

# IMMUNOLOGY PROGRAM

*Chair, Executive Committee for the Immunology Program:* Lawrence Steinman (Professor of Neurology and Neurological Sciences)

*Director for Immunology Program:* Eugene Butcher (Professor of Pathology)

*Director for Clinical Immunology Program:* C. Garrison Fathman (Medicine/Immunology and Rheumatology)

## **Participating Departments and Faculty:**

*Biological Sciences:* Patricia P. Jones (Professor)

*Cardiothoracic Surgery:* Carol Clayberger (Associate Professor, Research; and Pediatrics)

*Chemistry:* Harden M. McConnell (Professor, emeritus)\*

*Genetics:* Leonard A. Herzenberg (Professor, emeritus), Lenore A. Herzenberg (Professor, Research)

*Medicine/Bone Marrow Transplantation Program:* Robert Negrin (Associate Professor), Judith Shizuru (Assistant Professor)

*Medicine/Endocrinology:* Ajay Chawla (Assistant Professor)

*Medicine/Hematology:* Peter Lee (Assistant Professor)

*Medicine/Immunology and Rheumatology:* C. Garrison Fathman (Professor), Jane R. Parnes (Professor), Samuel Strober (Professor), Paul J. Utz (Assistant Professor)

*Medicine/Oncology:* Gilbert Chu (Associate Professor, and Biochemistry), Dean Felsher (Assistant Professor), Ronald Levy (Professor), Shoshana Levy (Professor, Research)

*Microbiology and Immunology:* Yueh-Hsiu Chien (Professor), Mark M. Davis (Professor), K. Christopher Garcia (Assistant Professor, and Structural Biology), Hugh McDevitt (Professor), Garry P. Nolan (Professor, Microbiology and Immunology), Hugh O. McDevitt (Professor), David Schneider (Assistant Professor)

*Molecular and Cellular Physiology:* Richard S. Lewis (Associate Professor)

*Molecular Pharmacology:* Phyllis Gardner (Professor, and Medical/Clinical Pharmacology, and Cardiovascular Medicine)

*Neurology and Neurological Sciences:* Lawrence Steinman (Professor, and Pediatrics)

*Pathology:* Eugene C. Butcher (Professor), Michael Cleary (Professor), Gerald R. Crabtree (Professor, and Developmental Biology), Edgar G. Engleman (Professor, and Medicine/Immunology and Rheumatology), Joseph S. Lipsick (Professor), Sara Michie (Associate Professor), Raymond A. Sobel (Associate Professor), Irving L. Weissman (Professor, and Developmental Biology)

*Pediatrics:* Ann Arvin (Professor, and Microbiology and Immunology), Christopher Contag (Assistant Professor, Research), Rosemarie DeKruyff (Assistant Professor, Research), Alan M. Krensky (Professor), Carol Clayberger (Professor, Research), David B. Lewis (Associate Professor), Elizabeth Mellins (Associate Professor), Dale T. Umetsu (Professor)

*Structural Biology:* Peter Parham (Professor, and Microbiology and Immunology)

*Surgery:* Sheri Krams (Associate Professor, Research), Olivia Martinez (Professor, Research)

\* Recalled to active duty

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Courses given in Immunology have the subject code IMMUNOL. For a complete list of subject codes, see Appendix B.

## **GRADUATE PROGRAMS**

### **MASTER OF SCIENCE**

Students in the Ph.D. program in Immunology may apply for an M.S. degree in Immunology, assuming completion of appropriate requirements. Students must complete:

1. Three full-tuition quarters of residency as a graduate student at Stanford
2. At least 45 units of academic work, all of which must be in courses at or above the 100 level, 36 units of which must be at or above the 200 level
3. Three quarters of graduate research (IMMUNOL 300), consisting of rotations in the labs of three faculty members
4. Course work in Immunology as follows: one course in basic immunology (BIOSCI 230, MI 200 or equivalent, advanced Immunology such as IMMUNOL 200 and 201), GENE 203, Advanced Genetics, MI 215, Principles of Biological Technologies, MCP 221, Cell Biology of Physiological Processes
5. Graduate-level biochemistry and molecular biology (BIOC 200, 201, or equivalents)
6. Course work in IMMUNOL 311, Seminar in Immunology, and IMMUNOL 311A, Seminar Discussion in Immunology
7. Participation in the Immunology journal club (IMMUNOL 305), and attendance at the weekly Immunology seminar and at the annual Stanford Immunology Scientific Conference
8. One written qualifying exam and proposal before candidacy

### **DOCTOR OF PHILOSOPHY**

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The interdepartmental Immunology Program offers instruction and research opportunities leading to a Ph.D. in Immunology. The goal of the program is to develop young investigators who have a solid foundation in immunology as well as related sciences and who can carry out innovative research. The program features a flexible selection of courses and seminars to enrich the students' backgrounds, combined with extensive research training in the laboratories of the participating immunology faculty.

Students applying to the program typically have an undergraduate major in biological sciences, but majors in other areas are acceptable if the applicants have had sufficient course work in biology and chemistry. Formal application should be made by December 15. Applications are evaluated by the Immunology Predoctoral Committee based on scores on the GRE exams (including the subject test in either biology, biochemistry, or chemistry), which should be taken by the October test date; grades; evidence of prior research experience; letters of recommendation, including letters from research sponsor(s); and commitment to a career in biomedical research. Interested Stanford medical students are welcome to apply to the program; they should contact the program director.

Students admitted to the program are offered financial support covering tuition, a living stipend, insurance coverage, and an allowance for books/travel. Applicants are urged to apply for independent fellowships such as from the National Science Foundation and the Howard Hughes Medical Institute. Fellowship applications are due in November of the year prior to matriculation in the graduate program. Because of the small number of department-funded slots, students who have been awarded an outside fellowship will have an improved chance of acceptance into the program.

On matriculation, each student is assisted in selecting courses and lab rotations in the first year and in choosing a lab for the dissertation research. Once a dissertation adviser has been selected, a dissertation committee including at least two Immunology faculty, and including the dissertation adviser, is constituted to guide the student during the dissertation research. The student must meet with the dissertation committee at least once a year.

Candidates for Ph.D. degrees at Stanford must satisfactorily complete a three-year program of study that includes 72 units of graduate course work and research and nine full-tuition quarters of residency. At least 3 units must be taken with each of four different Stanford faculty members.

The requirements for the Ph.D. degree in Immunology include the following:

1. Training in biology and cognate disciplines equivalent to that provided by the undergraduate Biology major at Stanford.
2. Completion of the following courses (or their equivalents from undergraduate work):
  - a) Basic Immunology (BIOSCI 230 or MI 200)

- b) Advanced Immunology (IMMUNOL 201, 202)
  - c) Biochemistry and Molecular Biology (BIOC 200)
  - d) Cell Biology of Physiological Processes (MCP 221)
  - e) Statistics (BIOSCI 141 or HRP 202)
  - f) Principles of biological technologies (MI 215)
  - g) Graduate level genetics (GENE 203)
  - h) Responsible Conduct in Science (MED 255)
  - i) Immunology Journal Club (IMMUNOL 305)
3. First-year students are required to take both the IMMUNOL 311, Seminar in Immunology and the companion course, IMMUNOL 311A, Seminar Discussion in Immunology, and participate in IMMUNOL 305, Immunology Journal Club. Students in their second year and above must participate in the IMMUNOL 311, Seminar in Immunology and may opt to take the companion course, IMMUNOL 311A. Students who have not yet achieved TGR status must register for 1 unit. Students attend the weekly Immunology Seminar Series (5-6 p.m. Tuesdays). Students read the papers of and have dinner with visiting seminar speakers two or three times each quarter, and meet with a faculty member to discuss the material.
  4. Elective courses as agreed upon by the student, adviser, and advisory committee. Electives may be chosen from graduate courses and seminars in any of the biomedical science departments and programs.
  5. Completion in the first year of three one quarter rotations. Two weeks after taking the written portion of the qualifying examination process in mid-July, students shall present their lab rotation research projects to the Predoctoral Committee and the Immunology community at large.
  6. Teaching assistantship in two immunology courses. A teaching assistantship requirement may be fulfilled by proposing a graduate student-initiated course IMMUNOL 315, Topics in Immunology.
  7. For admission to candidacy, completion of two requirements by the end of the Autumn Quarter of the second year: a rotation presentation on one of three lab rotations, and a comprehensive written examination in immunology and related biomedical sciences must be completed satisfactorily by the middle of Summer Quarter of the first year. Finally, students must prepare and defend a research proposal on their dissertation research by December 23, the end of Autumn Quarter of their second year. Administration and evaluation of these requirements is the responsibility of the student's dissertation committee.
  8. Participation (through regular attendance and oral presentation) in the student-run immunology journal clubs for at least the first two years (IMMUNOL 305). Students are also expected to attend the graduate students' journal club, the Tuesday evening immunology seminars, and the annual Stanford Immunology Scientific Conference.
  9. Passing of the University oral examination on the dissertation research, which is to be taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the candidate presents his/her research.
  10. Completion of a Ph.D. dissertation, resulting from independent investigation and constituting a contribution to knowledge in the area of immunology.

## COURSES

Course and lab instruction in the Immunology Program conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at <http://www.stanford.edu/dept/DoR/rph/8-2.html>.

**IMMUNOL 200. Immunology for Medical Students**—(Same as PATH 220, MI 200; medical students register for MI 200 only.) The basic concepts of immunology and the role of the immune system in a variety of diseases, utilizing case presentations of diseases including autoimmune diseases, infectious disease, transplantation, immunodeficiency diseases, hypersensitivity reactions, and allergic diseases. Weekly problem sets based on case reports and publications drawn from the clinical literature. Emphasis is on application of the fundamental concepts of immunology.

*4 units, Win (Lewis, Staff)*

**IMMUNOL 201. Advanced Immunology I**—(Same as MI 211.) For graduate students and advanced undergraduates. Topics: genetics and structure/function relationships of antibodies, T-cell receptors, MHC antigens; accessory molecules; lymphocyte differentiation and activation; cellular regulation of immune responses; autoimmunity and other problems in clinical immunology. Prerequisites: biochemistry, basic immunology course; consent of instructor for undergraduates.

*3 units, Win (Chien, Staff)*

**IMMUNOL 202. Advanced Immunology II**—(Same as MI 212.) Readings of immunological literature and specific areas of immunology. Classic problems and emerging areas are covered based on primary literature. Student and faculty presentations. Prerequisite: 201.

*3 units, Spr (Garcia, Staff)*

**IMMUNOL 203. Advanced Immunology III**—(Same as MI 213.) Immunological literature. Possible themes: the history of immunology, classic problems and emerging areas, or new topics in immunology.

*3 units, Sum (Staff)*

**IMMUNOL 215. Principles of Biological Technologies**—(Same as MI 215.) Required of first-year graduate students in Microbiology and Immunology. The principles underlying commonly utilized technical procedures in biological research. Lectures on gel electrophoresis, nucleic acid hybridization, protein purification and stabilization, light microscopy and computer search algorithms for protein and nucleic acid databases. Prerequisites: biochemistry, organic chemistry, and physics.

*2 units, Spr (Kirkegaard)*

**IMMUNOL 230. Introduction to Medicine**—(Same as BIOMEDIN 207.) For graduate students in biological sciences, bioengineering, and biomedical informatics. Information and approaches used by physicians to understand human disease by focusing on two multisystem disorders: type I and type II diabetes mellitus. Lectures by medical school and outside faculty, and field trips to clinics, the clinical laboratory, clinical research center, and a relevant biotech company. Students carry out quarter-long, team projects.

*3-4 units, Spr (Mellins, Parnes)*

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