offers graduate programs of study leading to the MS and PhD degrees. In addition, the Department participates in the combined MD/PhD, DPM/PhD, and MS/MD programs. The programs prepare candidates for careers in research and teaching in the field of modern Microbiology and Immunology, which is a rapidly progressing multi-disciplinary field of the biomedical sciences.

Career Potential

Microbiologists and immunologists can find productive careers in academic settings, hospitals, environmental agencies and public health service centers, and in pharmaceutical and biomedical research institutes and industries. Postdoctoral training is considered helpful and often necessary for securing academic positions.

All recipients of doctoral degrees in microbiology and immunology from the University to date have found successful employment within their field, most of them in academic and biotech institutions. The department maintains information on postdoctoral openings and will assist graduates in securing positions.

Graduate Training

The aim of the graduate training program is to develop competent researchers and teachers in all fields of medical microbiology and immunology. Emphasis is placed on helping the student to explore creative potential and to develop essential research skills and teaching competence that will enable him/her to secure a faculty appointment, in a medical or related health professions' school, or a position as a research scientist in a biomedical research institute or in the biotechnology and pharmaceutical industry. The department offers formal courses covering both basic and clinical microbiology and immunology and specializes in advanced teaching of immunology, molecular biology,

clinical immunology, molecular virology, cell biology, parasitology, and molecular parasitology. Collateral formal course work is provided in other basic medical sciences by the Departments of Cell Biology and Anatomy, Biochemistry and Molecular Biology, Pathology, Cellular and Molecular Pharmacology, Physiology and Biophysics in the Medical School.

Students are encouraged, with assistance of faculty advisors, to develop a specific program of coursework, independent reading and dissertation research that in the breadth and depth of its coverage is fitting to their individual backgrounds, interests and career goals. Modern research laboratories and equipment are available to all graduate students within the department.

Entrance Requirements

Candidates for admission must have a baccalaureate or MS degree or its equivalent from an accredited college or university. Applicants are selected on the basis of previous academic work grade point average, satisfactory scores on the Graduate Record Examination (GRE), recommendations from persons involved in the student's previous educational and/or research experience and, whenever possible, a personal interview.

Although no formal deadline exists for applying, students are urged to submit their applications as early in the year as possible. Students requiring financial support should apply before March 25. Please refer to general entrance requirements and financial aid sections in this catalogue and on the University Web site. Application forms may be obtained from the Office of Graduate Admissions, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, IL 60064. Completed applications should be returned to the Office of Graduate Admissions.

Core Courses

GMIC 600A, B, C Microbiology and Immunology
(Fall, Winter, Spring)

MBCH 502 Molecular Cell Biology (Fall)

MBCH 505A, B Medical Biochemistry
(Winter, Spring)

Course Descriptions

GMIC 600A, B, C Microbiology and Immunology

This course consists of two parts: 1) approximately 55 lectures of relevance from Medical Microbiology and Immunology (GMIC 600A-C) taken along with medical students on immunology, basic bacteriology, pathogenic bacteria and virology and 2) students' review, presentations and discussion of the latest articles related to subjects of the lectures. Parts 1 and 2 will be scheduled according to the subject matters. Evaluation will include a written exam for the lecture materials in Part 1 and scores of the students' presentations. Dr. Fennewald and Faculty.

GMIC 600A Fall Quarter, 6 lecture hours
(when scheduled) per week
(4 units)

GMIC 600B Winter Quarter, 6 lecture hours
(when scheduled) per week
(4 units)

GMIC 600C Spring Quarter, 3 lecture hours per week
(4 units)

MBCH 502 Molecular Cell Biology

In this course, the molecular and cellular processes common to all eukaryotic cells are studied and, where appropriate, comparisons to prokaryotic cells are made. The molecular and cellular processes of specific cell types and tissue types are also considered, and related to their morphological appearance. Fall Quarter, three lecture hours and one conference hour per week (5 units). Dr. Walters and Faculty.

GMIC 503 Virology

This course covers fundamental animal virology including virus structure, classification, replication and genetics. Viruses of current interest that produce human disease (HIV, for example) will be discussed. Other topics may include molecular mechanisms of viral latency, role of viruses in oncogenesis, emerging viral infections of man, and viruses and gene transfer vectors in human gene therapy. The course will be lecture based and include discussion of original research articles. A mid-term and final examination, as well as one short paper, will be required. Winter, alternate years, three lecture hours per week (3 units). Prerequisite: MBCH 502 or permission of instructor. Drs. Chandran and Meneses, and Faculty.

MBCH 505A, B Medical Biochemistry

The fundamental chemical properties and biological reactions of the various compounds important to the normally functioning human organism are studied. As far as possible, mechanisms of life processes at the cellular and molecular level are explained in terms of these properties. Original literature is discussed in conference groups. Winter Quarter, five lecture hours and one conference hour per week for four weeks. Spring Quarter, three lecture hours and two conference hours per week (total of 7 units). Dr. Kaplan and Faculty.

GMIC 510 Introductory Immunology

This course is appropriate for non-Microbiology and Immunology majors who have no formal training in immunology or who wish to review the fundamentals in preparation for the Advanced Immunology course. An overview of specific and nonspecific immunity, structure and function of immunoglobulins, molecular basis of antibody diversity, T-cell and B-cell differentiation, cell-cell interactions in the immune response, humoral and cell-mediated immunity, lymphokines and mediators, immunogenetics and major histocompatibility complexes, complement, inflammation, hypersensitivity, autoimmune and immunodeficiency diseases, tumor immunology and transplantation immunology are among the topics discussed. Fall Quarter, 30 to 35 total hours (3 units). Prerequisite: Permission of instructor. Drs. Beaman and Gilman-Sachs, and Faculty.

GMIC 520 Molecular Parasitology

This course involves theoretical and practical aspects of applying new biological technology to study parasites and parasitic mechanisms of major tropical diseases. Emphasis is on molecular biology (especially DNA and RNA interactions). The depth of coverage depends on the prior training of the participants. Students are expected to actively participate in discussing recent literature as well as in project-oriented research. Research topics may be catered to the background or training and interests of the students. Winter Quarter, three hours per week (3 units). Prerequisites: Biochemistry, Cell Biology and/or Molecular Biology. Dr. Chang.

GMIC 530 Master's Thesis in Microbiology and Immunology

Fall, Winter, Spring and Summer Quarters. Hours and units of credit to be arranged (5 to 15 units per quarter). All Faculty.

GMIC 532 Microbiology and Immunology Journal Club

Faculty, post-doctoral fellows and students discuss current research efforts. Participants will present their "work in progress" in informal presentations that include an introduction to the field of interest. This series will cover the topics of research currently being pursued in our department and is geared towards learning of each other's work and assisting one another in defining our science and presentation skills. Required for all Microbiology and Immunology students. Journal Club continues throughout the entire year (1 unit). Dr. Meneses and Faculty.

GMIC 533 Seminar in Microbiology and Immunology

Presentations on current research in the field of Microbiology and Immunology by invited speakers, faculty and students. Required of all Microbiology and Immunology students. Fall, Winter and Spring Quarters, one hour per week (1 unit). Dr. Chandran and Faculty.

GMIC 535 Doctoral Dissertation in Microbiology and Immunology

Fall, Winter, Spring and Summer Quarters. Hours and units of credit to be arranged (5 to 15 units per quarter). All Faculty.

GBCH 538A, B Advanced Molecular Biology

This course is designed to give the student a sound background in molecular biology and genetics. This course will cover topics such as gene regulation, RNA splicing, DNA structure and topology, chromosome structure and mechanics, recombination and replication with an emphasis on protein-nucleic acid interactions. Both eukaryotes and prokaryotes will be covered. Parts of Winter and Spring Quarters, three lectures per week (5 units). Prerequisites: Introductory Biochemistry and Molecular Cell Biology or related courses. Drs. Potashkin and Fennewald, and Faculty.

GMIC 539 Introduction to Research

Graduate students, early in their courses of study, work with a member of the faculty in research to learn specific basic procedures that enable students to select their graduate research work. Fall, Winter, Spring and Summer Quarters. Hours and units of credit to be arranged. All Faculty.

GMIC 540 Research in Clinical Immunology

Six weeks of full-time research during the summer between the first and second years. Students, early in their courses of study, work with a member of the faculty to learn basic procedures of research. Student involvement consists of doing experimental research in the faculty advisor's laboratory. Evaluation of student is based on research accomplishment and knowledge. Each student is required to present a poster at the Summer Research Fellowship Poster Session held in the fall (6 units). Dr. Gilman-Sachs and Faculty.

GMIC 542 Selected Topics of Microbiology, Virology, Parasitology, Immunology and Molecular Biology

Topics for discussion in any of the above areas are announced three months in advance. Fall, Winter, Spring and Summer Quarters, one to five hours per week, to be arranged by individual instructors (1 to 5 units per quarter). Prerequisites: GMIC 600A, B and C. All Faculty.

GMIC 549 Flow Cytometric Technique

Students learn flow cytometric technology including immunophenotyping, cell sorting, DNA kinetics and cellular ploidy analysis. Fall Quarter, alternate years. Prerequisites: Permission of instructor. Dr. Gilman-Sachs.

GMIC 560 Advanced Immunology

Lectures, discussion and assigned reading for in-depth studies to cover properties of antigens and antibodies, mechanisms of antibody formation, phylogeny and ontogeny of the immune system, structural and functional aspects of the immune system, molecular basis of antibody and lymphocyte diversity, major histocompatibility complexes in man and animals, immunogenetics of differentiation, effector mechanisms of antibody and cell-mediated immunity, immunodeficiency diseases, regulation and control of the immune response and genetics and immunology of transplants and tumors. Winter Quarter, alternate years, three lecture hours per week (3 units). Prerequisites: GMIC 600A or Introductory Immunology and Biochemistry. Drs. Beaman and Gilman-Sachs, and Faculty.

GMIC 561 Clinical Immunology

Lectures, discussion and assigned readings on subjects related to clinical immunology including immunogenetics, immunopathology and mechanisms of immunologic diseases such as allergy, immunodeficiency, autoimmune and malignant diseases; mechanisms of immunoregulation; therapeutic manipulation of the immune response; and application of monoclonal antibodies, etc. Fall Quarter, alternate years, three hours per week (3 units). Prerequisites: GMIC 600A and/or GMIC 560 and permission of instructor. Drs. Gilman-Sachs and Beaman.

GMIC 564 Contemporary Topics in Clinical Immunology

This course covers basic concepts, rationale and principles of clinical immunology assays used in the clinical immunology laboratory for diagnosis and clinical evaluation. It helps the students to be able to describe clinical research as used in the clinical immunology laboratory. Summer Quarter, two hours per week (2 units). Drs. Beaman and Gilman-Sachs.

GMIC 565 Scientific Writing for Graduate Students

Students are led through the process of writing scientific manuscripts of their own data. Class size is limited to eight students. Spring Quarter, one two-hour session per week (2 units). Prerequisites: Students should be advanced-standing students. Faculty.

GMIC 580 Molecular and Genetic Basis of Diseases

The course presents the molecular and genetic basis of a series of diseases involving the immune system and infectious microbes. It is designed to cover the experimental basis of scientific investigations in these areas and their relevance to our understanding of human diseases. The course will cover topics such as transplantation, allergic and autoimmune diseases, immunodeficiency diseases, microbial infections, microbial resistance, cancer and HIV infections. Winter Quarter, three hours per week (3 units). Prerequisites: MBCH 502 Molecular Cell Biology. Dr. Fennewald (Course Director) and Faculty.

GMIC 590 Zero Credit

This designation is utilized for students who have completed all course and research requirements but are continuing with thesis/dissertation work.

Multidisciplinary Courses

GBCH 538A Advanced Molecular Biology

This course deals with advanced topics in molecular biology that are of current and fundamental interest. Recent advances in the expanding field and their implications are emphasized. Winter and Spring quarter, three lectures per week (5 units). Prerequisite: Introductory Biochemistry and Molecular Cell Biology or related courses. Director Dr. Potashkin, Co-Director Dr. Fennewald and Faculty.

GMIC 560 Advanced Immunology

Lectures, discussion and assigned readings for in-depth studies covering properties of antigens and antibodies, mechanisms of antibody formation, phylogeny and ontogeny of the immune system, structural and functional aspects of the immune system, molecular basis of antibody and lymphocyte diversity, major histocompatibility complexes in man and animals, immunogenetics of differentiation, effector mechanisms of antibody and cell-mediated immunity, immunodeficiency diseases, regulation and control of the immune response, and genetics and immunology of transplants and tumors. Winter Quarter, alternate years, three lecture hours per week (3 units). Prerequisite: GMIC 600A or Introductory Immunology and Biochemistry. All Faculty.

GMTD 800 Seminar (MD/PhD)

This course is designed for the first two years of the MD/PhD student's or the first year of the PhD student's course of study, before the selection of a major advisor and a basic science department. The students will take a seminar course from each of the six departmental seminar programs. Students are required to attend and/or participate in at least one seminar per week from any of the departmental seminars (GBCH 533, GCBA 533, GMIC 533, GNSC 533, GCMP 509 and GPHY 505). Fall, Winter and Spring Quarters, one hour per week (1 unit). All Faculty.

GMTD 805 Introduction to Research (MD/PhD) (TBA)

This course is designed for the first two years of the MD/PhD student's or the first year of the PhD student's course of study, before the selection of a major advisor

and a basic science department. The student may take this course as laboratory research rotations. Fall, Winter, Spring and Summer Quarters, hours and units to be arranged. All Faculty.

General Courses

GGCS 717 Biostatistics

Introduction to data analysis and computer techniques for the biological sciences. Topics covered include descriptive statistics, parametric and non-parametric hypothesis testing, analysis of variance, simple linear regression and correlation. Spring Quarter, four hours per week (4 units). Psychology Faculty.

GBCH 539 The Art of Scientific Presentation

The successful scientific career requires clear communication of scientific results. Participants in this course practice giving and evaluating oral presentations of technical material. Topics to be covered include organization of a talk, targeting the material to the appropriate level of the audience, overcoming "stage fright," effective visual aids, developing eye contact, effective use of voice, overcoming language barriers and handling question-and-answer sessions. Spring Quarter, two hours per week (2 units). Dr. Walters.

GGCS 724 Ethics in Biomedical Research

This course covers a variety of topics that are related to the responsible conduct of research in the biomedical sciences. The topics include scientific integrity in the gathering and reporting of data, proper allocation of credit in collaborative studies and the various types of misconduct that are seen in research. The ethical use of animals and human subjects is discussed. Furthermore, current issues concerning the societal role of the academic scientist in dealing with the media, commercialized research, etc., are presented. The course is structured along federal guidelines on scientific integrity as part of research training and is aimed to prepare students for the various ethical situations that may arise during the course of a research career. The course is mandatory for all graduate students. Spring Quarter, one hour per week (1 unit). Offered every year. Faculty.

MS/MD Program in Clinical Immunology

The MS/MD program in Clinical Immunology is offered by the Department of Microbiology and Immunology and is designed to provide the medical student with in-depth knowledge of the basic principles of clinical immunology and their application to the diagnosis and treatment of immunologically related disorders. The program encompasses the study of a spectrum of diseases including autoimmune diseases, allergy and hypersensitivity reactions, immunodeficiency diseases, AIDS and other infectious diseases, lymphoproliferative disorders and the immune response during pregnancy, particularly as it is related to transplantation and fertility. The curriculum is designed to give the student an introduction to basic laboratory research and provide advanced courses in immunology and clinical immunology, as well as techniques used in diagnosis and treatment. In addition to the regular medical school curriculum, the following courses are required.

First Year

GMIC 540 Research in Clinical Immunology

Six weeks full-time research during the summer between the first and second years. Students, early in their courses of study, work with a member of the faculty to learn basic procedures of research. Student involvement consists of doing experimental research in the faculty advisor's laboratory. Evaluation of student is based on research accomplishment and knowledge. Each student is required to present a poster at the Summer Research Fellowship Poster Session held in the fall (6 units). Dr. Gilman-Sachs and Faculty.

GMIC 564 Contemporary Topics in Clinical Immunology

This course covers basic concepts, rationale and principles of clinical immunology assays used in the Clinical Immunology Laboratory for diagnosis and clinical evaluation. It helps the students to be able to describe clinical research as used in the Clinical Immunology Laboratory. Summer Quarter, two hours per week (2 units). Drs. Beaman and Gilman-Sachs.

Second Year

GMIC 533 Seminar in Microbiology and Immunology

Presentations on current research in the field of Microbiology and Immunology by invited speakers, faculty and students. Required of all Microbiology and Immunology students. Fall, Winter and Spring Quarters, one hour per week (1 unit). Students may select and attend 10 seminars per year. Dr. Chandran and Faculty.

GMIC 540 Research in Clinical Immunology

Continuation of research project started in the first year (3 units). Dr. Gilman-Sachs and Faculty.

GMIC 560 Advanced Immunology

Lectures, discussion and assigned reading. Student has an understanding of properties of antigens and antibodies, mechanisms of antibody formation, phylogeny and ontogeny of the immune system, structural and functional aspects of the immune system, molecular basis of antibody and lymphocyte diversity, major histocompatibility complexes in man and animals, immunogenetics of differentiation, effector mechanism of antibody and cell mediated immunity, immunodeficiency diseases, regulation and control of the immune response and genetics and immunology of transplants and tumors. Students are evaluated by a final written exam. Winter Quarter, alternate years, three lecture hours per week (3 units). Prerequisites: GMIC 600A or Introductory Immunology and Biochemistry. Faculty.

Third Year

GMIC 533 Seminar in Microbiology and Immunology

Students may select and attend 10 seminars per year (1 unit). Dr. Chandran and Faculty.

Fourth Year

GMIC 533 Seminar in Microbiology and Immunology

Students may select and attend 10 seminars per year (1 unit). Dr. Chandran and Faculty.

GMIC 540 Research in Clinical Immunology

Laboratory research in advisor's laboratory or library research during the period of the senior elective. Program ends with a required report of either the student's laboratory research or a library term paper and a 45-minute seminar (4 units). Dr. Gilman-Sachs and Faculty.

GMIC 549 Flow Cytometric Technique

Students learn flow cytometric technology in our Flow Cytometry Laboratory including immunophenotyping, cell sorting, DNA kinetics and cellular ploidy analysis during six-week elective. Taken concurrently with GMIC 561. Evaluation by a final exam (1 unit). Dr. Gilman Sachs.

GMIC 561 Clinical Immunology

Lecture, discussion and assigned readings on subjects related to clinical immunology including immunogenetics, immunopathology and mechanisms of immunologic diseases such as allergy, immunodeficiency, autoimmune and malignant diseases; mechanisms of immunoregulation; therapeutic manipulation of the immune response; and application of monoclonal antibodies. Enrollment required during six-week senior elective. Evaluation by a final exam. Prerequisites: GMIC 600A and permission of instructor. (2 units) Drs. Gilman-Sachs and Beaman, and Faculty.

By participation in this curriculum, the student should understand the basic concepts of clinical immunology and show he/she is able to apply these concepts to the diagnosis and treatment of patients as well as understand the basic concepts of research in the area of clinical immunology.

Faculty and Associated Staff

Kenneth Beaman, PhD, Professor

Bala Chandran, PhD, Professor and Chair

Kwang-Poo Chang, PhD, Professor

Michael Fennewald, PhD, Associate Professor

Eric Gall, MD, Professor

Alice Gilman-Sachs, PhD, Associate Professor

Joanne Kwak-Kim, MD, Associate Professor

Patricio I. Meneses, PhD, Assistant Professor

Department of Neuroscience

Neurological disorders afflict approximately 25% of the American public including more than four million individuals currently suffering from neurodegenerative disorders such as Alzheimer's disease, parkinsonism and others. Millions of other Americans are affected by schizophrenia, depression, stroke, epilepsy, visual impairment, drug addiction and hearing loss. Basic and clinical research holds great promise for the diagnosis, prevention and treatment of such diseases.

The Department of Neuroscience offers research opportunities leading to the PhD, DPM/PhD, and MD/PhD degrees in Neuroscience. The interests of participating faculty members encompass several neurotransmitter systems (particularly dopamine, nitric oxide, and excitatory amino acids), mechanisms of neural degeneration and death (particularly as related to Parkinson's disease, Alzheimer's disease, and other neurological disorders), neuronal repair strategies (including gene therapy and neuronal stem cells), and the cellular basis of drug addiction and drug-induced neuroplasticity.

In addition, the Department of Neuroscience coordinates the Interdepartmental PhD Program in Neuroscience that includes the Departments of Biochemistry & Molecular Biology, Cell Biology and Anatomy, Cellular & Molecular Pharmacology, and Physiology & Biophysics. The Interdepartmental Program affords students an even wider range of potential research topics and thesis advisors.

The objective of our graduate programs is to prepare PhD, MD/PhD, and DPM/PhD students for careers in research and teaching. The first two years of graduate study are occupied by course work, laboratory rotations, and completion of the Qualifying Exam. In subsequent years, students are involved in research, seminars and independent study. The course of study is guided by an integration of molecular, cellular, systems, and clinical perspectives. This multidimensional approach provides the broadest spectrum of research opportunities in this exciting and diverse field.

Graduate Degrees Offered

The PhD degree requires successful completion of required course work, a qualifying examination, an original research project, and the writing and defense of an acceptable dissertation. Students admitted to the combined MD/PhD and DPM/PhD programs are able to complete most of their PhD course work through the basic science courses required during the first two years of medical studies. They then enter the doctoral dissertation phase of their studies, followed by two years of training in clinical medicine. Four to five years are typically required to complete the PhD degree, and six to seven to complete the combined MD/PhD and DPM/PhD degrees.

Application to the Program

Interested students should direct inquiries to Dr. Lise Eliot, Director of the Interdepartmental Neuroscience Program (lise.eliot@rosalindfranklin.edu). A resume of the applicants' academic accomplishments and research interests should accompany the inquiry. Formal application materials may be obtained from the Office of Graduate Admissions, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, Illinois, 60064.

Applicants are welcome to contact the Department office for further information at 847-578-3429 as needed. The deadline for applications is February 1, though later applications may be considered on a space-available basis. Admission to the program is decided upon by interdepartmental and departmental committees and official notification of acceptance is offered from the Office of the Dean of the Graduate School.

Financial Assistance

Qualified students are usually offered university fellowships with full remission of tuition. Students also are encouraged to apply, with faculty guidance, for external funds available from various agencies.

Course of Study

The first year of study typically includes: Molecular Cell Biology (MBCH 502: Fall), Introductory Biochemistry (MBCH 505A, B: Winter, Spring), Physiology for Neuroscience (GPHY 520, GPHY 521: Fall, Winter), Neuroscience (MNSC 501: Spring), Brain Frontiers (GMTD 510–512: Fall, Winter and Spring) as well as a Journal Club and a Seminar series running from Fall through Spring terms. The second year curriculum includes Basics of Neuropharmacology (CMP 5603: Fall), Neuropharmacology (CMP 5601A, B: Winter, Spring), Brain Frontiers GMTD 513–515: Fall, Winter, Spring), Ethics in Biomedical Research (GGCS 724: Winter), and Biostatistics (GGCS 717: Spring). Students will also complete a series of laboratory rotations during the first two years to select a laboratory in which to conduct their dissertation research.

Courses Offered

MNSC 501 Neuroscience

An interdisciplinary approach to the structure and function of the nervous system is presented by faculty from the Department. This course, designed for both medical and graduate students, provides a broad introduction to modern neuroscience, emphasizing: 1) cellular neuroscience, including neurochemistry of transmitters and receptor function, 2) systems neuroscience, focusing on motor, sensory and higher cognitive and affective systems, 3) neuroanatomy laboratories, utilizing human autopsy material and interactive computer-based learning, and 4) clinical neuroscience, focusing on neurological and psychiatric disorders, presented both in clinical correlations and small group discussions. Prerequisites: Medical Physiology, previously or concurrently, and permission of the instructor. Spring Quarter, 8 hours per week (7 units). Coordinated by Dr. Eliot and Faculty.

GNSC 504 Neuroscience Seminar

Invited speakers from around the world present their recent research. Fall, Winter and Spring Quarters, 1 hour every 3–4 weeks (1 unit). Coordinated by Dr. Peterson.

GNSC 535 Doctoral Dissertation in Neuroscience

Hours and units of credit to be arranged (5–15 hours per quarter). Faculty.

GNSC 539 Introduction to Research

Laboratory rotations performed prior to selecting a thesis advisor. All Quarters, hours per week will vary (6–8 units). Prerequisite: Graduate student status in Neuroscience PhD program. Faculty.

GNSC 553 Neuroscience Journal Club

Presentations on current literature, personal research and newsworthy developments in neuroscience by faculty, staff and students. Prerequisite: Graduate status in a department of the University. Fall, Winter and Spring. Quarters, one hour per week; may be repeated for credit (1 unit). Coordinated by Dr. West.

GNSC 555 Plasticity in Brain Development

Most nervous systems pass through two, overlapping phases in their development. The first phase, largely controlled by genes, sets up the basic architecture of the brain through the birth, migration, and initial synapse formation of new neurons. The second phase, on which we will focus in this course, is critically shaped by an animal's experience and involves the selective strengthening or pruning of individual connections as a function of their electrical activity. We will begin this seminar with a review of Hubel and Wiesel's classic work on experience-dependent brain plasticity and follow the topic to the latest studies of developmental plasticity in transgenic animals. Prerequisite: Consent of the instructor. Offered on a rotating basis during either Fall or Winter Quarter (3 units). Coordinated by Dr. Eliot.

GNSC 560 Cellular Neurobiology

This advanced course covers the unique aspects of neurodegenerative diseases. Topics to be covered are receptor-effector mechanisms, neural/glial metabolism and signaling and trophic substances and growth factors. Students receive didactic training, read current topics from the literature and lead pertinent discussion sessions. Prerequisite: Consent of the instructor. Offered on a rotating basis during either Fall or Winter Quarter (3 units). Coordinated by Dr. Ariano.

GNSC 563 Neurogenesis and Differentiation

This course covers the generation of the central nervous system and the differentiation of the multiple cell types that underlie the regional organization of the brain. The first portion of the course will survey basic concepts and recent advances in developmental neurobiology. The second portion will address the emerging field of neural stem cells in the adult brain and recent advances in our understanding of the factors regulating adult neurogenesis. The course will conclude by addressing the potential for using neural stem cells from the adult brain for structural brain repair. Prerequisite: Consent of the instructor. Offered on a rotating basis during either Fall or Winter Quarter (3 units). Coordinated by Dr. Peterson.

GNSC 564 Synaptic Transmission

This advanced course covers many aspects of synaptic function in the central nervous system, including the life cycle of neurotransmitters (synthesis, storage, release, re-uptake and metabolism), receptors responsible for presynaptic and postsynaptic actions, signal transduction mechanisms responsible for receptor signaling, and mechanisms enabling plasticity in the responsiveness of neurotransmitter systems. Students are responsible for presenting material and leading discussions based on current topics in the literature. Evaluation is based on class presentations and participation in group discussions. Prerequisite: Consent of the instructor. Offered on a rotating basis during either Fall or Winter Quarter (3 units). Coordinated by Dr. Wolf.

GNSC 570 Neuroscience Teaching Assistant

Assist with neuroanatomy training and exams for Medical Neuroscience Course. Spring Quarter, 4 hours per week (4 units). Coordinated by Dr. Eliot.

GNSC 575 Neurobiological Correlates of Psychiatric Disorders

This course examines the neurobiological basis of psychiatric disturbances (including schizophrenia, depression, anxiety, and Tourette's syndrome). The initial portion presents an overview of basic neuro-pharmacological concepts, with an emphasis on recent findings relevant to psychiatric disorders. The second portion will focus on the neuroanatomical, physiological, and neurochemical bases for specific psychiatric disturbances, and the mechanism of action of drugs used in their treatment. Prerequisite: Consent of the instructor. Offering on a rotating basis during either Fall or Winter Quarter (3 units). Coordinated by Dr. West.

Other Courses

All graduate students must take Brain Frontiers (GMTD 510-515) as well as Ethics in Biomedical Research (GGCS 724) and Biostatistics (GGCS 717). Other courses may be taken as determined by the trainee and their advisory committee.

Faculty and Associated Staff

Marjorie Ariano, PhD, Professor
Lise Eliot, PhD, Assistant Professor
Robert Marr, PhD, Assistant Professor
Daniel Peterson, PhD, Associate Professor
Grace E. Stutzmann, PhD, Assistant Professor
Anthony West, PhD, Assistant Professor
Marina Wolf, PhD, Professor and Chair

Department of Pathology

Graduate programs offered by the Department of Pathology are designed for students who are interested in research-related pathology, particularly cellular and molecular pathogenic mechanisms of major human diseases, such as diabetes, cancer, cardiovascular diseases, and neurological diseases, and the development of methods for the prevention and cure of these diseases.

Innovative research programs for PhD students have been established in the department. In particular, research on the cellular and molecular pathogenic mechanisms of autoimmune type 1 diabetes, prevention of autoimmune diabetes by the control of immune regulation, and approaches to the cure of type 1 and type 2 diabetes by insulin gene therapy and stem cell therapy have been recently established.

Career Potential

There are excellent career opportunities for those holding a PhD in pathology in medical and biomedical institutes, hospitals, public health service centers, and pharmaceutical companies. Those who have a PhD in pathology may need postdoctoral training before finding faculty positions in academic institutions. The demand from hospitals, pharmaceutical industries, and private and government biomedical research institutes for well-trained scientists has significantly increased.

The department provides available information on employment opportunities in hospitals and industry. In addition, the department will assist graduates in securing positions.

Course of Study

The department offers general courses in pathology and special courses on cell-specific diseases and the theoretical and practical aspects of advanced laboratory techniques in medical science. Collateral formal course work is provided in general basic medical science by the Departments of Biochemistry and Molecular

Biology, Microbiology and Immunology, Cell Biology and Anatomy, Neuroscience, Cellular and Molecular Pharmacology, and Physiology and Biophysics in the School of Graduate and Postdoctoral Studies and in the Chicago Medical School.

Admission to the Program

Admission to the PhD program in the Department of Pathology is on a competitive basis in addition to satisfying the minimum requirements for admission to graduate school. Applicants with a minimum score of 1800 on the GRE and a GPA of 3.5 and above (on a scale of 4.0) are considered competitive.

The MD/PhD program is designed for students who are interested in a research and/or academic career along with an MD degree, have a strong undergraduate science background, and are committed to a career combining both clinical and basic research. Applicants with a minimum score of 30 of the MCAT and a GPA of 3.5 or above are considered competitive.

Prerequisites for the MS program are established individually, depending on the interests of the applicant, in addition to the minimum requirements for admission to the graduate school.

Inquiries should be directed to:

Director of Graduate Programs in Pathology
Department of Pathology
Chicago Medical School
Rosalind Franklin University of Medicine and Science
3333 Green Bay Road
North Chicago, Illinois 60064

Application materials may be obtained from the Office of Graduate Admissions. Completed applications should be returned to the Office of Graduate Admissions.

Course Descriptions

MPAT 600A General Pathology

The biological bases and mechanisms of disease, including inflammation and repair, and cell injury by infectious, immunologic, vascular, genetic, physical, chemical, and neoplastic mechanisms, followed by a beginning survey of disease with emphasis on clinical pathologic correlations. Fall Quarter. Six lecture hours and two laboratory hours per week (7 units). Faculty.

MPAT 600B Systemic Pathology

Continuation of the survey of human disease. Winter quarter. Five lecture hours per week (6 units). Faculty.

MPAT 600C Systemic Pathology

Completion of the survey of human diseases. Spring quarter. Four lecture hours and two laboratory hours per week (6 units). Faculty.

GPAT 538 Special Topics in Cell-Specific Diseases

This course covers cellular and molecular pathogenic mechanisms of cell-specific autoimmune diseases including type 1 diabetes, rheumatoid arthritis, multiple sclerosis, and Sjögren syndrome. The course consists of lectures and student presentations. Students will be asked to read and demonstrate understanding papers from the literature. Two term papers are required as well as one final examination. Winter quarter, alternate years. Two 90-minute lectures a week (3 units). Instructors: Dr. Jeon and faculty.

GPAT 560 Theory of Advanced Laboratory Techniques in Medical Science

This course covers advanced techniques used in medical research, such as genomics and proteomics, flow cytometric analysis, real-time polymerase chain reaction, nucleotide sequencing, enzyme-linked immunosorbent assay, radioimmunoassay, transfection of eukaryotic cells, affinity chromatography, RNA and DNA isolation, recombinant DNA technology, gene therapy, and stem cell technology. The techniques offered will depend on the number and interests of the students. Presentations on an assigned technique required. Fall semester, alternate years. Two 90-minute lectures per week (3 units). Instructors: Dr. Jeon and faculty.

GPAT 523 Stem Cell Biology and Human Diseases

This course covers embryonic and adult stem cell biology, and emphasizes the basic concept of development and differentiation of organs and tissues and the application of stem cells for the possible treatment of human diseases such as diabetes, neurological disorders, hematopoietic diseases, and others. The course will be composed of lectures and student presentations. Students will be asked to read and demonstrate comprehension of papers from the literature. Two term papers are required as well as one final examination. Fall semester, alternate years. Two 90-minute lectures a week (3 units). Instructors: Dr. Jeon and faculty.

GPAT 524 Discussion on Research Progress

Students will prepare a formal presentation on their specific assigned research. All enrolled students will participate in discussions of the presented subject. The discussions will center on the strength and the weakness of the presented research work, anticipated problems involved in the research, and possible solutions of such problems. Two term papers are required as well as one final oral examination. Fall, winter and spring semesters. Two hours per week (2 units). Instructors: Dr. Jeon and faculty.

GPAT 525 Seminar in Pathology

Guest speakers, faculty, and students present current topics in the field of laboratory medicine and pathology related to their fields of emphasis. Many of the sessions are conducted in a journal club-like format, and students are expected to prepare at least one presentation. Prerequisite: Consent of seminar chair (1 unit). Faculty.

GPAT 521 Literature Survey

Students will prepare a written survey of the literature on a current topic related to pathology. Selection of the topic is to be approved by the faculty. Hours and units of credit to be arranged. Faculty.

GPAT 522 Teaching in Pathology and Laboratory Medicine

Students are responsible for preparing lectures or laboratory sessions for one of the department courses. Hours and units of credit to be arranged. Faculty.

GPAT 535 Doctoral Thesis Research

Students conduct an independent research project under the direction of a selected faculty member. Prerequisite: Successful completion of the preliminary examination. Hours and units of credit to be arranged. Faculty.

GPAT 536 Master's Thesis Research

Students conduct an independent research project under the direction of a selected faculty member. Hours and units of credit to be arranged. Faculty.

GPAT 539 Introduction to Research

Students are introduced to research techniques by working in the laboratory of an individual faculty member. Hours and units to be arranged. Faculty.

GPAT 590 Zero Credit

This designation is used for students who have completed all course and research requirements, but are continuing with thesis/dissertation work.

In addition to the courses offered by the Department of Pathology, the following courses are offered by other departments:

Course Number	Course Name
MBCH 505A, B	Medical Biochemistry
MMIC 600A, B, C	Medical Microbiology and Immunology
GCBA 505	Developmental Biology
MCBA 504	Embryology
MNSC 501	Medical Neuroscience
MPHY 500 A, B	Medical Physiology

Elective Courses

Course Number	Course Name
GBCH 538 A, B	Advanced Molecular Biology
GMIC 510	Introductory Immunology
GMIC 549	Flow Cytometric Techniques
GMIC 560	Advanced Immunology
GGCS 717	Biostatistics
GNSC 560	Cellular Neurobiology
GNSC 563	Neurogenesis and Differentiation

Specific Programs**PhD Program**

The objective of the PhD Program is to provide opportunities for students to become proficient in pathology and biomedical science, with particular emphasis on pathogenic mechanisms of major human diseases and development of methods for the prevention and cure of the diseases. Students should take at least three of the following courses: MPAT 600A: General and Systemic Pathology, GPAT 538: Special Topics in Cell-Specific Diseases, GPAT 560: Theory of Advanced Laboratory Techniques in Medical Science, GPAT 523: Stem Cell Biology and Human Diseases, MMIC 600A: Medical Microbiology and Immunology, and MBCH 505A Medical Biochemistry. It is highly recommended that students take as many elective courses as possible from the list. Students should also take the following courses: GPAT 535: Doctoral Thesis Research and GPAT 524: Discussion on Research Progress. Students will participate in departmental journal club seminars during the entire program. Additionally, students must meet the minimal requirements of the School of Graduate and Postdoctoral Studies (60 units of graduate course work and 75 units of research credit).

MD/PhD Program

This program is conducted concurrently with the regular medical school curriculum, and is configured so that the requirements for the PhD degree are satisfied along with those for the MD degree. Students ordinarily enter the program following completion of the second year medical school program. The prerequisite courses for the MD/PhD program in Pathology are: MPAT 600A: General and Systemic Pathology, MBCH 505A: Medical Biochemistry and MMIC 600A: Medical Microbiology and Immunology; these should be taken during the first two years of the regular medical school curriculum. To enter the MD/PhD program, a minimum of grade B in each of these three courses is required. Additionally, the MD/PhD programs require three major courses: GPAT 538: Special Topics in Cell-Specific Diseases, GPAT 560: Theory of Advanced Laboratory Techniques in Medical Science, and GPAT 523: Stem Cell Biology and Human Diseases.

As well, students should take the following courses: GPAT 522: Teaching in Pathology and Laboratory Medicine, GPAT 535: Doctoral Thesis Research, and GPAT 524: Discussion on Research Progress. It is highly recommended that students take as many elective courses as possible from the suggested list (see above). Students participate in departmental journal club/seminars during the entire program. Students also must meet the minimal requirements of the School of Graduate and Postdoctoral Studies (60 units of graduate course work and 75 units of research credit).

MS Program

The MS Program offers a degree in the field of general pathology, stressing pathogenic mechanisms of major human diseases. Students should take at least two of the following courses: MPAT 600A: General and Systemic Pathology, GPAT 538: Special Topics in Cell-Specific Diseases, GPAT 560: Theory of Advanced Laboratory Techniques in Medical Science, GPAT 523: Stem Cell Biology and Human Diseases, MMIC 600A: Medical Microbiology and Immunology, and MBCH 505A: Medical Biochemistry. At least two elective courses are required. Students should also take the following courses: GPAT 536: Master Thesis Research and GPAT 524: Discussion on Research Progress. Students will participate in the departmental journal club seminars during the entire program. Additionally, students must meet the minimal requirements of the School of Graduate and Postdoctoral Studies (30 units of graduate course work and 15 units of research credit).

MS/MD Program

This program is conducted concurrently with the regular medical school curriculum and is configured so that the requirements for the MS degree are satisfied along with those for the MD degree in the regular four year time span. Students ordinarily enter the program following completion of the third quarter of the first year medical school program, or in some instances, upon admission to the medical school with advanced standing.

The program begins with an introduction to the practice of pathology wherein the student is introduced to pathology and laboratory medicine as an integral component of the practice of medicine through a series of hospital-based experiences. Students participate in the departmental journal club/seminar during the entire program. At least two didactic or practical electives offered by the department are taken prior to the third year of medical school. During the fourth year of medical school, students participate in an intensive eight-week, full-time, hospital-based experience in diagnostic pathology. Additionally, a selected topic is explored in depth, and a formal paper is prepared and presented to the department.

MS/MD Courses

GPAT 551A Introduction to the Practice of Pathology

A beginning exposure to the practice of pathology as a hospital-based medical specialty. From the vantage of a representative group of preceptor-like experiences in selected hospital laboratory settings, the student is introduced to pathology and laboratory medicine as an integral component of the practice of medicine. Experiences include exposure to the variety of day-to-day activities of the practicing pathologist in surgical pathology, cytopathology and hospital laboratory practice as well as to a number of specialized activities such as electron microscopy, immunohistochemistry, neuropathology and forensic pathology. Classroom-based tutorials and discussions supplement and integrate the diverse practical experiences and introduce selected didactic concepts basic to pathology practice. Prerequisite: completion of the first year of the regular medical school curriculum, admission and enrollment in the Pathology MS/MD program. Summer quarter, six weeks full-time (6 units) Dr. Szanto.

GPAT 551B Introduction to the Practice of Pathology

This course is the same as GPAT 551A other than the scheduling of the course in the regular school year. In contrast to GPAT 551A which is given as a full-time, six-week summer course, GPAT 551B is given over the fall, winter and spring quarters. Prerequisite: enrollment in the Pathology MS/MD program. (6 units) Dr. Szanto.

GPAT 520 Seminar in Pathology and Laboratory Medicine

Students in the MS/MD program must enroll in the fall, winter and spring during the second, third and fourth years of medical school. Attendance in a minimum of ten sessions a year and presentation of a topic in at least one session is required during each of the three years. (1 unit per year). Dr. Szanto.

GPAT 527 Special Projects in Pathology

Students participate in a research project under the direction of a faculty member. Prerequisite: Consent of department chair. Hours and credit to be arranged. Faculty.

GPAT 537 Clinical Case Studies in Pathology

The applications of surgical pathology and clinical cytology to patient diagnosis and management. Human tissues obtained by biopsy or other techniques are reviewed by students and faculty. Pathologic changes are correlated with clinical and pathophysiologic data and the integration of the pathologist with other physicians concerned in day-to-day patient care and management is demonstrated by actual ongoing patient problems. Concurrent enrollment in GPAT 540 is required. Fall, winter or spring quarters, four weeks (4 units). Faculty at affiliated institutions.

GPAT 540 Clinical Correlations in Laboratory Medicine

The student is exposed to a wide variety of clinical laboratory tests and becomes familiar with technical and quality assurance aspects of clinical laboratory practice. Clinical correlations of laboratory testing and the interactions of the pathologist with other physicians in the diagnosis and management of specific patient problems are emphasized. Concurrent enrollment in GPAT 537 is required. Fall, winter or spring quarters, four weeks (4 units). Faculty based at affiliated institutions.

GPAT 569 Literature Review

The student prepares a formal paper based on library research or on a laboratory or clinical research project conducted by the student. Credit for this course depends on both acceptance of the written paper and an oral presentation to the department. Fall, winter and spring quarters (3 units). Dr. Szanto and faculty.

MS/MD Electives

It is highly recommended that students take three electives from the following list. A minimum of two is required.

GPAT 556 Applied Neuropathology

An in-depth presentation of nervous system disorders with special emphasis on anatomy, pathology and clinical pathological correlation. The topics covered are elaborations of topics previously introduced during the sophomore pathology course for medical students. The course should be of special interest to students planning careers in pathology, neurology or psychiatry. Spring Quarter, three hours lecture and discussion per week (3 units). Dr. Haberland.

GPAT 559 Advanced Hematology

An in-depth consideration of diseases of the hematopoietic and lymphoid systems and of hemorrhagic disorders, with considerable emphasis on etiology, pathogenesis, and clinical diagnostic approaches. The subjects covered are elaborations of topics previously introduced during the sophomore pathology course for medical students. Spring Quarter, three hours lecture and discussion per week (3 units). Dr. Schneider.

GPAT562 Chemical Pathology

A consideration of laboratory analytic considerations and the applications to clinical problem solving of data obtained by clinical chemistry laboratory procedures. Introductory lectures on a variety of topics are followed by the retrieval of laboratory data from hospital information systems and the interpretation and presentation of such data. Spring Quarter, two hours lecture and conference and three hours laboratory per week (3 units). Dr. Garon and Dr. Liu.

GPAT 564 Diagnostic Microbiology

The laboratory diagnosis of infectious disease. A detailed hands-on exposure to diagnostic procedures conducted in the clinical microbiology laboratory is followed by a clinically based set of problem-solving exercises utilizing actual ongoing patient problems to demonstrate the integration of the clinical microbiology laboratory with the clinical diagnosis and management of patients with infectious disease. Spring quarter, one hour lecture, six hours laboratory per week (3 units). Faculty based at affiliated institutions.

Faculty and Associated Staff

Elham Abboud, MD, Damascus University, 1988. Clinical Assistant Professor. *Anatomic and Clinical Pathology, Dermatopathology*.

Seana Aldabagh, MD, University of Baghdad, 1980. Clinical Assistant Professor. *Anatomic and Clinical Pathology*.

Saroja Bharati, MD, Madras University, 1966. Clinical Professor. *Pathology of Congenital Heart Disease and Conduction System*.

Moirá Breen, PhD, Northwestern University, 1960. Clinical Associate Professor. *Biochemistry of Aging*.

Antonio Chedid, MD, Central University of Madrid, 1962. Professor. *Hepatopathology, Electron Microscopy*.

Dilipkumar Dharkar, MD, University of Baroda, 1974. Clinical Professor. *Anatomic and Clinical Pathology*.

John R. Dooley, MS, MD, Boston College, 1958; University of Vermont, 1962. Associate Professor (retired). *Pathology of Infectious Disease*.

Bourke Firfer, MD, The Chicago Medical School, 1987. Assistant Professor (affiliate). *Anatomic and Clinical Pathology*.

Jack E. Garon, MD, Loyola University, 1981. Professor of the Practice of Pathology (affiliate). *Anatomic and Clinical Pathology, Clinical Chemistry*.

Catherine Haberland, MD, Kossuth Lajos Medical School, 1949. Professor of the Practice of Pathology (affiliate). *Neuropathology*.

Clarke J. Halfman, PhD, University of Illinois, 1970. Associate Professor (retired). *Clinical Chemistry, Immunoanalysis*.

Terence Harper, MD, American University of the Caribbean, 1995. Clinical Instructor. *Anatomic and Clinical Pathology*.

Raul M. Heredia, MD, University of Mexico, 1959. Clinical Assistant Professor. *Electron Microscopy*.

Hee-Sook Jeon, PhD, Chosun University, 1989. Research Associate Professor. *Molecular Pathology and Cell-specific Autoimmune Diseases*.

Nancy L. Jones, MD, Finch University of Health Sciences/The Chicago Medical School, 1982. Professor of the Practice of Pathology (affiliate). *Forensic Pathology*.

Ning Liu, MD, PhD, Beijing Capital Medical School, 1983. Assistant Professor (affiliate). *Clinical Chemistry*.

Chandrakant M. Modi, MBBS, Kastruba Medical College, 1967. Clinical Assistant Professor. *Anatomic and Clinical Pathology, Clinical Microbiology*.

Maria Muñoz, MD, University of Santo Tomas, 1965. Clinical Assistant Professor. *Anatomic and Clinical Pathology, Nuclear Medicine*.

Marc G. Reyes, MD, University of the Philippines, 1964. Professor of the Practice of Pathology (affiliate). *Neuropathology*.

Osvaldo L. Rubinstein, MD, MS, University of Buenos Aires, 1955; University of Michigan, 1960. Associate Professor (affiliate). *Anatomic and Clinical Pathology*.

Arthur S. Schneider, MD, The Chicago Medical School, 1955. Professor and Chair. *Hematopathology, Erythrocyte Enzymopathies, Molecular Diagnosis*.

Satinder K. Singh, MBBS, Punjabi University, 1963. Clinical Associate Professor. *Anatomic and Clinical Pathology, Cytopathology*.

Philip A. Szanto, MD, University of Basel, 1955. Associate Professor. *Anatomic and Clinical Pathology*.

William Thomas Jr., MD, Boston University, 1955. Clinical Professor. *Anatomic and Clinical Pathology*.

Elliot S. Weisenberg, MD, Finch University of Health Sciences/The Chicago Medical School, 1989. Associate Professor of the Practice of Pathology (affiliate). *Anatomic and Clinical Pathology*.

Department of Physiology and Biophysics

The Department of Physiology and Biophysics offers advanced degree programs leading to the MS, MD/PhD, DPM/PhD and PhD in Physiology. These programs are described below.

Career Potential

The training received in the Department of Physiology and Biophysics allows the individual to choose from a number of research and teaching oriented careers, including teaching at undergraduate institutions, combining teaching and research at professional or graduate schools, or finding career opportunities in private industry or government research institutes. Recent graduates typically engage in postdoctoral research, which enhances their ability to find employment in their desired field. Graduates of the department have all found employment in their specialized fields, primarily in medical centers.

The MS and PhD Programs in Physiology

The objective of the program is to provide opportunities for students to become skilled in the basic principles of physiology, to master the techniques needed to carry out significant research, and to develop the ability to communicate research achievements and knowledge to others. With this in mind, the Department offers opportunities for research and teaching in well-equipped facilities and in a departmental setting where interaction with faculty and fellow students is promoted. The research disciplines represented in the department are cardiovascular, cell volume regulation, neuroendocrinology, epithelial physiology, membrane biophysics, membrane transport and neuroscience. Research projects are conducted in such diverse areas as molecular mechanisms of ionic homeostasis, cardiac metabolism, epithelial transport systems, cerebral function, blood-brain barrier transport, neuroendocrinology and aging.

Course of Study

A student accepted into either the masters or doctoral program is assigned a temporary advisor by the Graduate Education Committee of the Department. The student and advisor select courses to meet requirements and the research interests of the student.

The first year of graduate work comprises several required courses including Medical Physiology, Biochemistry, Neuroscience and departmental seminars and journal clubs. The first year courses are planned by the student and appointed faculty advisor in conjunction with the Graduate Education Committee. At the end of the first year, each student selects a permanent advisor with whom future courses and research are planned. During the second year, students take advanced elective courses and begin laboratory research. After completing the first year, students participate in teaching laboratory demonstrations and conferences in the Medical Physiology course. This provides an excellent opportunity for students to gain teaching experience. At the end of the second year, PhD candidates take a preliminary examination that is a comprehensive examination covering the principles of physiology and testing the student's ability to interpret and evaluate scientific literature and think critically. Once these requirements are satisfied, the student spends the subsequent years conducting research for his/her thesis which will be written and defended before their thesis committee. Those students in the Master's degree program select advisors in the same way, and take their preliminary examination after completion of their coursework which usually occurs at the end of the first year. There is no foreign language requirement for an advanced degree in the Department.

Admission to the MS and PhD Programs in Physiology

All applications for admission to the School of Graduate and Postdoctoral Studies at Rosalind Franklin University of Medicine and Science are reviewed by the Graduate School Admissions Committee. Acceptable applicants are then considered by the Department. The Graduate Education Committee of the Department reviews each applicant looking for: (1) excellence in past educational and non-educational endeavors, (2) evidence of interest in the field, and (3) evidence of potential for success in research and teaching in physiology.

Applicants should have a baccalaureate degree from an accredited college and the level of academic performance should be above average in the sciences (equivalent to B or better). No field of undergraduate major is specified. Applicants should submit GRE (Graduate Record Examination) scores and three letters of recommendation. Foreign applicants should also submit TOEFL (Test of English as a Foreign Language) and TWE (Test of Written English) scores.

Application

Prospective students may direct queries to the Director of Graduate Studies in the Department, or to a member of the Department whose work is of interest to him or her. This should be done in the fall of the academic year preceding the year of entrance. A resume of the applicant's course work and up-to-date grades should accompany letters of inquiry. Application materials may be obtained by writing to The Office of Graduate Admissions, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, Illinois 60064.

Please refer to the general requirements for admission. Official notice of acceptance or rejection is issued from the Office of the Dean of the Graduate School.

Course Descriptions

MPHY 500A, B Medical Physiology

The course offers the basic principles of organ system physiology. Through lectures, demonstrations, conferences and laboratory work, students receive a quantitative and integrated concept of subcellular, cellular and organ system function. (N.B. This course is required for all graduate students majoring in physiology.)

MPHY 500A

Fall Quarter, five lectures and three hours of laboratory work and conferences per week (7 units). Faculty.

MPHY 500B

Winter Quarter, six lectures and two hours of conferences per week (7 units). Faculty.

GPHY 505 Physiology Seminar

Students, staff and invited guests present their current research programs in physiology for discussion and analysis. Fall, Winter and Spring Quarters, one hour per week (1 unit per quarter). Faculty.

GPHY 512 Physiology of the Autonomic Nervous System

An advanced course with the material covering autonomic nervous regulation and integration of vital functions such as respiration, circulation and temperature regulation. Fall Quarter, two lecture hours per week. Prerequisite: MPHY 500A, B. (2 units) Dr. Sukowski.

GPHY 513 Pulmonary Pathophysiology

The biophysics of pulmonary mechanics and gas transport are presented as a basis for evaluating pulmonary function. Modern pulmonary function-testing equipment is utilized in the laboratory, and an emphasis is placed on recognizing abnormal lung volumes and air flows. Spring Quarter, two hours per week (2 units). Prerequisite: Medical Physiology, MPHY 500A, B. Dr. McCormack.

GPHY 514 Physiology of the Liver

In addition to an in-depth discussion of the functions of the liver and experimental techniques used in studying the liver, the effects of complete and partial hepatectomy are described as well as the pathophysiology of the liver. Winter Quarter, two lecture hours per week (2 units). Dr. Sukowski.

GPHY 516 Cardiovascular Pathophysiology

Clinical aspects of cardiovascular function are emphasized, e.g. heart sounds and murmurs, electrocardiogram, monitoring of central venous pressure, and cardiac function curves. Fall Quarter, 2 hours per week (2 units). Prerequisite: Medical Physiology (MPHY 500A, B) or its equivalent. Dr. McCormack.

GPHY 520 Principles of Physiology for Neuroscience I

This course, which includes a subset of the lectures and conferences from *Medical Physiology A*, covers the physiology for the nervous, muscular, and cardiovascular systems. It is required of graduate students in Neuroscience. (4 units.) Faculty.

GPHY 521 Principles of Physiology for Neuroscience II

This course, which includes a subset of the lectures and conferences from *Medical Physiology B*, covers endocrine and integrative physiology. It is required of graduate students in Neuroscience. (3 units) Faculty.

GPHY 523 & GPHY 524 Topics in Physiology I & II

Topics in Physiology is a required two-quarter course for students in the Master's degree program in Biomedical Sciences. The objectives of this course are to 1) understand the biophysics and physiology of biomolecules as building blocks of cells; 2) understand the biophysical basis of the origin of cell membrane potentials, membrane transport, pumps and exchangers; 3) understand the biophysical basis of membrane excitability and ion channel physiology; 4) understand how ion channels are targets for toxins, drugs and genetic diseases; 5) understand the physiological basis for synaptic transmission and sensory transduction; 6) understand the physiological basis for programmed cell death and 7) understand the physiological basis of some cardiac, adrenal, electrolyte, renal, gastrointestinal, thyroid and extracellular fluid volume disorders. (4 units.) Faculty.

GPHY 534 Teaching Methods

To provide graduate students with practical experience in teaching physiology, advanced students present lectures and assist in the planning and direction of laboratory and discussion sessions and in the presentation of technical material under the careful supervision of the staff. Hours and units of credit to be arranged (1-2 units). Faculty.

GPHY 535 Doctoral Research in Physiology

Hours and units of credit to be arranged (5-15 units per quarter). Faculty.

GPHY 539 Introduction to Research

In their second year of study, students assist a member of the faculty with research as a step towards determining and planning their own graduate research work. Hours and units of credit to be arranged. Faculty.

GPHY 542 Electrogenic Ion Pumps

The objective of this course is to conduct an in-depth survey of the current state of knowledge of the mechanisms of electrogenic active transport of ions and of other substrates whose movement is coupled to the movement of a charged substrate. This objective will be achieved primarily by lectures presented by the instructors. In addition, students will be given written homework assignments that will be discussed in class. In general there will be two lecture hours presented per week and one hour of classroom discussion time. Topics to be discussed include: 1) basic principles of pump function, 2) electrogenic properties of ion pumps, 3) ion pumps and electrical properties of cell membranes, 4) bacteriorhodopsin, 5) proton pumps, 6) Na/K ATPase, 7) Ca-ATPase of sarcoplasmic reticulum, 8) Fo F1 – ATPases, and 9) cytochrome oxidase. A written final examination will be given at the end of the course. Winter quarter, three hours per week. Given in alternate years with the course GPHY 618, Molecular Biophysics of Ionic Channels. Prerequisite: MPHY 500A, B or permission of the instructor. (3 units) Dr. Rasgado-Flores and Faculty.

GPHY 545 Acid-Base Physiology

Group discussions of assigned readings on the mechanisms of body defenses against changes in acid-base balance. Spring Quarter (2 units). Dr. Peterson.

GPHY 590 Zero Hour Credit

This designation is used for students who have completed all course and research requirements but are continuing with thesis/dissertation work.

GPHY 618 Molecular Biophysics of Ionic Channels

This course will cover both experimental and theoretical aspects of ionic channels in biological membranes. Topics to be discussed include the following: 1) classical biophysics of the squid giant axon, 2) Na and K channels, 3) calcium channels, 4) K and chloride channels, 5) endplate channels, 6) properties of ions in solution, 7) properties of pores, 8) counting channels, 9) ionic selectivity, 10) ion saturation and binding, 11) mechanisms of drug block, and 12) gating mechanisms. Winter quarter, three hours per week (3 units). Given in alternate years with the course GPHY 542, Electrogenic Ion Pumps. Prerequisite: MPHY 500A, B or permission of the instructor. Dr. Rasgado-Flores and faculty.

Multidisciplinary Course

GMTD 711 Cell Journal Club (1 unit).

General Course

GGCS 724 Ethics in Biomedical Research (1 unit).

Faculty and Associated Staff

Neil Bradbury, PhD, Associate Professor
Robert J. Bridges, PhD, Professor and Chair
Lisa Ebihara, MD, PhD, Associate Professor
Sarah Garber, PhD, Associate Professor
Raul Gazmuri, MD, PhD, Associate Professor
Timothy Hansen, PhD, Professor
Richard Hawkins, PhD, Professor
Donghee Kim, PhD, Professor
Charles McCormack, PhD, Professor and Vice Chair
Feridoon Najmabadi, PhD, Research Assistant Professor
Darryl Peterson, PhD, Professor
Gordon Pullen, PhD, Assistant Professor
Hector Rasgado-Flores, PhD, Associate Professor
Bruce Riser, PhD, Adjunct Professor
Henry Sackin, PhD, Professor
Sant Singh, MD, Professor (Affiliate)
Ernest Sukowski, PhD, Associate Professor
Janice Urban, PhD, Associate Professor
Juan Vina-Ribes, MD, PhD, Research Professor
Demetrios Zikos, MD, Assistant Professor

Department of Psychology

Philosophy and Objectives of the Program

The clinical psychology training program integrates academic, scientific, and professional training and offers the Doctor of Philosophy degree. Students are accepted only into the PhD program. During the course of the PhD program, students also earn a Master of Science degree in Psychology. The program provides students with intensive instruction in the theoretical framework of psychology and broad experience in methods of practice of clinical psychology. Our program is defined by the scientist-practitioner model. “The scientist-practitioner model produces a psychologist who is uniquely educated and trained to generate and integrate scientific and professional knowledge, attitudes, and skills so as to further psychological science, the professional practice of psychology, and human welfare. The graduate of this training model is capable of functioning as an investigator and as a practitioner, and may function as either or both, consistent with the highest standards in psychology. The scientist-practitioner model is ideal for psychologists who utilize scientific methods in the conduct of professional practice” (Belar & Perry, 1992). In keeping with the scientist-practitioner model, we believe that clinical psychologists should be both scientists – knowledgeable in formulating and solving scientific problems, and professionals – experienced in the use of clinical techniques. To this end, the core courses are organized as integrated theory-research-practice units with a problem solving emphasis.

Within the context of a general clinical psychology training program, our department offers focused training in Neuropsychology, Health Psychology and Psychopathology. The training emphasis of the program involves a combined biological and behavioral approach to the understanding and treatment of abnormal behavior and its relationship to normal behavior. The training

tracks prepare students for clinical service, teaching and research in medical, mental health and academic settings. Students receive training in a broad range of assessment procedures and intervention approaches with an emphasis on empirically supported interventions. Students gain experience with a range of medical, neurological, psychiatric and neuropsychiatric populations through clinical and research activities. Our graduates are well prepared clinician researchers because of their solid grounding in theory, practice and research. The training ensures the development of both broad-based clinical skills and an emphasis encouraging close cooperative work with other health care specialists such as pediatricians, internists, neurologists, neurosurgeons, geriatricians and psychiatrists.

The clinical psychology program enjoys full accreditation status by the American Psychological Association (APA). Our program strives to maintain a balance between academic course work, research training, and supervised clinical practicums. In designing its core curriculum, the department follows the recommendations of the Committee on Accreditation. The course curriculum includes a sequence of required courses that exposes students to the current body of knowledge in the following areas: biological aspects of behavior; cognitive and affective aspects of behavior; social aspects of behavior; history and systems of psychology; psychological measurement; research methodology; and techniques of data analysis. Additionally, students in the areas of Health Psychology, Neuropsychology and Psychopathology are required to take additional courses and electives. A sequence of clinical practicums, and participation in research round out the pre-internship years.

Program Description

The program requires a minimum of four full-time pre-internship years. In addition, students must complete a one-year internship. While the PhD degree can be completed within five years, typically six to seven years is the average length of study. The fourth academic year and all years thereafter are tuition-free. There are four quarters in the academic year; all quarters are approximately eleven weeks in duration. The minimum academic load for full-time students is twelve credit units per quarter except during the summer quarter, when students register for only two credit units. Students are eligible to apply for internship after passage of Preliminary Qualifying Comprehensive Exams and approval of a dissertation proposal. Once the dissertation proposal is approved, up to three additional years are allowed for the completion of all requirements for the PhD degree (i.e., completion of the dissertation and its defense, and the internship year).

Year 1

A sequence of required courses is taken during the first year. Clinical practicums also begin during the first year. It is anticipated that students will begin active participation in a research program with their advisor. The fourth quarter (Summer) is typically devoted to research and applied courses designed to prepare students for second year practicums.

Year 2

A series of required general courses and track courses are offered during the second year. Students may begin to take electives as part of their schedule. Continuation of clinical practicums and research participation occur during this year. Completion of a thesis, along with satisfactory course grades, qualifies the student for the MS degree.

Year 3 and Year 4

A series of required courses, electives, clinical practicums and research activities continue during these years. Comprehensive examinations are taken after completion of the Master's Thesis. Upon successful completion, students may develop their dissertation proposal. The dissertation proposal must be approved by September 30 if the student is to be eligible to apply for internship the following year.

Additional didactic activities in which students participate include: Department sponsored colloquia; Neuroimaging Seminar; a Visiting Speaker Series; training conferences, special lectures and grand rounds sponsored by basic science and/or clinical departments, as well as the Psychology and Psychiatry Service of the North Chicago Veterans Affairs Medical Center (NCVAMC).

Typical Sequence of Required Courses

First Year

Descriptive Psychopathology
Physiological Psychology
Professional Issues I
Psychological Statistics I
Psychological Statistics I
Cognitive Assessment
Experimental Design and
Program Evaluation I and II
Theories of Psychotherapy

Second Year

Behavior Therapy
Neuropsychological Assessment*
Health Psychology I
Social Psychology
Introduction to Neuropsychology
Life Span Development*
Neurosciences*
Personality Theory

Third Year

Professional Issues II
History and Systems
Health Psychology II**
Theoretical Psychopathology
Learning Theory
Personality Theory
Multicultural Issues in Mental Health
Developmental Psychopathology***

* Required elective for Neuropsychology track

** Required elective for Health Psychology track

***Required elective for Psychopathology track

Note: Sequence of courses may be subject to change at any time.

Sample of Elective Courses

Neuropsychology	Behavioral Medicine	General Clinical
Rehabilitation Psychology	Cardiac Psychology	Family and Child Therapy
Medical Neuropsychology	Pediatric Health Psychology	Child Psychopathology
Neuropsychology of Emotion	Effective Behavior Risk	Managed Care
Pediatric Neuropsychology	Interventions	Case Seminar in Occupational Health
	Psychology	Psychoanalytic Therapy
		Clinical Medicine for Psychologists
		Professional Issues Seminar
		Clinical Psychopharmacology

Requirements for Admission

The following are the basic requirements each applicant must fulfill to be considered for admission:

1. BA or BS degree from an accredited college or university.
2. Three letters of reference from former professors or employers familiar with the applicant's professional or educational capabilities. Preferably, two letters should be from former professors.
3. Graduate Record Examination – Verbal, Quantitative, and the Analytical Writing. The Advanced Psychology GRE is required for those students who are not undergraduate Psychology majors or have a Master's degree in a non-Psychology discipline.
4. Transcripts – Candidates must submit an official transcript from each college/university they have attended. If coursework has been taken abroad, you must provide an official credential evaluation of that coursework by World Education Services (WES). The official WES evaluation must be sent directly from the World Education Office to the Office of Admissions. The main telephone number for WES is 212-966-6311, or toll free at 800-937-3895. Fax number is 212-739-6139 and their Web site is <http://www.wes.org>.
5. Foreign Applicants – Foreign applicants from a country in which English is not the native language and have not attended an American college or university full-time for 2 consecutive years, must

provide an official report of TOEFL (Test of English as a Foreign Language) and TWE (Test of Written English) or The Computer Based TOEFL. Results of the TSE (Test of Spoken English) are also a requirement. These scores must be from examinations taken within the past two years. Test scores must be sent directly from the Educational Testing Service, Princeton, New Jersey 08540. You must also submit a completed Financial Statement for International Students accompanied by supporting official documentation. If not enclosed, this can be obtained from the Office of Admissions.

The following are the *preferred* test scores, grades and academic preparation.

- a. A minimum grade point of 3.2 (on a 4-point scale) for the last two years of undergraduate study.
- b. Adequate preparation in psychology: at least 15 credit hours of psychology, including a course in statistics and biological psychology.
- c. A minimum score of 600 in each area of the GRE (Graduate Record Examination): Verbal, Quantitative, Analytical and Advanced Psychology. For the Analytical Writing, at least 4.5/5 minimum.

It should be noted that each application is reviewed in terms of strengths and compatibility with the program. The final decision is based on the *overall profile* rather than any particular piece of information. Official notice of acceptance is issued from the Office of the Dean of the Graduate School.

Based on an initial review and screening of the application, a designated group of applicants are invited to visit the Department and meet faculty and students and learn more about the program and University. This interview day is typically held during the first two weeks in March. For those applicants who are unable to attend on this day, arrangements can be made to either visit the University at an alternative time or have a phone interview with a faculty member. These arrangements should be coordinated through the Department of Psychology, Administrative Assistant, Ms. Pat Rigwood, 847-578-3305. All students to be accepted into the program are expected to either visit the Department or have a phone-call interview with a member of the faculty.

December 31 is the application deadline for the academic year starting in September. Applications can be obtained online at: www.rosalindfranklin.edu/sgpds/psychology/admissions.cfm. It is the applicant's responsibility to ensure that all application materials have been received by the deadline date.

Inquiries about the completeness of an application should be directed to the Office of Graduate Admissions at 847-578-3209 or e-mail to grad.admissions@rosalindfranklin.edu.

Completed applications and other application materials should be sent to:

Office of Graduate Admissions
Rosalind Franklin University of Medicine and Science
3333 Green Bay Road
North Chicago, IL 60064
847-578-3209

Clinical Practicums

Clinical training is considered an integral part of the doctoral program in clinical psychology. Clinical practicums are organized to ensure a progression of clinical training experiences that correspond with the sequence of the course curriculum. Clinical practicum training plays an important role in the integration of theory, research and practice. Clinical practice provides opportunities for students to integrate critical thinking and hypotheses testing into their clinical activities and to assimilate an empirical, scientifically informed approach to clinical practice. The department works collaboratively with a number of off-site practicum training sites in Illinois and Wisconsin. These settings include but are not limited to hospitals, medical centers, community mental health centers, school districts, and private practices. The department also has clinical programs that are supervised by department faculty. Students gain experience in general therapy and assessment skills, as well as training specifically in the three training tracks offered in the department: neuropsychology, health psychology, and psychopathology. Although the department has a cognitive-behavioral orientation, the practicum training at the different sites exposes students to multiple theoretical orientations and intervention techniques.

A listing and brief description of practicum sites can be found at: www.rosalindfranklin.edu/sgpds/Psychology/pracsites.cfm. The Director of Clinical Training works with the students to facilitate specific placements.

Research

Student research is a fundamental part of the training program. Students begin participating in faculty research early in the first year, and quickly become integral members of a research team. The faculty has broad research interests within the areas of neuropsychology, health psychology and psychopathology (see faculty research interests list at: www.rosalindfranklin.edu/sgpds/Psychology). Under faculty supervision, students complete a master's thesis, and ultimately develop their own research culminating in the doctoral dissertation.

Advisors

Upon entering the program, students are assigned a faculty advisor who matches their clinical-research interests. This faculty member serves as both the academic advisor and research mentor. Advisors guide students through the selection of courses, independent study and practicum experiences necessary to complete the program. They provide information, direction, feedback and long-term guidance. Advisors meet with students regularly to review academic performance and to discuss future plans. In addition, an annual three-way meeting of student-advisor-DCT is held to review a student's progress and recommendations made for further training.

In addition to faculty advisors, all incoming students are also matched to student mentors who also assist students in their transition to graduate school and adjustment to the program.

Internship

Students are required to complete a one-year, full-time, clinical internship, after having completed formal course work and a dissertation proposal. The internship is completed at a site chosen to meet students' individual career goals. During internship, students function under supervision as clinical psychologists. The internship facility must comply with the American Psychological Association accreditation standards and must be approved by the Department of Psychology. Our students are typically accepted into APA-approved, high quality internship programs all across the country (see list of Internship Sites at: www.rosalindfranklin.edu/sgpds/Psychology/internship.cfm).

Requirements for PhD Degree

Students must fulfill the following requirements in order to obtain the PhD in Clinical Psychology:

1. Successful completion of all required courses in the program curriculum and an approved group of elective courses.
 - a. It is expected that core courses will be completed through departmental offerings. Electives are typically taken in the Department or in related

programs within the University. In some instances, electives may be fulfilled through courses taken in another institution. A course syllabus must accompany your request for approval and an official transcript must be provided so that credit can be received. All of this must secure the approval of the advisor and the faculty.

- b. Students who have formally registered for and successfully completed one or more graduate courses in accredited universities, prior to entry into our program, may transfer up to 12 credits toward electives. The courses to be transferred must not be redundant with current core course offerings. The faculty will recommend such action to the Dean for approval. All students must enroll at Rosalind Franklin University of Medicine and Science for all required courses and specified electives for their chosen area of clinical emphasis.
2. A minimum of 1,000 clinical practicum pre-internship hours.
3. Completion of a Master's Thesis research project.
4. Passing the comprehensive examinations, scheduled at the completion of the Master's Thesis.
5. Completion of dissertation proposal and satisfactory oral defense of the dissertation.
6. Demonstrable proficiency in the internship year.
7. Qualification for graduation requires that the student maintain good academic standing defined by an overall average of B or better.

It is important to note that these are minimum requirements and the final determination of the adequacy and completion of students' course work and training rests with the Department. At the discretion of the Department, a student may be required to take additional courses and/or training.

Course Descriptions

Core Courses

GPSC 510 Psychological Statistics I

Introduction to the methods of modern statistical analysis and their use in drawing conclusions from data collected in surveys and in the laboratory. Topics covered include: descriptive statistics; probabilities; confidence interval estimation of population parameters; tests of significance; correlation; regression; and analysis of variance (4 units).

GPSC 511 Psychological Statistics II

Correlational techniques, partial correlation, regression analysis, analysis of variance, simple and complex experimental design, analysis of covariance, multivariate analysis (4 units).

GPSC 515 Experimental Design and Program Evaluation I

This course provides an overview of research design in psychology with emphasis both on the implementation and the evaluation of psychological research studies. Specific topics include: the scientific process, external validity, construct validity, internal validity, experimental, quasi-experimental and non-experimental designs and conclusion validity. The goal is to establish a firm foundation in the fundamentals of research design that will allow students to both design their own research projects as well as critically evaluate studies in the psychological literature (4 units).

GPSC 516 Experimental Design and Program Evaluation II

Examination of the methods of designing, organizing, conducting and evaluating behavioral research. Primary attention is given to research strategies in relevant problem areas, program evaluation techniques and the application of research finding to professional practice (4 units).

GPSC 520 Descriptive Psychopathology

In-depth analysis of diagnostic criteria for major categories of psychopathology which covers the concept of illness, schizophrenia, affective disorders, anxiety disorders, organic brain disease and personality disorders. This course also introduces neurological evaluations (4 units).

GPSC 521 Theoretical Psychopathology

In-depth analysis of contemporary, psychosocial, cognitive and biological theories concerning the major forms of psychopathology. Emphasis is placed on recent empirical findings regarding the etiology of mental disorders (3 units).

GPSC 530 Introduction to Neuropsychology

Description of major theories of neuropsychological development, role of brain function in normal and abnormal human behavior, and findings from neuropsychological research in adults and children are discussed in detail (4 units).

GPSC 540 Learning Theory

Theoretical overview of various learning theories and models as they apply to human behavior change in clinical intervention. Behavioral, cognitive, social vicarious learning and conditioning paradigms and their applications to diagnoses and therapy are covered (2 units).

GPSC 541 History and Philosophy of Science

Historical antecedents through contemporary positions involving philosophy and clinical developments are analyzed and critiqued in the framework of current knowledge, problems and future directions (3 units).

GPSC 560 Tests and Measurement and Cognitive Assessment

Theoretical and practical issues of test construction and measurement are considered in depth along with issues of development, standardization and validation of psychological tests. Theory of assessment of adult intellectual functioning and practical application of the WAIS-R are included (4 units).

GPSC 570 Physiological Psychology

Examination of human physiological processes as these relate to biobehavioral models of normal and abnormal functioning in appetitive, motor cognition and affective systems. Includes introduction to psychopharmacology and also neuroanatomy laboratory (4 units).

GPSC 664 Personality Assessment

Theory and application of objective psychological tests for the assessment of personality and personality development (4 units).

GPSC 665 Personality Theory

Introduction to personality theory and research. Major personality theories are covered with an emphasis on current approaches, empirical bases and clinical applications. The focus is on normal personality, but the relationship between normal and abnormal personality is discussed (3 units).

GPSC 567 Neuropsychological Assessment

Use of psychological tests in the evaluation of the relationship between brain and behavior. The goal of this course is to acquaint students with modern neuropsychological approaches to normal and abnormal behavior along with methods of assessing the neurological basis of behavioral problems (4 units).

GPSC 571 Independent Study

Independent study course that would involve students to typically work one on one with instructor. This course would typically involve the reading of articles, meeting with the instructor to gain more knowledge in a certain area, and possibly mini quizzes, etc. (1–3 units).

GPSC 575 Social Psychology/Learning Theory

In-depth discussion of theory and research contribution to social functioning, development and organizational issues. The utilization of social psychological principles in applied settings are examined (3 units).

GPSC 690 Cognitive and Behavioral Therapy

Current application of learning principles and techniques of therapeutic change and problems encountered in practical applications. Emphasis on methods and procedures effective in the elimination of inappropriate behaviors and the acquisition and maintenance of appropriate behaviors (4 units).

GPSC 695 Theories of Psychotherapy

Survey of major theories of psychotherapeutic and intervention strategies from both clinical and research viewpoints are discussed (4 units).

**GPSC 750 Advanced Physiological Research Seminar —
GPSC 570 Lab**

This introduction to human neuroanatomy involves examination of the gross brain, sections and slides. Students learn to identify structures and their function, especially those pertaining to the course content of Physiological Psychology 570 (1 unit).

GPSC 751 Health Psychology and Behavioral Medicine I

An overview of representative content areas and conceptual approaches to health psychology/behavioral medicine. Considers the concepts of stress and coping; autonomic and immune function; endocrine parameters and epidemiological approaches to outcomes in cardiovascular disease, cancer, diabetes, obesity and the addictions (4 units).

GPSC 754 Life Span Developmental

The course is a basic developmental course covering the entire life span from biological, social, and cognitive perspectives. Special emphasis will be placed on the unique methodological features of developmental research. The course will complement training in all three aspects of the program, namely clinical, health, and neuropsychology (2 units).

**GPSC 755 Ethical Issues & Professional Standards
in Clinical Psychology I**

The course is designed to introduce the doctoral student to professional training in clinical psychology. A broad range of topics are reviewed including professional training, specialization within clinical psychology, professional ethics, and career development. Emphasis is placed on the student's development of a comprehensive understanding of ethical principles and issues affecting the practice of contemporary clinical psychology (1 unit).

**GPSC 756 Ethical Issues & Professional Standards
in Clinical Psychology II**

The course examines practice guidelines including the Clinical Psychologist Licensing Act. It also examines ethical and legal guidelines for advertising, confidentiality, custody, malpractice and other forensic issues (2 units).

GPSC 759 Minority Issues in Mental Health

Assessment and therapeutic treatment of diverse populations with special emphasis on American ethnic/racial groups. Emphasis on specific problems associated with age, race, disability, religious preferences, etc., and how these affect the counseling relationship (3 units).

GPSC 784 Professional Seminar in Clinical Fundamentals

The second year practicum will include a summer seminar prior to beginning of practicum and a bimonthly meeting throughout the academic year. The seminar will meet once a week for three hours for five weeks. Students will be cross-trained in assessment and therapy skills regardless of their specific practicum placements. Initial sessions will include microskills and clinical interviewing training. Later sessions will include review of psychological tests to be used at respective practicum sites and didactics on topics such as multidisciplinary committee meetings, individual education plan, specific therapeutic interventions and special populations. During the academic year, 60-minute meetings will be held twice a month and will essentially serve as support to the individual supervision received at respective sites. The meetings will primarily focus on case conceptualization skills and remediating skills necessary for particular practicum sites (1 unit per quarter).

GPSC 789 Developmental Psychopathology

This course will present an empirically-based developmental psychopathology perspective, with an emphasis on scientific issues and methods. It will explore advanced conceptual models of developmental psychopathology for a range of syndromes, focusing on those that develop in childhood and may continue through the lifespan. With each syndrome, biological, genetic, familial, and sociocultural risk and protective factors will be considered (4 credits).

GPSC 800 Clinical Practicum

Clerkship in clinical inpatient and outpatient psychiatric, psychological and medical settings. Under direct supervision of psychologists (or, in selected instances, psychiatrists), this takes place throughout the second and third year of the student curriculum at a rate of approximately one practicum per quarter. (Credit to be arranged.)

GPSC 850 Research Practicum

Individual research practicum with faculty members of the Department of Psychology along with research experiences with clinical faculty at affiliated institutions. The duration of these relationships ranges from one quarter to an entire year. (Credit to be arranged.)

GPSC 890 Zero Credit

This designation is utilized for students who have completed all course and research requirements but are continuing with thesis/dissertation work.

General Course**GGCS 724 Ethics in Biomedical Research**

This course will cover a variety of topics that are related to the responsible conduct of research in the biomedical sciences. The topics include scientific integrity in the gathering and reporting of data, proper allocation of credit in collaborative studies and the various types of misconduct that are seen in research. The ethical use of animals and human subjects will also be discussed. Furthermore, current issues concerning the societal role of the academic scientist in dealing with the media, commercialized research, etc. will be presented. The course is structured along federal guidelines on scientific integrity as part of research training and is aimed to prepare students for the various ethical situations that may arise during the course of a research career. Fall Quarter, one hour per week (1 unit). Offered every year. Faculty.

Elective Courses**GPSC 632 Child Neuropsychology**

Goal of this course is to provide an introduction to the issues and principles involved in the neuropsychological evaluation of children. A basic theme is an examination of the unique considerations involved in the assessment/interpretation of test data from a developmental neuropsychological perspective (2 units.)

GPSC 700 Psychology of Aging

Effect of aging on emotions, intellectual functions, sensation and social interaction and life-style. Topics are discussed from a theoretical and clinical view point (3 units.)

GPSC 704 Family, Parent and Child Therapy

Behavioral approaches to intervention in behavioral difficulties within the family. The treatment of children is discussed primarily from a practical viewpoint. The efficacy of various therapeutic regimes is evaluated (2 units).

GPSC 744 Child Psychopathology

This course emphasizes the developmental aspect of abnormal personality processes in children and adolescence. Specific disorders of behavior and affect in the pre-adult years are examined (2 units).

GPSC 752 Health Psychology and Behavioral Medicine II

The specific utilization of intervention strategies, both behavioral and psychophysiological, as these can be applied to individuals, families, groups and organizations. Specific behavioral deficits and life style difficulties leading to potential risk for physical disability will be examined (4 units).

GPSC 753 Group and Social Systems Psychotherapy: Theory, Research and Application

Course dynamic theory and research on groups and social systems focusing on small and large group dynamics and intergroup relations will be examined in the first three sessions of the course. The work of Bion, Cytrynbaum, Edelson, Freud, Horowitz, Lipgar, Mann, Rice, and Wheelan will be presented in a lecture-discussion format. During the first four sessions, one hour of class will consist of continuing lecture discussion based upon student reading summaries and research-observational reports from students. The second hour will be used for an experiential small group in which the focus will be on group-as-a-whole dynamics. The latter four sessions of the course will emphasize the application of group and systems theory and research and experiential learning to topics including therapeutic groups, milieu therapy, work and problem solving groups, educational groups, organizational leadership and change, and consultation to human delivery systems.

GPSC 757 Seminar in Psychoanalytic Therapy

Since its inception, a number of changes have occurred in psychoanalysis in both theory and technique and the pace of change keeps increasing. Starting with Freud, we will survey and apply the ideas of a number of "post-Freudian" analysts to our current clinical work (2 units).

GPSC 758 Managing Care and Risk in Psychological Practice

Managed care's impact on the practice of psychology has caused a great deal of conflict and change. Many

psychologists are not adequately prepared to deal with this impact on their practices. This course will provide 1) an understanding of healthcare financing and managed care's evolution; 2) an understanding of the various types of managed care and third party payers; 3) methods in which to structure one's practice, agency, or facility as to best operate within managed care; 4) methods of mitigating risk; 5) examples of legal issues and precedents; 5) strategies for the future (2 units).

GPSC 760 Seminar in Rehabilitation Psychology

This seminar is for students with clinical experience in some aspect of rehabilitation including life-style change related to specific medical disorders (e.g., cardiovascular disease), assessment and recovery from catastrophic injury (e.g., brain damage, burn injury), or coping with progressive illness (e.g., cancer, caregivers of dementia patients). Students will select a topic and present to the group an overview and current research, from a behavioral medicine or neuropsychological perspective, elucidating the role of the psychologist in a rehabilitation treatment protocol (2 units).

GPSC 761 Behavioral Genetics

Consideration of theory and research in behavioral genetics and issues of genetic counseling. Both research and application are discussed as these relate to a wide variety of identified syndromes and potential usefulness in psychiatric and general health settings (3 units).

GPSC 762 Psychotherapy with Children and Adolescents

This course will focus on the major theories of child development as a framework for working with children, adolescents and families. It will help students become familiar with the classification of childhood psychopathology according to DSM-IV, appreciate ethical and legal issues, and learn to be sensitive to cultural variables in working with children and families. The course will cover different treatment approaches and students will learn to conceptualize and develop appropriate treatment goals and interventions. There will also be a focus on special topics such as ADHD, Conduct/Behavior Problems and Antisocial Behavior, Eating Disorders, Parent Training, Pediatric Psychology, etc. (2 units).

GPSC 763 Basic Neurology/Behavioral Neurology

This course covers neurological examination, electroencephalography and behavioral neurophysiology. Cerebrovascular diseases, demyelinating diseases, narcolepsy, movement disorders, common neurological conditions (including headache and pain syndromes), and convulsive disorders are discussed, and integrates clinical neurology and basic psychiatry. The focus is on the relationship between behavioral signs and symptoms and subtle and coarse brain disease. The neurological exams, special laboratory techniques, and the neuropsychology and neurophysiology of behavioral and neurological disease are discussed (2 units).

GPSC 765 Clinical Psychopharmacology

To acquaint the clinical psychology students with the actions of the most important psychotropic drugs. This will enable them to assess the efficacy and possible adverse effects these drugs might have in those patients who are taking them. These objectives will be achieved in discussions of the psychotropic drugs from two broad perspectives: 1) basic principles of drug action; 2) pharmacology of the psychotropic drugs in terms of mechanisms of action, side effects and drug-interactions (1 unit).

GPSC 770 Pediatric Psychology Seminar

This course will cover the following subjects: What is Pediatric Psychology?; Developmental Issues in Pediatric Psychology; Family Issues in Pediatric Psychology; Symptom Perception, Death & Dying; Feeding/Eating Disorders; Cystic Fibrosis; Cancer; Dialysis and Kidney Disease, etc. (2 units.)

GPSC 771 Cardiac Psychology Graduate Seminar

This course will offer an overview of psychological issues, theories of history relevant to heart disease. It will give background information on heart disease; clinical issues and research; risk factors management and research; and other issues of heart disease (1 unit).

GPSC 773 Topics in Medical Neuropsychology

Neuropsychology has traditionally focused attention on diseases of the CNS with little consideration to diseases of other organs and systems that could compromise cerebral integrity and disrupt cognition and behavior. Each organ system contributes in unique and specialized fashion to maintaining the integrity of brain functioning. This elective will address the consequences of disturbed functioning of organs and organ systems such as the pulmonary system, cardiovascular system, renal system, hepatic system, pancreas, and thyroid. Discussion will also focus on the various factors that can influence the cognitive performance of medically ill patients (such as stage of illness, age of disease onset, treatment effects) and the impact cognitive/behavioral deficits can have on the patient's independent functioning/quality of life on their medical management. In addition to lecture and readings, students will be responsible for a short paper and a class presentation based on this paper. A take-home final exam is anticipated (2 units).

GPSC 774 Introduction to Pediatric Psychiatry

The first part of the course focuses on child development. Direct observation of children is provided by visits to schools, child-centered agencies in the community, video-tapes and films. The second part of the course introduces diagnostic procedures. Videotapes of diagnostic interviews with children, adolescents, and parents are combined with lectures reviewing the common syndromes in child psychiatry. Readings focus on diagnosis and treatment, including play therapy (2 units).

GPSC 777 Occupational Health

The course will provide a conceptual framework for the assessment, development, and evaluation of OHP programs. Graduate students will learn about current programs and services that employers offer, including employee assistance, workplace violence prevention, critical incident stress intervention, work-life resources, occupational health, disability management, fitness, health promotion, disease prevention and disease management. Key course objectives will include the ability to: assess key workplace health-related needs and issues; select an appropriate health service model for key workplace issues; and develop a detailed proposal for a workplace health program or strategy, including an outcome measure (2 units).

MNSC 501 Medical Neuroscience

A multidisciplinary approach to the structure and function of the nervous system is presented by faculty from the Departments of Biochemistry and Molecular Biology, Cell Biology and Anatomy, Neurology, Cellular and Molecular Pharmacology, and Physiology and Biophysics. This course provides a broad introduction to modern neurobiology by lecture, laboratory demonstration and conference sessions. The goal of the course is to correlate the structure with the function of the nervous system in man and other animals under normal, as well as drug- or disease-modified conditions (8 units).

GPSC 781 Effective Behavioral Risk Interventions

This class will review several programs in smoking cessation, weight loss, exercise, dietary change, and medication/treatment adherence, but the main focus will be on the psychological, social and environmental factors and processes involved in creating sustainable, long-term change in these areas to reduce health risks (1 unit).

GPSC 782 Neuropsychology of Emotion

This class will provide an overview of the neuroanatomy, neurophysiology, and neuropsychology of emotion, as well as major biologic theories/models of emotional processing. Additionally, several classes of psychiatric illnesses (including affective disorders, anxiety disorders, and schizophrenia) will be explored from the standpoint of biologic etiology, and their respective presentations will be examined in terms of underlying cognitive and emotional deficits (2 units).

GPSC 783 Family Systems and Therapy

In this course, students are introduced to major models of family therapy. Primary theorists and techniques of each model will be considered. Lectures, class discussion and small group interactions are included. Students will gain a working knowledge of some of the major family systems models; they will also explore and understand the theories and techniques applicable to each model; explore a variety of family systems with an emphasis on understanding cultural, gender and sexual orientation differences as they relate to family therapy; understand and complete assessment procedures with particular emphasis on genogram construction and interpretations and finally examine ethical issues as they relate to the practice of family therapy (3 units).

GPSC 785 Professional Issues Seminar

This two-credit elective is open to all students. RFUMS Department of Psychology alumni will lead most of the seminars. A variety of topics will be discussed: Professionalism in the Medical Setting; Lever of Care/Emergency Room Assessments; Substance Abuse Evaluations; Working with the Developmentally Handicapped & the DCFS System; Working with the School System to advocate for special education services; Alternative Career Paths; Developing a Fee for Service Clinic/Practice; Integrating Research into one's Clinical Practice; Organizing & Managing Clinical Drug Trials. Speakers may have handouts/articles for your reference (2 units).

GPSC 786 Clinical Medicine for Psychologists

This is a didactic course covering the major medical disorders and their behavioral/cognitive implications. The major illnesses within the following disciplines will be discussed: endocrine disorders, cardiology, gastroenterology, infectious disease, hematology/oncology, nephrology, neurology, pulmonary medicine and rheumatology. The epidemiology diagnosis, differential diagnosis, clinical manifestations, basic pathophysiology, laboratory findings, course of illness, and treatment will be covered in detail from a medial perspective. Readings will be assigned. Prerequisite: Graduate level physiological psychology (2 units).

GPSC 787 Behavior Therapy II

The purpose of this course is to provide the student with instruction, training, and supervised practice with various standard behavioral techniques. The theory and background of each technique will be discussed, along with specific instructions on their implementation. Ample opportunity for practice will be given through direct supervision of all techniques that can be done in class, as well as supervised role-playing. In addition, outcome research will be discussed for each intervention (2 units).

GPSC 789 Developmental Psychopathology

This course will present an empirically-based developmental psychopathology perspective, with an emphasis on scientific issues and methods. Will explore advanced conceptual models of developmental psychopathology for a range of syndromes, focusing on those that develop in childhood and many continue through the life span. With each syndrome, biological, genetic, familial, and social-cultural risk and protective factors will be considered (4 units).

Faculty and Associated Staff

John Bair, PhD, Clinical Assistant Professor
 Bernhard Blom, PhD, Clinical Associate Professor
 John Burns, PhD, Associate Professor
 John Calamari, PhD, Associate Professor
 Catherine Campbell, PhD, Clinical Assistant Professor
 Karen Cassidy, PhD, Adjunct Clinical Assistant Professor
 Chinni Chilamkurti, PhD, Clinical Associate Professor
 Roland Erwin, PhD, Associate Professor
 Denise Fiducia, PhD, Adjunct Associate Professor
 Mitchell Goodman, PhD, Clinical Assistant Professor
 Michael Gurtman, PhD, Adjunct Clinical Assistant Professor
 David Kosson, PhD, Associate Professor
 Mitchell Liberman, PhD, Adjunct Clinical Assistant Professor
 Howard Lipke, PhD, Clinical Assistant Professor
 Gary Oltmans, PhD, Interim Chair
 Lawrence Perlmutter, PhD, Professor
 Margaret Primeau, PhD, Adjunct Clinical Assistant Professor
 Stephen Rao, PhD, Adjunct Professor
 Michael Seidenberg, PhD, Professor
 Eddie Williams, PhD, Clinical Assistant Professor
 John Woodard, PhD, Associate Professor
 Sandra Zakowski, PhD, Associate Professor

Program in Molecular and Cellular Science

For research interests of the faculty, refer to the individual departmental degree program.

Director

Kenneth Neet, PhD, Department of Biochemistry and Molecular Biology

Faculty and Associated Staff

Marc S. Abel, PhD, Cell Biology and Anatomy

Marjorie Ariano, PhD, Neuroscience

Kenneth D. Beaman, PhD, Microbiology and Immunology

Neil A. Bradbury, PhD, Physiology and Biophysics

Christopher Brandon, PhD, Cell Biology and Anatomy

Robert J. Bridges, PhD, Physiology and Biophysics

Bala Chandran, PhD, Microbiology and Immunology

K.P. Chang, PhD, Microbiology and Immunology

Carl Correl, PhD, Biochemistry and Molecular Biology

Pastor Couceyro, PhD, Cellular and Molecular Pharmacology

Joseph DiMario, PhD, Cell Biology and Anatomy

Mirek Dundr, PhD, Cell Biology and Anatomy

Lisa Ebihara, MD/PhD, Physiology and Biophysics

Michael A. Fennewald, PhD, Microbiology and Immunology

William Frost, PhD, Cell Biology and Anatomy

Sarah S. Garber, PhD, Physiology and Biophysics

Marc J. Glucksman, PhD, Biochemistry and Molecular Biology

David H.T. Harrison, PhD, Biochemistry and Molecular Biology

Ronald S. Kaplan, PhD, Biochemistry and Molecular Biology

Donghee Kim, PhD, Physiology and Biophysics

Robert A. Marr, PhD, Neuroscience

David McCandless, PhD, Cell Biology and Anatomy

Patricio I. Meneses, PhD, Microbiology and Immunology

David M. Mueller, PhD, Biochemistry and Molecular Biology

Monica M. Oblinger, PhD, Cell Biology and Anatomy

Gary A. Oltmans, PhD, Cellular and Molecular Pharmacology

Daniel A. Peterson, PhD, Neuroscience

Darryl R. Peterson, PhD, Physiology and Biophysics

Judy Potashkin, PhD, Cellular and Molecular Pharmacology

Hector Rasgado-Flores, PhD, Physiology and Biophysics

Henry Sackin, PhD, Physiology and Biophysics

Michael P. Sarras, Jr., PhD, Cell Biology and Anatomy

Heinz Steiner, PhD, Cellular and Molecular Pharmacology

Grace E. Stutzmann, PhD, Neuroscience

Thanos Tzounopoulos, PhD, Cell Biology and Anatomy

Janice Urban, PhD, Physiology and Biophysics

Barbara Vertel, PhD, Cell Biology and Anatomy

D. Eric Walters, PhD, Biochemistry and Molecular Biology

Marina E. Wolf, PhD, Neuroscience

Graduate training in Molecular and Cellular Science (MCS) is offered through an interdisciplinary program comprising the basic science departments of the University. An attractive feature of this program is that students have the opportunity to select an advisor from a large pool of investigators, which provides a wide spectrum of research projects to choose for the thesis work.

In recent years, great strides have been made in molecular and cell biology, which includes identification of genes responsible for major diseases such as cancer, cystic fibrosis and Huntington's disease. The molecular basis of several other diseases has also been established. Treatment of diseases by gene therapy is now reality rather than fiction. Basic research offered in this multidisciplinary University program can prepare students in a number of important areas in molecular and cellular sciences.

Students are recruited and accepted into the graduate school prior to determination of a department for graduate study. These students take a common set of courses, acceptable in participating departments, and choose their research advisor at the end of their first year from the MCS faculty members. The student earns a PhD degree in one of the six participating departments. The PhD program is directed by the department selected by the student with a special emphasis in MCS. The PhD degree is awarded by the University upon recommendation of the MCS student's chosen department.

The first year of graduate study focuses on course work and rotations through at least three research laboratories. In subsequent years, students are involved in research, seminars and independent study. The program faculty consists of approximately thirty investigators from the participating departments of Biochemistry and Molecular Biology, Cell Biology and Anatomy, Cellular and Molecular Pharmacology, Microbiology and Immunology, Neuroscience, Physiology and Biophysics. The research interests of participating faculty members include control of gene transcription, gene splicing, heavy metal detoxification and oxidative damage, use of transgenic animals to study expression of foreign genes, molecular mechanisms of tumor cell differentiation and DNA repair, molecular neuroscience, molecular aspects of cholesterol biosynthesis, viral gene expression, genetic regulation of cell cycle, molecular genetics, cardiac K⁺ channel function, evolution of proteins, cell membranes and transport, cell biology of Na/K⁺ pump, enzyme mechanisms, regulation of enzyme activity, receptors, neuronal development and regeneration, immune regulation, molecular parasitology, molecular biophysics and cellular trafficking of proteins.

Graduate Degrees Offered

The PhD degree requires successful completion of course work, a comprehensive (preliminary) examination, an original research project and the writing and defense of a dissertation. For a combined MD/PhD degree, the student should first complete all requirements for the PhD degree before the clinical training.

Application to the Program

Interested students should direct inquiries to the office of the program Director with a brief description of the applicant's undergraduate record, GRE scores (if available) and research interests. Formal application materials may be obtained from the Office of Graduate Admissions, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago,

Illinois 60064. Applicants may also contact the Director's office for additional information (847-578-3221). Applications may be submitted in the Fall of the year preceding entrance, but no later than June 1 of the subsequent year. Admission to the program is decided upon by an interdepartmental and departmental committees and official notification of acceptance is offered from the Office of the Dean of the Graduate School.

Financial Assistance

Qualified students are eligible for full tuition waiver and a stipend depending upon undergraduate record, letters of recommendation, GRE scores and research experience (if any).

Course of Study

The first year of study typically consists of the following courses: Molecular Cell Biology (MBCH 502), Biochemistry and Cellular Biology (MBCH 505A, B), Advanced Molecular Biology (GBCH 538A, B), Introduction to Research and Ethics in Biomedical Research (GGCS 724). The students in this program are also urged to select several of the following courses as part of their training: Enzyme Structure and Mechanism (GBCH 543), Ion Channels, Carriers and Pumps (GPHY 618).

Once his/her advisor and department are chosen at the beginning of the second year, the student follows the requirements for graduation as prescribed by the department's regulations. Departments with specialized course requirements for the degree might have to accommodate these requirements in the second year. These include Clinical Anatomy (MCBA 500A, B) for Cell Biology and Anatomy, Medical Physiology (MPHY 500A, B) for Physiology and Biophysics, Medical Microbiology and Immunology (MMIC 600A, B, C) for Microbiology and Immunology, Foundations of Medical Pharmacology (GCMP 600A, B, C) for Cellular and Molecular Pharmacology and Medical Neuroscience (MNSC 501) for Neuroscience.

Multidisciplinary Courses

Biomedical research is a multidisciplinary effort, requiring a broadly based expertise. For this reason, faculty members of the basic sciences departments at the Chicago Medical School have developed a series of multidisciplinary courses and journal clubs, focused on the molecular/cellular sciences and the neurosciences. Several seminar series featuring outside speakers complement the formal course offerings. Related courses are listed under department headings.

GMTD 707 Current Topics in Neurobiology

This interdisciplinary course will deal with selected topics of neurobiology that are of current and fundamental interest. It is presented by faculty of the Department of Neuroscience and the Departments of Biochemistry and Molecular Biology, Cell Biology and Anatomy, Cellular and Molecular Pharmacology, and Physiology and Biophysics. The course is organized into two parts: molecular/cellular (first quarter) and physiological/behavioral (second quarter). The topics covered in the first part include electrogenic properties of excitable membranes, axoplasmic transport, synaptic transmission and its modulation, neurotransmitter receptors, neuropeptides, neuroendocrine systems, and supporting non-neuronal cells and their products. The topics in the second part include: blood-brain barrier; neural development; neuronal adaptation; neuronal control of biological rhythms; model neural systems; autonomic integration; vision; pain; sleep; and temperature regulation. Prerequisite: Neuroscience (MNSC 501) or equivalent. Fall and Winter Quarters, two hours per week (2 units). Dr. Brandon and Faculty.

GMTD 708 Molecular and Cellular Sciences Journal Club

Presentations on current literature and personal research by faculty, staff, students and guest speakers in all aspects of gene expression. Prerequisite: None. Fall, Winter and Spring Quarters, one hour alternate weeks (2 units per year). Faculty.

GMTD 709 Molecular and Cellular Sciences Seminar

Presentations on current literature and personal research by guest speakers in all aspects of molecular and cellular sciences. Fall, Winter and Spring Quarters, one hour alternative weeks (1 unit). Dr. Neet and Faculty.

GMTD 510, 511, Brain Frontiers: Advanced Topics 512, 513, 514, 515 in Neuroscience Research

Through lectures and discussion, this team-taught survey course covers major topics in neuroscience research currently being conducted at the University. The objectives of this course are: to deepen students' knowledge in specific areas of neuroscience; to introduce different research methods, and explain their underlying principles; to foster critical reading of the scientific literature; and to provide a unifying experience for Neuroscience graduate students, which encourages their interaction and develops an esprit de corps within the Program. Fall, Winter and Spring Quarters, 2 hours per week (2 units). Faculty.

GMTD 711 Cell Journal Club

Presentations from current literature by faculty, staff and students. All areas of membrane biology are discussed including ion transport, second messengers, receptors and morphology. Fall, Winter and Spring Quarters, one hour per week (1 unit). Dr. Kim and Faculty.

GPHY 618 Advanced Topics in Cell Biology: Ion Channels, Carriers and Pumps

The objective of this course is to conduct an in-depth survey of the current state of knowledge of the mechanism of permeation through ionic channels. Topics to be discussed include: 1) elementary properties of ions in solution, 2) electrodiffusion, 3) surface charge theory, 4) ionic selectivity, 5) mechanisms of channel block, 6) channel gating mechanisms, 7) molecular biology of ion channels, 8) voltage dependent Na and K channels, 9) Ca channels and 10) chloride channels. Winter Quarter in alternate years with GPHY 542, three hours per week (3 units). Dr. Rasgado-Flores and Faculty.

GBCH 538A, B Advanced Molecular Biology

This course deals with advanced topics in molecular biology that are of current and fundamental interest. Recent advances in the expanding field and their implications are emphasized. Prerequisites: Medical Biochemistry and Molecular Cell Biology or related courses. Parts of Winter and Spring Quarter, three lectures per week (5 units). Dr. Potashkin and Faculty.

MBCH 502 Molecular Cell Biology

In this course, the molecular and cellular processes common to all eukaryotic cells are studied and, where appropriate, comparisons to prokaryotic cells are made. The molecular and cellular processes of specific cell types and tissue types are also considered and related to their morphological appearances. Fall Quarter, five lecture hours and one conference hour per week (6 units). Dr. Oblinger and Faculty.

GCBA 505 Developmental Biology

The course presents a comprehensive study of basic developmental processes in model systems ranging from lower eukaryotes to mammals. The course covers both cellular and molecular aspects of development. Medical applications of conclusions drawn from basic experimental systems will be discussed where appropriate; for example, understanding of birth defects and the development of human gene therapy protocols. Prerequisite: MBCH 502, Spring Quarter, offered in alternate years (2 units). Drs. Vertel, DiMario and Faculty.

GMIC 560 Advanced Immunology

Lectures, discussion and assigned reading for in-depth studies covering properties of antigens and antibodies; mechanisms of antibody formation; phylogeny and ontogeny of the immune system; structural and functional aspects of the immune system; molecular basis of antibody and lymphocyte diversity; major histocompatibility complexes in man and animals; immunogenetics of differentiation; effector mechanism of antibody and cell-mediated immunity; immunodeficiency diseases; regulation and control of the immune response; genetics and immunology of transplants and tumors. Prerequisites: MMIC 600A or Introductory Immunology and Biochemistry. Winter

Quarter, alternate years, three lecture hours per week (3 units). Dr. Kim and Faculty.

GMIC 580 Molecular and Genetic Basis of Diseases

This course presents the molecular and genetic basis of a series of diseases involving the immune system and infectious microbes. It is designed to cover the experimental basis of scientific investigations in these areas and their relevance to our understanding of human diseases. The course will cover topics such as transplantation, allergic and autoimmune diseases, immunodeficiency diseases, microbial infections, microbial resistance, cancer, and HIV infections. Prerequisites: MBCH 502, Molecular Cell Biology. Winter Quarter, three hours per week (4 units). Faculty.

GCBA 536 The Neurobiology of Learning & Memory

The mechanisms by which the brain stores learned information are under intense investigation. Topics to be covered will include the different behavioral learning paradigms, the distributed nature of memory storage, the respective roles of the hippocampus vs. cortex, forgetting as an active process, excitability vs. synaptic modifications, the role of gene expression, and the respective contributions being made by invertebrate vs. vertebrate preparations. Original research papers will be read and discussed. Three hours per week. Prerequisite: MNSC 501, Medical Neuroscience. Fall Quarter (3 units). Offered alternate years.

GMTD 800 Seminar (MD/PhD) Series

This course is designed for the first two years of the MD/PhD students or the first year of PhD students' course of study, before the selection of a major advisor and a basic science department. The students will take a seminar course from each of the six Departmental Seminar Programs. Students are required to attend and/or participate in at least one seminar per week from any of the Departmental seminars (GBCH 533, GCBA 533, GMIC 533, GNSC 553, GCMP 509, and GPHY 505). Fall, Winter and Spring Quarters, one hour per week (1 unit). Dr. Kim and Faculty.

GMTD 805 Introduction to Research (MD/PhD)

This course is designed for the first two years of the MD/PhD student or the first year of the PhD student's course of study, before the selection of a major advisor and a basic science department. The student may take this course as a laboratory research rotation. Fall, Winter, Spring and Summer Quarters, hours and units to be arranged. All Faculty.

General Courses**GGCS 710 Computational Analysis**

This course will serve as an introduction to statistical analysis with an emphasis on application in the medical sciences. Course content will include both the theoretical foundations necessary to understand and implement statistical procedures as well as practical applications using modern statistical tools available for personal computers. Statistical software will be used to illustrate concepts as well as for data visualization and analysis. Emphasis will be placed on interpreting computer output rather than rote calculations. (3 units). Faculty.

GGCS 717 Biostatistics

Introduction to data analysis and computer techniques for the biological sciences. Topics covered include: descriptive statistics, parametric and non-parametric hypothesis testing, analysis of variance, simple linear regression and correlation. Prerequisites: None. Spring Quarter, four hours per week (4 units). Psychology Faculty.

GBCH 554 Computer Applications in Biological Chemistry

This course focuses on the application of computers to biological research. Topics to be covered include: Internet and other networks; nucleic acid, protein carbohydrate and other databases; nucleic acid and protein sequence analysis; protein and nucleic acid modeling; data fitting. Winter Quarter, two hours per week. Not offered every year. Prerequisite: Familiarity with PC and Macintosh computers. (2 units) Dr. Walters and Faculty.

GBCH 539 The Art of Scientific Presentation

The successful scientific career requires clear communication of scientific results. Participants in this course practice giving and evaluating oral presentations of technical material. Topics to be covered include organization of a talk, targeting the material to the appropriate level of the audience, overcoming "stage fright", effective visual aids, developing eye contact, effective use of voice, overcoming language barriers, and handling question-and-answer sessions. Spring Quarter, 2 hours per week (2 units). Dr. Walters.

GGCS 720 Intermediate Concepts in Computer Science

This course is designed as a continuation of GBCH 554, exploring the topics in more technical detail. The course content is updated yearly to incorporate new advances in computer technology. Examples of topics discussed in this class are database administration, artificial intelligence and object oriented programming. Prerequisite: GBCH 554. Any quarter, depending on number of students signing up (1–3 units). Faculty.

GGCS 724 Ethics in Biomedical Research

This course covers a variety of topics that are related to the responsible conduct of research in the biomedical sciences. The topics include scientific integrity in the gathering and reporting of data, proper allocation of credit in collaborative studies, and the various types of misconduct that are seen in research. The ethical use of animals and human subjects is also discussed. Current issues concerning the societal role of the academic scientist in dealing with the media, commercialized research, etc. are presented. The course is structured along federal guidelines on scientific integrity as part of research training, and is aimed to prepare students for the various ethical situations that may arise during the course of a research career. This course is mandatory for all graduate students. Winter Quarter, one hour per week. (1 unit). Dr. Eliot and Faculty.