

# PATHOLOGY

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*Emeriti: (Professor)* Ronald Dorfman; Richard L. Kempson;  
(*Professor, Clinical*) P. Joanne Cornbleet, Lawrence F. Eng, Luis Fajardo, Heinz Furthmayr, F. Carl Grumet

*Chair:* Stephen J. Galli

*Professors:* Daniel Arber, Ellen Jo Baron, Gerald J. Berry, Eugene C. Butcher, Michael L. Cleary, Gerald R. Crabtree, Edgar G. Engleman, Andrew Fire, Steven Fount, Stephen J. Galli, Lawrence Tim Goodnough, Michael R. Hendrickson, Sabine Kohler, Jon C. Kosek, Joseph S. Lipsick, Donald P. Regula, Robert V. Rouse, Richard K. Sibley, Raymond Sobel, Howard H. Sussman, Dolly Tyan, Matt van de Rijn, Hannes Vogel, Teresa S. F. Wang, Roger A. Warnke, Irving L. Weissman, James Zehnder

*Associate Professors:* Jeffrey D. Axelrod, Athena M. Cherry, Andrew Connolly, Tina Cowan, James D. Faix, Dean Felsher, Susan A. Galel, Sharon M. Geaghan, John P. Higgins, Peter K. Jackson, Christina Kong, Teri A. Longacre, Sara A. Michie, Yasodha Natkunam, Bruce Patterson, Jonathan R. Pollack, Arend Sidow

*Assistant Professors:* Matthew Bogoyo, Raffick Bowen, Soheil Dadras, Magali Fontaine, Tracy George, Kristin Jensen, Neeraja Kambham, Bingwei Lu, Jesse McKenney, Iris Schrijver, Erich Schwartz, Uma Sundram, Robert West

*Courtesy Professors:* Bertil Glader, Lucy Tompkins

*Courtesy Associate Professors:* Donna Bouley, Robert Shafer

*Clinician Educators:* Susan Atwater, David Bingham, Barbara Egbert, Dita Gratzinger, Terri Haddix, Amy McKenney, Melanie Manning, Reetesh Pai, Shalini Pereira, Run Shi, Brent Tan, Maurene Viele

*Instructors:* Niaz Banaei, Daniel Kraft, Michaela Liedtke

*Adjunct Clinical Faculty:* Robert Archibald, Jerome S. Burke, Glenn Cockerham, Stephen Shi-Hua Chen, Seth Haber, Maie K. Herrick, Paul W. Herrmann, Simon Hirschl, Charles Lombard, John E. McNeal, Judy Melinek, Joseph O'Hara, Mahendra Ranchod, Thomas W. Rogers, Joshua Sichel

*Department Offices:* Medical Center, Lane Building, L-235

*Mail Code:* 94305-5324

*Phone:* (650) 723-5255

*Web Site:* <http://pathology.stanford.edu>

Courses offered by the Department of Pathology have the subject code PATH, and are listed in the "Pathology (PATH) Courses" section of this bulletin.

## PROGRAMS OF STUDY IN PATHOLOGY

The Department of Pathology offers advanced courses in aspects of pathology. The department does not offer advanced degrees in pathology, but qualified graduate students who are admitted to department-based or interdepartmental graduate programs may elect to pursue their thesis requirements in the department's research laboratories. The discipline of pathology has served as a bridge between the preclinical and clinical sciences and is concerned with the application of advances in the basic biological sciences, both to the diagnosis of human disease and the elucidation of the mechanisms of normal molecular, cellular, and organ structure and function that manifest themselves in clinical disease. Accordingly, the department's research interests extend from fundamental molecular biology to clinical-pathological correlations, with an emphasis on experimental oncology.

Investigation in the department includes basic studies in areas using molecular biological, biochemical, and genetic cell biological techniques: DNA replication in yeast and cultured eukaryotic cells, cell cycle control in animal cells and yeast, identification and pathogenetic role of chromosomal aberrations in human malignancies and mechanisms of activation of oncogenes in human and animal cells, lymphocyte and neutrophil-interactions with endothelial cells, cell type specification and signal transduction pathways leading to specific gene expression or modulation of cytoskeletal behavior; cytoskeletal architecture, cell-matrix interaction, developmental biology of hematopoietic stem cells and

thymus, regulation of the immune system, mechanisms of immune and other responses in the central nervous system, and neuro-degenerative diseases. Various studies focus on the development of novel diagnostic and immunotherapeutic treatment modalities and techniques for solid tumors, lymphomas, HIV, and genetic diseases. Research training in all of these areas is available for qualified medical and graduate students by individual arrangement with the appropriate faculty member. A summary of the research interests of the department faculty is available at <http://pathology.stanford.edu>.

## PATHOLOGY (PATH) COURSES

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For information on graduate programs in Pathology, see the "Pathology" section of this bulletin. Course and laboratory instruction in the Department of Pathology 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>.

### UNDERGRADUATE COURSES IN PATHOLOGY

#### PATH 101. Cancer Biology

(Same as C BIO 101.) Experimental approaches to understanding the origins, diagnosis, and treatment of cancer. Focus on key experiments and discoveries with emphasis on genetics, molecular biology, and cell biology. Topics include carcinogens, tumor virology, oncogenes, tumor suppressor genes, cell cycle regulation, angiogenesis, invasion and metastasis, cancer genomics, cancer epidemiology, and cancer therapies. Discussion sections based on primary research articles that describe key experiments in the field. Prerequisite: Biology or Human Biology core or equivalent, or consent of instructor.

4 units, Spr (Lipsick, J)

#### PATH 103Q. Lymphocyte Migration

Stanford Introductory Seminar. Preference to sophomores. How lymphocytes leave the blood stream and enter tissues to participate in immune surveillance and the development of inflammation. Known as lymphocyte migration, this process involves a complex series of adhesion, activation and diapedesis events. The cellular mechanisms involved in lymphocyte migration, including lymphocyte adhesion molecules that interact with their counter-receptors on endothelial cells, and molecules, including cytokines and chemokines, that attract or activate lymphocytes. The roles of these molecules in the development of human diseases such as asthma, type I diabetes, and multiple sclerosis.

1 unit, Win (Michie, S)

#### PATH 105Q. Final Analysis: The Autopsy as a Tool of Medical Inquiry

Stanford Introductory Seminar. Preference to sophomores. Based on review of patient medical histories and examination of formalin-fixed and unfixed tissues from autopsy. Student-directed problem-solving; students develop learning objectives for each case, and present findings. The effect of disease on normal structure and function, ethics of patient care, allocation of medical resources, efficiency of therapy, and medical error. Prerequisite: hepatitis-B vaccination; free vaccinations during the winter for accepted students.

3 units, Spr (Regula, D)

#### PATH 199. Undergraduate Research

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

## GRADUATE COURSES IN PATHOLOGY

Primarily for graduate students; undergraduates may enroll with consent of instructor.

### **PATH 206. Epigenetics**

(Same as GENE 206.) For graduate students; undergraduates by consent of instructor. Mechanisms by which phenotypes not determined by the DNA sequence are stably inherited in successive cell divisions. From the discovery of position-effect variegation in *Drosophila* in the 20s to present-day studies of covalent modifications of histones and DNA methylation. Topics include: position effect, gene silencing, heterochromatin, centromere identity, genomic imprinting, histone code, variant histones, and the role of epigenetics in cancer. Prerequisite: background in genetics and molecular biology.

*2 units, alternate years, not given this year*

### **PATH 210. Stem Cells in Development and Disease**

Molecular and cellular mechanisms underlying the basic self-renewal and differentiation properties of stem cells in multiple tissues and organisms. How abnormal stem cell behavior may contribute to diseases such as cancer. How to manipulate stem cell behavior in vitro or in vivo for therapeutic purposes. Classical papers and recent literatures in the field of stem cell biology. Open to graduate, medical, and advanced undergraduate students. Prerequisite: consent of instructor.

*1-2 units, Aut (Lu, B)*

### **PATH 218. Computational Analysis of Biological Images**

Physical and computational tools for acquisition, processing, interpretation, and archiving of biological images. Emphasis is on digital microscopy.

*2 units, alternate years, not given this year*

### **PATH 233. The Biology of Small Modulatory RNAs**

(Same as GENE 233, MI 233.) Open to graduate and medical students. How recent discoveries of miRNA, RNA interference, and short interfering RNAs reveal potentially widespread gene regulatory mechanisms mediated by small modulatory RNAs during animal and plant development. Required paper proposing novel research.

*2 units, alternate years, not given this year*

### **PATH 296. Stem Cell Biology and Regenerative Medicine**

(Same as DBIO 296.) For graduate and medical students. Embryonic and adult stem cells, including origin, regulation, self-renewal, differentiation, fate, and relationship to cancer; biological mechanisms and methods to translate findings to therapeutic applications. Medical students must enroll for 5 units; graduate students may choose to take only the basic science part for 3 units. Prerequisites: DBIO 201 and 210, or consent of instructor.

*3-5 units, Win (Weissman, I; Nusse, R; Fuller, M)*

### **PATH 299. Directed Reading in Pathology**

Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

### **PATH 399. Graduate Research**

Students undertake investigations sponsored by individual faculty members. Opportunities at the molecular, cellular, and clinicopathologic levels. Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*