



2014-2015 Handbook



Stem Cell Biology and Regenerative Medicine Interdisciplinary Graduate Program (PhD)



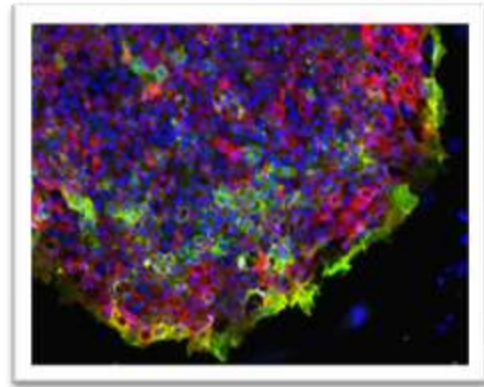
Institute for Stem Cell Biology
and Regenerative Medicine
School of Medicine
Stanford University
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Stanford, CA 94305-5461

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About the Program

The Stanford Stem Cell Biology and Regenerative Medicine (SCBRM) program is the first stand-alone, doctoral degree program in the United States devoted entirely to basic stem cell biology and its clinical translation. The SCBRM program is designed to provide doctoral education that drives basic science into clinical applications. This is typically referred to as *Translational Science* and is of intense interest internationally in medical schools and universities. Our rigorous core curriculum is combined with unique research and clinical/ professional immersion rotations to provide opportunities to specialize in the broad subject of translational medicine and yet focus specifically on the fundamentals of biology necessary for a successful career in this competitive new discipline. The curriculum builds expertise in stem cell biology and regenerative medicine along with a solid foundation of genetics, cell biology, and developmental biology. Our courses include a laboratory-based, didactic course on human development with stem cell methodologies, an advanced course in SCBRM with basic science and clinical applications, and a practical immersion with unprecedented opportunities in clinical medicine, law, business, computer science and/or engineering.



Immunostaining of pluripotent stem cells grown in culture.

The Interdepartmental SCBRM program is led by Dr. Theo Palmer along with Co-Directors Drs. Joanna Wysocka and Margaret Fuller. The SCBRM program is housed within the Lorry Lokey Stem Cell Research Building, a modern research facility completed in 2011. Our program is a part of the School of Medicine [Biosciences Program](#) along with 13 other programs. Courses and research occur in a supportive environment with a dedicated group of faculty, staff and students working together to transform biomedical research. Our students graduate with the rigorous educational background and research experience necessary to develop translational careers in SCBRM. This is in line with their desire and hope to “change the world” via application of knowledge to human health. Our program also has the advantage of opening doors for our students to seek the most competitive postdoctoral positions for career advancement in academia; to further their education via business or law; or to establish themselves as scientists in private industry.



Students and Faculty in the SCBRM program.

Our Mission

Our mission is to produce the future leaders in the field of translational science through a combination of rigorous basic science education, innovative research training, and clinical/professional immersion.



Chandelier designed by world-renowned glass artist Dale Chihuly illuminates the entryway to the Lorry Lokey Building.

The SCBRM program accommodates students who wish to focus primarily on basic science alongside those who wish to focus specifically on innovation, such as new device development to solve a clinical problem in regenerative medicine. Those primarily interested in basic research might seek out a primary mentor whose career has focused on discovery research and take electives that reflect interests in the basic sciences. In the latter case, the student might select an elective with an engineering focus and seek out a primary mentor with more clinically or engineering focused research.

About the Institute for Stem Cell Biology and Regenerative Medicine

Stanford has been a leader in stem cell research for the past quarter century. In 2001, the Stanford University School of Medicine unveiled a plan to create five new translational institutes of medicine, one of which is the Stanford Institute for Stem Cell Biology and Regenerative Medicine. The Institute was established in 2003 to build on Stanford's leadership in stem cell science and to set the foundations for the creation of a new field of science: regenerative medicine. Under the leadership of Drs. Irving Weissman, Michael Clarke and Maria-Grazia Roncarolo, the Institute is devoted to four areas of focus: pluripotent stem cells and embryonic development; reprogramming of somatic cells; cancer stem cells; and tissue-specific stem cells. We explore how stem cells are maintained, the mechanisms by which they self-renew and differentiate, and their utility for clinical applications of great need to alleviate common human health problems. Our ultimate goal is to translate this knowledge into dramatic new medical therapies for the world's most serious and intractable afflictions.

Bioscience PhD Programs

The SCBRM Program is a part of the [Biosciences Program](#), alongside 13 other Home Programs. Being part of the Biosciences Program allows students to form a professional network that encourages creative thinking, interdisciplinary collaboration, and high-stakes/high-reward research. Students receive the best of both worlds: the camaraderie, flexibility and resources of a large Biosciences program along with the support and direct mentorship fostered by a focused group of faculty within the Institute for Stem Cell Biology and Regenerative Medicine.

At Stanford, the world's best students have the resources of the entire University at their fingertips. The network of Biosciences PhD programs provides students opportunities to work in a close-knit, intellectual community. The [14 Home Programs](#) empower students with the flexibility to tailor their education to their skills and interests as they evolve. Students work with global leaders in biomedical innovation, who provide the mentorship to answer the most difficult and important questions in biology and biomedicine. We encourage our students to interact freely between the 14 Home Programs. Unfettered access to all labs encourages collaboration and allows each student to discover her or his own passion.

Stanford University

Interdisciplinary collaborations are the engine that drives discovery and accelerates translational research. Collaborations between faculty, post-doctoral fellows and students from diverse disciplines have led to significant discoveries and have been a hallmark of Stanford's leadership. The interdisciplinary environment is in large part a product of the proximity of the seven schools on Stanford's campus – the Schools of Medicine, Law, Business, Earth Sciences, Education, Engineering and Humanities & Sciences. In close proximity to these schools are the Stanford Hospital and Clinics as well as the Silicon Valley, a world-renowned epicenter of business and technology innovation. This location sets the stage for dynamic interactions among those who will create the future of medicine: basic scientists, clinical researchers, medical care providers, legal and ethical scholars, biomedical engineers, business leaders, and venture capitalists.



Scenic view of Stanford University's Memorial Chapel and Oval.

SCBRM Graduate Program Faculty and Research Interests



Philip A. Beachy, PhD

<http://stemcell.stanford.edu/about/Laboratories/beachy/index.html>

The Beachy laboratory studies the normal functions of secreted protein signals, such as those of the Hedgehog family, in the establishment and maintenance of tissue patterning, and the pathological roles of such signaling pathways in cancer growth and normal development.



Michael F. Clarke, MD

<http://stemcell.stanford.edu/about/Laboratories/clarke/index.html>

The Clarke laboratory works on the molecular regulation of self-renewal in normal stem cells and disease including cancer and inherited diseases. The lab also explores how modulation of the pathways involved in self-renewal may yield potential therapeutic targets for regenerative medicine and cancer.



Max Diehn, MD, PhD

<http://stemcell.stanford.edu/about/Laboratories/diehn/index.html>

The Diehn laboratory studies normal and cancer stem cells in epithelial tissues. The overarching goal of the lab is the development of novel therapeutic strategies for eliminating cancer stem cells. A major focus is applying genomic and bioinformatic approaches to developing cancer stem cell-directed therapies and predictive/prognostic clinical assays.



Margaret Fuller, PhD

<https://med.stanford.edu/profiles/margaret-fuller>

The Fuller laboratory focuses on understanding the mechanisms that regulate adult stem cells. Fuller uses the fruit fly male germ line as a model for teasing apart the factors that either hold stem cells in an undifferentiated state or push cells to differentiate into adult fates.



Sarah Heilshorn, PhD

<http://www.stanford.edu/group/heilshorn/>

The Heilshorn laboratory designs engineered microenvironments that mimic critical aspects of the stem cell niche using the tools of recombinant matrix design, biomaterials science, and microfluidics. Applications include systems that enable three-dimensional culture and expansion of stem cells, scaffolds for regenerative medicine, and injectable stem cell delivery vehicles.



Michael T. Longaker, MD, MBA

<http://stemcell.stanford.edu/about/Laboratories/longaker/index.html>

The Longaker laboratory is focused on regenerative medicine using mouse models of normal and diabetic wound healing, skeletal regeneration, and craniofacial development. The lab hopes to translate basic findings in alleviating common health problems to regeneration, in particular skeletal repair.



Ravi Majeti, MD, PhD

<http://stemcell.stanford.edu/about/Laboratories/majeti/index.html>

The Majeti laboratory focuses on the molecular characterization and the therapeutic targeting of leukemia stem cells in human hematologic disorders, particularly acute myeloid leukemia (AML). The lab is also interested in characterizing normal human hematopoietic stem cells, with a major focus on identifying cell surface molecules preferentially expressed on leukemia stem cells and the development of therapeutic monoclonal antibodies targeting these proteins.



Michelle Monje, MD, PhD

<http://neurology.stanford.edu/labs/monjelab/>

The Monje laboratory studies the molecular and cellular mechanisms of postnatal neurodevelopment in health and disease. This includes postnatal neurogenesis and gliogenesis; cellular contributions to the neurogenic and gliogenic signaling microenvironment; molecular determinants of neural precursor cell fate; developmental origins of pediatric brain tumors; and the role of neural precursor cells in oncogenesis and repair mechanisms.



Hiromitsu (Hiro) Nakauchi, MD, PhD

<https://med.stanford.edu/profiles/hiromitsu-nakauchi?tab=bio>

In the Nakauchi Lab, we are working on uncovering new diseases, elucidating the causes of disease, and developing therapeutic modalities by connecting the knowledge and methodology of basic science including immunology, molecular biology, cell biology, and developmental engineering with clinical medicine. Our ultimate goal is to contribute to establishing new frontiers of stem cell therapy and to make clinical applications of stem cells a reality.



Roel Nusse, PhD

<http://www.stanford.edu/group/nusselab/cgi-bin/lab/main>

The Nusse laboratory is interested in the role of the Wnt pathway in stem cell control. Using mice in which the developmental fate of stem cells can be visualized, the lab tracks stem cells in various tissues, exploring the mechanisms of injury detection; stem cell activation; and how the physiological state of the animal (like hormonal changes) impact on stem cell biology.



Theo D. Palmer, PhD

http://med.stanford.edu/profiles/Theo_Palmer/

Research in the Palmer laboratory focuses on the biology of neural stem cells in the developing and adult brain. The lab's goal is to leverage emerging stem cell technologies to better understand neurological diseases and their treatment, with emphasis on neurodevelopmental disorders and aging-related neurodegenerative disease.

Maria-Grazia, Roncarolo, MD

https://med.stanford.edu/profiles/Maria-Grazia_Roncarolo

Dr. Roncarolo's goal at Stanford is to build the teams and



infrastructures to fast track stem cell and gene therapy to the clinic and to bring basic-science discoveries to patients. In addition, her laboratory continues to work on T regulatory cell-based treatments to induce tolerance after transplantation of allogeneic tissue stem cells.



Vittorio Sebastian, PhD

<http://stemcellphd.stanford.edu/faculty/vittorio-sebastiano.html>

The Sebastiano lab studies the thread of Ariadne that connects germ cells, preimplantation development and pluripotent stem cells with a specific interest in human development. Long term goals are several: Understanding the biology of germ cells and their ability to sustain early phases of preimplantation development.



Irv Weissman, MD

<http://stemcell.stanford.edu/about/Laboratories/weissman/index.html>

The Weissman laboratory studies the identification, isolation, and function of normal and cancer stem cells, including the lineage of their precursors and progeny, and the phylogeny of stem cells in colonial protochordates. It is deeply involved in taking normal and cancer stem cell discoveries through preclinical proof of principle, and into early-phase clinical trials in humans.



Marius Wernig, MD, PhD

<http://stemcell.stanford.edu/about/Laboratories/wernig/index.html>

The Wernig laboratory is focused on reprogramming somatic cells into induced pluripotent stem (iPS) cells or directly into induced neuronal (iN) cells. These emerging reprogramming technologies provide new potential translational applications such as patient-specific stem cell therapies or disease phenocopying of devastating brain diseases.



Joseph Wu, MD, PhD

<https://med.stanford.edu/profiles/radiology/joseph-wu>

The Wu laboratory is focused on the biological mechanisms of adult stem cells, embryonic stem cells, and induced pluripotent stem cells. A combination of gene profiling, tissue engineering, physiological testing, and molecular imaging technologies is used to better understand stem cell biology in vitro and in vivo.



Joanna Wysocka, PhD

http://med.stanford.edu/profiles/Joanna_Wysocka/

The Wysocka laboratory studies the epigenetic regulation of stem cell fate and differentiation; the role of chromatin modification in early development; chromatin architecture; the developmental dynamics of DNA regulatory elements; and neural crest and formation of the human face.

Associate Members of the Institute for Stem Cell Biology and Regenerative Medicine and Their Departmental Affiliations

Students can join any lab associated with Stanford including the associate member labs listed here. In addition to primary graduate faculty, the Institute for Stem Cell Biology and Regenerative Medicine has a rich cohort of colleagues to advise and mentor graduate students in conjunction with primary faculty. Any Stanford University faculty member can potentially serve as a thesis advisor.

[ALTMAN, RUSS](#)

[ANDREASSON, KATRIN](#)

[ARTANDI, STEVEN](#)

[ATTARDI, LAURA](#)

[AXELROD, JEFFREY](#)

[BAER, THOMAS M.](#)

[BAKER, BRUCE](#)

[BAKER, JULIE](#)

[BARRES, BEN A.](#)

[BARRON, ANNELISE](#)

[BEHR, BARRY](#)

Department of Bioengineering

Department of Neurology

Department of Medicine/Hematology

Department of Radiation Oncology

Department of Pathology

Department of Applied Physics

Department of Biology

Department of Genetics

Department of Neurobiology

Department of Bioengineering

Department of Obstetric and Gynecology

Institute for Stem Cell Biology and Regenerative Medicine

BERG, PAUL	Department of Biochemistry
BERGMANN, DOMINIQUE C.	Department of Biological Sciences
BLAU, HELEN	Department of Microbiology & Immunology
BOGYO, MATTHEW	Department of Immunology
BRUNET, ANNE	Department of Genetics
BUTTE, ATUL	Department of Pediatrics--Cancer Biology
CALOS, MICHELE	Department of Genetics
CHANG, CHING-PIN	Department of Medicine/Cardiovascular Medicine
CHANG, HOWARD	Department of Dermatology
CHEN, CHANG-ZHENG	Department of Microbiology
CHEN, JAMES	Department of Chemical and Systems Biology
CHENG, IVAN	Department of Orthopaedic Surgery
CHESHER, SAMUEL	Department of Neurology and Neurological Sciences
CLANDININ, THOMAS	Department of Neurobiology
CLEARY, MICHAEL	Department of Pathology
COCHRAN, JENNIFER	Department of Bioengineering
COOKE, JOHN	Department of Medicine/Cardiovascular Medicine
DEISSEROTH, KARL	Department of Bioengineering
ELIAS, JOSHUA	Department of Chemical and Systems Biology
ENGLEMAN, EDGAR	Department of Pathology
FELDMAN, BRAIN	Department of Pediatrics/Endocrinology
FERRELL, JAMES	Department of Chemical and Systems Biology
FONTAINE, MAGALI	Department of Pathology
GIACCIA, AMATO	Department of Radiation Oncology
GONZALGO, MARK	Department of Urology
GOZANI, OR	Department of Biology
GRAEF, ISABELLA	Department of Pathology
GURTNER, GEOFFREY C.	Department of Surgery
HANAWALT, PHILIP	Department of Biology
HELLER, H. CRAIG	Department of Biology
HELLER, STEFAN	Department of Otolaryngology
HELMS, JILL A.	Department of Surgery
HSU, TEDDY	Department of Obstetrics and Gynecology
KENNEDY, DONALD	President Emeritus, Stanford University
KHAVARI, PAUL	Department of Dermatology
KIM, SEUNG K.	Department of Developmental Biology
KOVACS, GREG	Department of Electrical Engineering
KRASNOW, GREGORY	Department of Biochemistry
KUO, CALVIN	Department of Medicine/Hematology
LEVENSTON, MARC	Department of Mechanical Engineering
LOWE, ANSON	Department of Medicine/Gastroenterology and Hepatology
LOWE, CHRISTOPHER	Department of Biology
LU, BINGWEI	Department of Pathology
MALENKA, ROBERT	Department of Psychiatry and Behavioral Sciences
MCCONNELL, SUSAN K.	Department of Biological Sciences
MITCHELL, BEVERLY	Department of Chemical and Systems Biology

Institute for Stem Cell Biology and Regenerative Medicine

<u>ORO, ANTHONY</u>	Department of Dermatology
<u>PASRICHA, PNKAJ JAY</u>	Department of Medicine/Gastroenterology and Hepatology
<u>PEEHL, DONNA</u>	Department of Urology
<u>PENN, ANNA</u>	Department of Pediatrics
<u>QUAKE, STEPHEN</u>	Department of Bioengineering
<u>RANDO, THOMAS</u>	Department of Neurology
<u>RECHT, LAWRENCE</u>	Department of Neurology and Neurological Science
<u>REISS, ALLAN</u>	Department of Psychiatry and Behavioral Science
<u>ROSEN, GLEN</u>	Department of Medicine/Pulmonary and Critical Care Med
<u>RUTT, BRIAN</u>	Department of Radiology
<u>SAGE, JULIEN</u>	Department of Pediatrics
<u>SAKAMOTO, KATHLEEN</u>	Department of Pediatrics/Hematology and Oncology
<u>SCHNITZER, MARK</u>	Department of Biology
<u>SCOTT, MATTHEW P.</u>	Department of Developmental Biology
<u>SHIZURU, JUDITH</u>	Department of Medicine
<u>SHORTLIFFE, LINDA</u>	Department of Urology
<u>SIMON, MICHAEL</u>	Department of Biology
<u>SO, SAMUEL</u>	Department of Surgery
<u>STEARNS, TIM</u>	Department of Biology
<u>STEINBERG, GARY</u>	Department of Neurosurgery
<u>SUDHOF, THOMAS</u>	Department of Molecular and Cellular Physiology
<u>SUNWOO, JOHN</u>	Department of Otolaryngology
<u>SWEET-CORDERO, ALEJANDRO</u>	Department of Pediatrics
<u>TALBOT, WILLIAM</u>	Department of Developmental Biology
<u>WANDLESS, THOMAS</u>	Department of Chemical and Systems Biology
<u>WEINBERG, KENNETH</u>	Department of Pediatrics
<u>WONG, ALBERT</u>	Department of Neurosurgery
<u>WU, JOSEPH</u>	Department of Medicine/Cardiovascular Medicine
<u>YANG, FAN</u>	Departments of Orthopedic Surgery & Bioengineering
<u>YANG, PHILLIP</u>	Department of Medicine
<u>YOCK, PAUL</u>	Departments of Medicine and Bioengineering

SCBRM Curriculum Overview

Our curriculum, combined with the research and rotation opportunities, provides a flexible but rigorous educational opportunity for doctoral students. During the first year coursework and research rotations, students begin to understand the broad subject of translational medicine while focusing more specifically on the fundamentals of Stem Cell Biology and Regenerative Medicine. The core of the SCBRM curriculum is built on the fundamentals of genetics, developmental biology, and cell biology. Also accompanying the formal classroom-based core curriculum is a requirement to complete up to three Graduate Research rotations (STEMREM 399) in the first year. After selecting a thesis advisor, the combined coursework and dissertation-directed research allows the completion of the requirements leading to a Doctoral degree. A minimum of 135 units of combined coursework and Graduate Research is required for the student to become eligible for the PhD degree after spring quarter of the 4th year of enrollment.

Before the start of the academic year, incoming SCBRM students are required to participate in a week-long Stem Cell Intensive (STEMREM 200) in which students learn proper methods of tissue culture, mouse embryo fibroblast (MEF) preparation, embryonic stem and induced pluripotent stem (ES/iPS) cell culture, differentiation, DNA isolation, polymerase chain reaction (PCR), immunohistochemistry, and basic microscopy.

All SCBRM students will enroll in the unique core SCBRM courses, STEMREM 201A, 201B, 202 and 203, as well as the Regenerative Medicine weekly seminar series – STEMREM 250. The curriculum starts by integrating didactic coursework in human development with laboratory-based stem cell methods. This introduction is followed by an exploration of the basic and clinical properties of different stem cell systems with a focus on developing a research proposal or business plan by the end of the second quarter. Finally, an immersion or internship in the third quarter or later is aimed at moving the student's professional and personal goals forward with novel opportunities in medicine, business, industry, human health, science policy, or other professional interest. Immersions are planned by the student in consultation with academic advisors and assist in acquiring a highly specialized subset of the knowledge, skills, and expertise for success.

Stem Cells and Human Development (STEMREM 201A & B) is a unique course offering that combines didactic lectures with comprehensive

laboratory-based instruction focused on human developmental biology, embryology, derivation of pluripotent stem cells, cell sorting, genomics, bioinformatics, imaging and other related topics. This course provides the educational foundation, hands-on skill development, and social group building for each first-year class of students.

Stem Cells and Translational Medicine (STEMREM 202) provides instruction by experiment and focuses on the fundamentals of SCBRM and uses an exploration of experimental and translational approaches being actively developed by Stanford faculty members. This course pairs lectures in the basic science of each topic, followed by clinical applications. The course culminates with construction of a research proposal or business plan in an area of interest that is unique to each student.

Stem Cell Immersion: Applications in Business, Law and Medicine (STEMREM 203) provides immersion or internship opportunities for students who have selected a research mentor and topic. The immersion can provide perspective into the world of clinical, pharmaceutical, biotechnology or business, providing insight into the world of medicine from multiple vantage points. The immersion provides the student an opportunity to explore and refine career pathways and sets the stage for students to translate research successfully beyond the academic sphere and gain the necessary knowledge, if possible, to move their research into real-life applications. STEMREM 203 must be pre-approved by your advisor and can be completed when it is best suited for the student.

The immersion rotation is an essential component of the core curriculum and is designed with input from the student's academic and research advisors and a clinical co-mentor selected by the student with assistance from the program directors. Prior to enrolling for credit, all immersion rotations must be approved by the SCBRM program director. Upon completion, a report of the immersion rotation is provided by the immersion mentor as evidence of completion and is included in the student record. Duration: variable; an immersion can span 2 – 4 weeks full/part time or can be structured as one or more days per week for one quarter.

We encourage our students to explore areas that are of interest to them in the immersion component of the curriculum. Examples include: doing a clinical immersion (shadowing a clinician who practices in the student's area of research), doing an internship at a biotechnology company, a venture capital or law firm, taking a business or law course, etc. The

students must discuss ideas for clinical immersion with their advisors and have their advisors' approval. For clinical rotations, students will participate fully in most of the usual medical student activities including attending patient rounds, diagnostic rounds, observing patient examinations, as well as attending grand rounds and other medical lectures. Alternatively, students can arrange to spend time attending clinic with their physician mentor or alternative clinical experiences as appropriate and agreed upon by their physician mentor and the graduate program directors. Students will be graded based on a final paper describing the current and future opportunities for the application of stem cell biology to the chosen discipline. Students in the SCBRM will be encouraged to also include clinical faculty on their advising team from qualifying to defense. Examples of immersion opportunities include:

1. Stanford Ignite: Powering Innovation and Entrepreneurship
<http://www.gsb.stanford.edu/ignite/stanford>
Application Deadline March 15th.
2. Attend Grand Rounds for any clinical department.
Here are a few links to some of the department's schedules.
<http://med.stanford.edu/seminars/medicine/depUpcomingEvents.do?department=231>
<http://cvi.stanford.edu/about/events.html>
<http://radiology.stanford.edu/education/grandrounds.html>
<http://obgyn.stanford.edu/>
<http://neurology.stanford.edu/education/grandRounds.html>
3. Shadow PI or co-mentor in a clinical setting. You must choose your lab before choosing this option.
4. Approved business course (your choice, with program approval).
5. Business internship (your choice, with program approval).
StartX provides access to companies for internships. <http://startx.stanford.edu/>
6. Law internship or law class (your choice, with program approval).
7. Course or mentored independent studies in policy or ethics (your choice, with program approval).

Regenerative Medicine Seminar Series - ReMS (STEMREM 250) provides 6 quarters of weekly lectures in stem cell biology and regenerative medicine. The ReMS series provide students with firsthand information about emerging research, toolsets, and cutting edge applications. ReMS also provide the students with an opportunity to evaluate faculty research topics for potential rotations and/or collaborations. Attendance is required for 1st and 2nd year students and encouraged for all students in the program.

Electives: Students (with input from their research advisors) will select appropriate elective courses from the Schools of Medicine, Humanities and Science, Engineering, Earth Sciences, Business and/or Law. Electives provide flexibility for the students to hone their knowledge and skills with in-depth training in areas of interest, including translational medicine; intellectual property development; legal and ethical issues; and/or entrepreneurship.

Overview of Curriculum by Quarter – Year 1

Year 1: Autumn QTR 1 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 200 9/15-9/19 from 9 to 5	Stem Cell Intensive G1161 & G1165	0 units	Palmer, T.
STEMREM 201A M 9 to 9:50 and W 9 to 9:50 (Discussion)	Stem Cells and Human Development G1161	1-2 units	Palmer, T.
STEMREM 201B T, TH 9 to 11:50 and F 9 to 9:50	Stem Cells and Human Development Lab G1165	3 units	Palmer, T.
BIOS 200 M 10 to 11:50 and 11:50 to 1:15 W, F 10 to 11:50	Foundations in Experimental Biology LKSC 101/102	6 units	Clandinin, T.; Goodman, M.; Stearns, T.; Straight, A.
STEMREM 250 TH 12 to 1	Regenerative Medicine Seminar Series Munzer Auditorium	0 units	Longaker, M.

Year 1: Winter QTR 2 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
BIOC 224 (BIO 214, MCP 221) M, W, F 10 to 11:50 or GENE 205 T, TH 1 to 2:30	Advanced Cell Biology	4 units	Jonikas, M.; Kopito, R.; Pfeffer, S.; Theriot, J.
STEMREM 202 W, F 1:15 to 3:05	Advance Genetics	3 units	Bustamante, C.; Fire, A.; Pringle, J.; Villeneuve, A.; Winslow, M.
MED 255 SAT 8:30 to 5	Stem Cells and Translational Medicine	3-5 units	Palmer, T.
STEMREM 250	Responsible Conduct of Research	1 unit	Karkazis, K.
	Regenerative Medicine Seminar Series	1 unit	Longaker, M.

Year 1: Spring QTR 3 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
DBIO 210 M, F 9 to 10:10 and W 9 to 10:50	Developmental Biology Beckman B302	4 units	Barna, M.
STEMREM 203	Stem Cells Immersion: Applications in Business Law and Medicine	3 units	Palmer, T.
STEMREM 250	Regenerative Medicine Seminar Series	1 unit	Longaker, M.
STEMREM 280 M, W 12 to 1	Stem Cell Biology and Regenerative Medicine Journal Club	2 units	Palmer, T.

Year 1: Summer QTR 4 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 399	Graduate Research	10 units	SCBRM Faculty

- Year One Total: 40 units
- Milestone Complete: Selection of Thesis Lab

Overview of Curriculum by Quarter – Year 2

Year 2: Autumn Qtr 5 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 250	Regenerative Medicine Seminar Series	1 unit	Longaker, M
STEMREM 399	Graduate Research	5-6 units	SCBRM Faculty
Elective	Elective	3-4 units	TBD

Year 2: Winter QTR 6 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 250	Regenerative Medicine Seminar Series	1 unit	Longaker, M.
STEMREM 281 T 7 to 9 PM	Landmark Papers in Immunology and Stem Cell Biology: How to Pose Experimental Questions	2 units	Weissman, I.
BIO 214 (BIOC 224, MCP 221) or GENE 205	Advanced Cell Biology	4 units	Jonikas, M.; Kopito, R.; Pfeffer, S.; Theriot, J.
	Advance Genetics	3 units	Bustamante, C.; Fire, A.; Pringle, J.; Villeneuve, A.; Winslow, M.
STEMREM 399	Graduate Research	3-4 units	SCBRM Faculty

Year 2: Spring QTR 7 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 250	Regenerative Medicine Seminar Series	1 unit	Longaker, M.
STEMREM 399	Graduate Research	5-6 units	SCBRM Faculty
Elective	Elective	3-4 units	TBD

Year 2: Summer QTR 8 (10 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 399	Graduate Research	10 units	SCBRM Faculty

*Biochemistry proficiency will be required by the end of Year 2. Electives will be added to the curriculum in (Winter/Spring)

- Year Two Total: 80 units
- Milestones Completed: Complete Course Work; Pass Qualifying Examination

Overview of Curriculum by Quarter – Years 3-5

Year 3: Autumn-Spring, QTRs 9-11 (10 units/quarter)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 399	SCBRM Independent Research	10 units	SCBRM Faculty

Year 3: Summer QTR 12 (5 units)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director(s)</i>
STEMREM 399	SCBRM Independent Research	5 units	SCBRM Faculty

- Year Three Total: 115 units
- Milestone Completed: Meet with Dissertation Reading Committee

Year 4 Autumn-Winter QTRs 13-15 (10 units/quarter)

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director</i>
STEMREM 399	SCBRM Independent Research	10 units	SCBRM Faculty

- Year Four Total: 135 Units
- Milestone Completed: Petition for TGR Status

Year 5 and beyond:

<i>Course</i>	<i>Title</i>	<i>Units</i>	<i>Course Director</i>
STEMREM 802	Dissertation	0 units	SCBRM Faculty

Summary of Degree Requirements

SCBRM graduate students enroll in 10 units per quarter and are required to complete 135 units of coursework including core curriculum and ethics training. Generally, required didactic coursework is completed in the first two years of the doctoral program. After completing coursework, students enroll in 10 units of Graduate Research (STEMREM 399) each quarter, thereby completing the required minimum of 135 units by the end of spring quarter of the 4th year. After this, students focus on dissertation research and may enroll in up to 3 units of electives per quarter.

A. Core Curriculum

▼ Mandatory Coursework and Immersion (9 Courses)

1. Stem Cell Intensive (STEMREM 200 – 0 units)
2. Stem Cells and Human Development with Laboratory (STEMREM 201A & B – 4 units)
3. Stem Cells and Translational Medicine (STEMREM 202 – 5 units)
4. Stem Cells Immersion Applications in Business, Law, and Medicine (STEMREM 203)
5. ReMS Regenerative Medicine Seminar Series (STEMREM 250 – 6 units)
6. Advanced Genetics (BIO 203/GENE 203/DBIO 203 – 4 units)
7. Developmental Biology (DBIO 210 – 5 units)
8. Cell Biology (MCP 256 – 4 units) or Advanced Biology (BIOC 224/BIO 214 – 4 units)
9. Biochemistry (2-5 units), any course with SCBRM approval, including.
 - CSB 210: Cell Signaling
 - SBIO 241: Biological Macromolecules
 - BIOS 228: Understanding Chemistry in Biology and Biological Experiments
 - BIOS 204: practical Tutorial on the Modeling of Signal Transduction Motifs

▼ Other Mandatory Courses/Unit

1. Responsible Conduct of Research (MED 255 – 1 unit)
2. Regenerative Medicine Seminar Series (ReMS) (STEMREM 250 – 1 unit/quarter) for a cumulative total of 6 units.
3. Graduate Research in Stem Cell Biology and Regenerative Medicine (STEMREM 399 – up to 10 units/quarter)
4. Dissertation (STEMREM 802 – 0 units, after completing 135 total units and all required coursework).

B. Elective Curriculum

▼ Electives (Must take at least 2 courses totaling 6 units and can be taken in any quarter. Additional electives are allowed and encouraged. (Below is a subset of elective offerings. Other courses are available in Computer Sciences, Engineering, Law, Business and Medicine, among many other courses can selected in consultation with academic and thesis advisors.)

- Cardiovascular Disease (such as MED 120Q)
- Tissue Engineering and ECM Scaffolding (such as BIOE 390)
- Neurobiology of Disease (NBIO 254)
- Cancer Biology (CBIO 241)
- Immunology (IMMUNOL 202)
- Histology (INDE 216)
- Anatomy (PATH 213)
- Bioinformatics (BIOMEDIN 212)
- Imaging (BIOE 222A or B, MCP 222)
- Patent Law and Strategy for Innovators and Entrepreneurs (ME 208)
- Biodesign, Innovation (BIOE 374, MED 272, ME 374, OIT 581/3)
- Entrepreneurship: Formation of New Ventures (GSB S353)

For additional information on available electives, see Appendix or see <http://explorecourses.stanford.edu/CourseSearch/> for the Stanford course offering website.

Other Seminar Series Relevant to SCBRM Students

Stanford University provides numerous opportunities to attend seminars of relevance in SCBRM including those hosted through the Department of Bioengineering, the BioX program, and other institutes such as the Neurosciences Institute, Cardiovascular Institute and Institute for Immunology, Transplantation and Infection. Seminars are generally of very high quality and lists will be distributed through the SCBRM graduate program home office and postings in the Lorry Lokey Stem Cell Research Building. Attendance exposes SCBRM students to important research questions in medicine. It will also expose them to a wide range of possible mentors engaged in stem cell biology and regenerative medicine for their PhD thesis work. Students will also be encouraged to attend the seminar series that is run for Stanford MSTP (Medical Scientist Training Program) students called “Unsolved Mysteries in Biomedical Research.”

Journal Club

Graduate students in the SCBRM doctoral program organize a Journal Club and Seminar Series designed for SCBRM students. Fellows and Faculty members attend at the request of the students. Journal Club allows students to develop rapport with each other, and other members of the community.

Journal club allow students to cover the latest publications in SCBRM and to hone their presentation skills. In addition, opportunities to include occasional guest speakers from Stanford and surrounding medical schools and the biotechnology community will also be explored. This Journal Club provides the opportunity for students to meet in small groups and to discuss recent research findings and topics not generally covered in the PhD curricula such as how to take a novel cell-based treatment from bench to bedside.



Students preparing for Journal Club

Advising

Each incoming student will be appointed an academic advisor, generally, the Director or one of the Co-Directors of the SCBRM Doctoral program. The academic advisor provides guidance for each student in the first year during rotations. Students typically select their thesis laboratory before the end of fall quarter of the second year. Once the thesis lab has been selected, the thesis mentor serves as the student's PhD research advisor. In addition, all students will be encouraged to select a physician co-mentor who specializes in an area of their interest related to the thesis project. If a primary advisor is selected from outside of the SCBRM faculty, then one of the SCBRM faculty members will be selected as a co-mentor.

Decisions regarding research interests. Students should select their rotations and ultimately their thesis laboratory and research advisor according to their research interests by the end of their fifth quarter in the SCBRM graduate program.

Changing advisors

Advisors can be changed by student appeal to the SCBRM Graduate Program. An Executive Committee of program faculty will consider the request. In general, there will be little restriction on changing of advisors to accommodate student educational goals as they may change over the course of the doctoral program

Research Rotations

Research rotations serve to expose students to the science and culture of a laboratory where they may choose to conduct their doctoral thesis research. The student chooses possible rotation laboratories with input and discussion with the academic advisor on a quarterly basis or more frequently if desired. Rotations are set up directly between student and the faculty member of interest.



Typical laboratory at Stanford University.

Students are encouraged to delay their first rotation until the second quarter of their first year to allow time for the student to meet with faculty members and discuss possible rotations. Faculty research interests can be viewed online at <https://med.stanford.edu/profiles/> and the weekly Regenerative Medicine Seminar series (STEMREM 250) provides students with firsthand information on ongoing research projects. Each student should independently contact prospective faculty members and arrange a one-on-one meeting to discuss if a rotation is in alignment for both the student and the faculty. Students are also encouraged to sit in on the faculty member's lab meetings, if permitted by the individual faculty. Students can rotate and choose a home lab from any of Stanford's faculty. The student should consult with their Program academic advisor for rotations that are not with one of the primary SCBRM Graduate Program faculty,

During rotations, it is recommended that the student go to lab daily and coordinate a schedule with the student's direct mentor. Generally, rotating students spend at least 20 hours per week in lab and the remaining time in class and doing coursework; however, the specific amount of time required varies by project and lab and should be discussed with the faculty member before the rotation begins.

Rotations should be no longer than one quarter in length and students are expected to complete 3 rotations by the end of the student's fifth quarter in the program (i.e., typically before the end of the fall quarter of second year). Students in the SCBRM program will be encouraged to include clinical faculty on their advising team throughout their thesis research. Students are encouraged to complete three full rotations, but will be allowed to select a lab after completing two rotations with their academic advisors' approval. All students are responsible for having their rotation advisor fill out a rotation evaluation and email it to the SCBRM Student Services Administrator.

Academic Milestone Assessment

Milestones in the SCBRM graduate program will be similar or identical to other programs in Biosciences and Bioengineering. Milestones have pass/conditional pass/fail grading structure.

For all years:

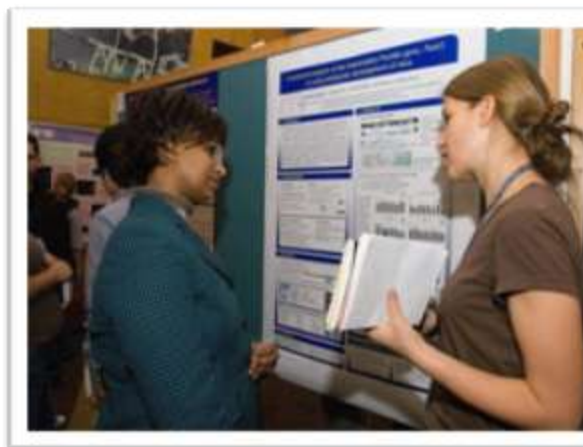
- a. Students must completed the required curriculum with a B average; exceptions or substitutions in the required curriculum need program approval for inclusion in credit requirements. Both MSTP and PhD students must enroll in required courses for a letter grade.
- b. Students will be required to complete additional courses, or alternative mechanisms such as writing a manuscript or review, in order to demonstrate proficiency if the grade requirement is not met.
- c. Students not able to meet PhD milestones after remediation may be offered a terminal MS degree if they have completed the SCBRM Program's required coursework.
- d. At the end of the second year, students are required to pass a qualifying examination to enter PhD candidacy.
- e. Starting in the 2nd year, all students must meet annually with their thesis committee. Starting in year 5 and onwards, all students must meet twice each year with the thesis committee.
- f. Starting in the 2nd year, all students must prepare an individual development plan and meet annually with the thesis advisor to review progress and update the individual development plan.

PhD First Year Milestones

Lab Rotations: The students will be required to explore research activities in two to three labs during their first academic year. Rotation evaluation forms are required for the completion of each rotation.

Choosing a Research Advisor: Students must choose a research or thesis advisor prior to the end of fall quarter of the second year. Prior to choosing a research advisor a program advisor will be assigned to each student. The research advisor assumes primary responsibility for the future direction of the student and will ultimately direct the student's dissertation. Please notify the Student Services Officer and your first-year advisor as soon as a research advisor is chosen.

Applying for Pre-doctoral Fellowship Applications: All first-year PhD students who are eligible to apply for outside pre-doctoral fellowships such as an NSF or NRSA are required to do so. Applications are generally available in October and are due in November. Check with Student Services and Financial Aid for further details and any questions concerning eligibility. Students are encouraged to consult with their faculty advisors when preparing fellowship applications.



Students and faculty discuss research at a poster session.

Required Courses: STEMREM 200, 201A&B, 202, STEMREM 250 (6 quarters), Foundations in Experimental Biology, Advanced Cell biology or Advanced Genetics (one or the other needs to be completed by the first year and the second course by the second year), MED 255 Responsible Conduct of Research, DBIO210 Developmental Biology, STEMREM 280 Journal Club. STEMREM 203 is not required in the first year and can be deferred to the second or third year. PhD students will have accumulated 40 units total by the end of year 1.

MSTP Students should enroll in additional STEMREM 399 units per quarter (18 total units per quarter) to accumulate 72 units total.

Advisor Meetings: All students are required to meet with their interim advisor prior to the upcoming quarter and must report the date for each meeting to the Student Services Officer.

Summary of PhD Second Year Requirements

Required Courses: STEMREM 250 (fall, winter, & spring quarter), Electives, STEMREM 203, & Bio 214 Advanced Cell biology or Gene 205 Advanced Genetics, Biochemistry course or equivalent, and independent research. Students will have accumulated 80 units total by the end of year 2.

MSTP Students enroll in additional STEMREM 399 units per quarter (18 total units per quarter) and accumulate 144 units by the end of year 2. Following completion of the qualifying exam, MSTP students transition to terminal medical registration (TMR) status.

Advisor Meetings: All students are required to meet with their advisor prior to the upcoming quarter and also report the date for each meeting to the Student Services Officer. Students must also prepare an individual development plan (IDP) and discuss and revise this plan with their advisor once each year.

Yearly Evaluations: At the end of each academic year (usually in early June) the SCBRM faculty will evaluate the progress of all PhD students.

Qualifying Exam: At the end of the second year all students are required to pass a qualifying exam. This meeting serves as your first thesis committee meeting.

Summary of PhD Third Year Requirements

Required Courses: Electives & independent research for a total of 10 units per quarter. Students will have accumulated 120 units total by the end of year 3.

MSTP students with TMR status enroll in 0 (zero) units of STEMREM 802 Dissertation and 3 units of STEMREM 399 Graduate Research or any combination of electives and graduate research totaling 3 units per quarter.

All students are required to meet with their committee members once each year to review progress and plans for the following year. All students are also required to update and review their IDP with their advisor.

Summary of PhD Fourth Year Requirements

Required Courses: Electives & independent research in Autumn and Winter Quarters totaling 10 units per quarter.

MSTP students with TMR status enroll in 0 (zero) units of STEMREM 802 Dissertation and 3 units of STEMREM 399 Graduate Research or any combination of electives and graduate research totaling 3 units per quarter.

By the end of Winter Quarter, PhD students will have completed 140 total units. The student must select members of the Dissertation Reading Committee and submit the petition for Terminal Graduate Registration Status ([TGR status forms](#)).

Once a student is awarded TGR status (Spring quarter of year 4 and onwards), the student enrolls in 0 (zero) units of STEMREM 802 Dissertation and 3 units of STEMREM 399 Graduate Research or any combination of electives and graduate research totaling 3 units per quarter.

Students are required to prepare a 1 page thesis progress report and discuss progress and plans towards completing the dissertation with their thesis committee during the annual committee meeting.

The student's IDP should be updated to reflect plans and milestones leading to the thesis defense. These goals should be discussed with the advisor and revised as necessary.

Summary of PhD Fifth Year Requirements and Onwards

Required Courses: Both PhD and MSTP students enroll in 0 (zero) units of STEMREM 802 Dissertation and 3 units of STEMREM 399 Graduate Research or any combination of electives and graduate research totaling 3 units per quarter.

Committee Meetings: Starting in the 5th year, all students must meet twice each year with the goal of defining discrete and achievable milestones that will lead to completion of the dissertation and oral exam (thesis defense).

Alternative Methods for Fulfilling Course Requirements

The Student can demonstrate competence in each knowledge area and fulfil the course requirement by one of the following alternative methods:

1. Take and pass a substitute course on the same topic. STEMREM 299 Directed Reading fulfills this option if the study plan engages 2 SCBRM program faculty members, the course is taken for a letter grade, and the student enrolls in an equivalent number of units as the required course that is being substituted.

OR

2. Demonstrating graduate level proficiency in the topic by:
 - a. Taking and passing the course final exam

OR

 - b. Taking and passing an oral exam that is administered and certified by 2 SCBRM Faculty members. The oral exam can be included in the Qualifying exam or can be administered at any other time by the 2 examining faculty members.

If an oral exam is administered, one of the administering faculty members will notify the Program Director and/or Student Services Associate in writing that an exam was administered for the waived course and that the student: 1) passed; 2) passed with contingencies (e.g., requires directed reading or other training); or 3) did not pass and will be required to complete the required core course.

How to petition:

1. The Student will first meet with their thesis advisor to discuss a proposed alternative. First year students should meet with their temporary advisor.
2. The **advisor** will send a brief e-mail to the Student Services Associate outlining the reason for the request and the proposed alternative.
3. The request will be reviewed by the SCBRM Advisory Committee.

Course Equivalency for MSTP or MD Students

MSTP students must declare their interest in joining the SCBRM Graduate Program by February 1 of the M2 year to be considered (exceptions to the rule are considered on an individual basis).

Non-MSTP MD students interested in doing a PhD in our program need to submit application materials through the regular Biosciences program application system.

MSTP can enroll in up to 35 units for quarters 9-13, and up to 18 units for quarters 14-16.

Required courses consist of STEMREM 200, STEMREM 201A & B, STEMREM 202, STEMREM 203, & 6 credits of STEMREM 250 are required. In addition MSTP students are required to complete MED 255, Responsible Conduct of Research and 6 units of electives.

Advanced Cell Biology, Advanced Genetics, Developmental Biology, and Biochemistry requirements are fulfilled during medical school. MSTP students are not required to take these courses but must still complete a total of 135 units during the PhD years before they are eligible to defend their thesis. These units are separate from Medical School units and typically consist of units enrolled in STEMREM 399 Graduate Research or electives.

Master of Science in Medicine Degree Program (MOM)

The ["Master of Medicine" \(MOM\) program](#) is a master's degree program that provides PhD candidates serious exposure to clinical medicine with a view to fostering translational research. The incredible pace of basic science discovery today stands in dramatic contrast to the slow rate of development of useful medical advances. There is urgent need for a more efficient mechanism to generate a larger pool of scientists knowledgeable about human biology and disease. The goal of the MOM program is to train a new generation of PhD students about human biology and disease, and thus better prepared to translate new scientific discoveries into useful medical advances.

The MOM program admits an elite group of highly talented people who have a serious commitment to translational research but are not interested in becoming clinicians. Students admitted to any of the PhD programs offered at Stanford University have the opportunity to apply for admission to this program on a competitive basis. The first group of MOM students was admitted in spring 2006 (see [Admissions](#)). The program continues with six students per year, and competition for these six slots is intense. Funding for each student during the first year of the program is completely covered by scholarship support from the MOM program. All remaining costs are covered by each student's home PhD program beginning in the second year. Thus, all students selected to participate in the MOM program will be able to do so regardless of financial need as all tuition, stipend, and health insurance costs are fully covered by the MOM and PhD programs.

In practice, the program extends the total time of training by about one year beyond the usual length of PhD training. During their first two years MOM, participants take basic biomedical science courses with the School of Medicine's MD students, as well as seminar series dedicated to issues in translational medicine. This course schedule allows MOM students to concurrently undertake some PhD course requirements and lab rotations. By early in the second year, students choose labs for thesis research and elect clinical mentors. The Master of Science in Medicine degree are conferred with the PhD degree upon each student's successful completion of her or his doctoral program. The PhD required course equivalencies for MOM students are the same as those for MSTP students (see above).

The Qualifying Examination

Prior to being formally admitted to candidacy for the PhD degree, the student must demonstrate knowledge of Stem Cell Biology and Regenerative Medicine fundamentals and a potential for research by passing a qualifying oral examination. Qualifying exams are typically scheduled for spring or summer quarter of Year 2. Students must complete the qualifying exam by the end of fall quarter of Year 3.

Each student is responsible for scheduling his/her own examination to conform to the following requirements and deadlines.

Format of the Qualifying Examination

The qualifying exam will consist of two parts:

- 1) An NIH-style proposal of the thesis project.
- 2) An oral examination

The written proposal format is outlined below. The proposal must be distributed to the qualifying exam committee at least one week prior to the exam.

Required Forms

1. All Students are required to fill out the Application for Candidacy for Doctoral Degree.
<http://studentaffairs.stanford.edu/sites/default/files/registrar/files/appcanddoct.pdf>
2. Qualifying Examination Report Form (page 1 of this document)

Qualifying Exam Committee

The examining committee includes a minimum of 3 faculty that are academic council members. Two committee members must be from the Stem Cell Biology and Regenerative Medicine Graduate Program. An outside member must be selected to serve as Chair. The Chair and outside member must be an academic council member but cannot be a SCBRM Program Faculty member or in the same Department as the student's advisor. The thesis advisor can be a committee member and may be present during the exam.

The composition of this committee is chosen by the student and thesis advisor and must be reviewed and approved by the Program Director.

Purpose of Exam

The intent of the PhD qualification exam is to:

1. Motivate students to review and synthesize course work and proposed thesis research.
2. Provide a mechanism for program faculty to:
 - a. Determine the student's ability to understand and apply fundamental concepts.

- b. Test the student's ability to communicate orally and to respond to questions and comments.
- c. Evaluate the student's potential to pursue doctoral research.
- d. Identify areas that need to be strengthened for the student to be successful as a PhD student, independent scholar, teacher, and researcher.

Mechanics of the Qualifying Examination

The written and oral proposal should represent the student's own efforts to identify a question of interest and to develop appropriate experimental approaches. Preliminary data generated by the student are NOT required. Students are strongly encouraged to begin developing a written Specific Aims section by the end of winter quarter, second year and to schedule the qualifying exam by the end of spring quarter, second year. The qualifying exam must be taken prior to the end of summer quarter, second year. If necessary, one retake will be permitted within 2 quarters of the original exam date.

Two Weeks Prior to the Exam:

The student will review exam requirements, committee makeup, and forms with the Program Administrator. The Program Administrator will prepare and deliver the exam packet to the Committee Chair.

On the Exam Date:

Just prior to beginning the oral exam,

1. The student's advisor is expected to meet with the examination committee for a brief closed-door session without the student present. A copy of the student's Stanford University transcript and laboratory rotation evaluations should be available. The advisor will relate any salient details about the student's current progress to the committee members.
2. The advisor will then leave the room and the examining committee will meet with the student. The committee will have the opportunity to assess the student's satisfaction and/or needs with regards to the advisor's mentorship.

During the oral exam, the Chair will formally be in charge of the proceedings and will decide when the exam is over.

Generally students prepare a 30-45 minute oral presentation that briefly reviews the background, but largely focuses on the Specific Aims and the proposed experiments. Quite often, this presentation is interrupted by questions from the examination committee. The goal of the examination is not necessarily to finish the prepared presentation, but rather to assess the student's readiness to pursue his/her dissertation work in the laboratory. When the Chair determines that the examination is completed (generally after about 90 to 120 minutes), the student is asked to leave the room and the committee deliberates in private about the student's performance.

The Chair will conduct a vote of the committee by anonymous ballot. A student's performance will be deemed satisfactory or unsatisfactory by a simple majority vote of the qualifying examination committee. The student will be assessed on his/her written proposal, oral presentation, mastery of the specific field of research including background literature and experimental techniques, and general knowledge about the broader field of cancer biology.

The committee may deem the exam satisfactory, unsatisfactory, or satisfactory with qualifications - such as a requirement to enroll in an additional course or engage in other directed studies to address a perceived shortcoming in the student's knowledge.

The decision of the examination committee is conveyed orally to the student immediately following the exam. In addition, the Chair is responsible for briefly summarizing the strengths and/or weaknesses of the written proposal and oral presentation on the examination form. The original examination form shall be given to the Program Administrator and then kept in the student's file in the Stem Cell Graduate Program Office.

Copies of the completed examination form shall be given to the student and the student's advisor by the Program Administrator. If the qualifying examination committee deems the student's performance unsatisfactory, the committee can request a revision or retake of the written proposal, the oral examination, or both.

Format of the Written Proposal

The written proposal should be approximately 5 pages long (no longer than 10 pages, excluding references). The proposal should be written in the

format of an NIH grant proposal. The NIH web page has a standard set of instructions (Form 398) available on the web at: [\[http://grants.nih.gov/grants/funding/phs398/phs398.pdf\]](http://grants.nih.gov/grants/funding/phs398/phs398.pdf).

The written proposal should include only the "Research Strategy" sections of the NIH Form 398 (the highlights of which are excerpted below from Section 5 of the linked document):

1. Specific Aims (one page)

State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved.

List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.

2. Research Strategy (5-10 pages including figures)

Organize the Research Strategy in the specified order and using the instructions provided below. Start each section with the appropriate section heading—Significance, Innovation, Approach. Cite published experimental details in the Research Strategy section and provide the full reference in the Bibliography and References Cited section.

(a) Significance

- Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

(b) Innovation

- Explain how the application challenges and seeks to shift current research or clinical practice paradigms.

- Describe any novel theoretical concepts, approaches or methodologies, instrumentation or intervention(s) to be developed or used, and any advantage over existing methodologies, instrumentation or intervention(s).
- Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation or interventions.

(c) Approach

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Unless addressed separately in the Resource Sharing Plan, include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate.
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.
- Point out any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised. A full discussion on the use of Select Agents should appear in 5.5.11 below.
- If research on Human Embryonic Stem Cells (hESCs) is proposed but an approved cell line from the NIH hESC Registry cannot be identified, provide a strong justification for why an appropriate cell line cannot be chosen from the Registry at this time.

Note that your qualifying examination proposal will have a 10-page limit. The Program recommends 1-page for Specific Aims and 5-7 pages for the Research Strategy sections, including figures or tables (excluding bibliography). It might be helpful to ask your PI to see a real grant application, but it would be a pointless exercise (and would constitute plagiarism) for you to simply copy chunks of his/her grant application into your own exam proposal. Figures within your proposal can be helpful to the reviewer, but should generally not be too complex. Figures can be put at the end, but they are often more effective if inserted directly into the text

at the appropriate places. The Figures are included in the page limit. Part of the exercise is learning how to present your data and plans concisely.

PhD Candidacy

Upon passing the qualifying exam, the student can be admitted to candidacy for the Doctoral Degree. Being admitted to candidacy signifies that the department considers the student capable of completing the requirements necessary for earning a PhD degree. Candidacy is valid for five calendar years (through the end of the quarter in which candidacy expires), unless terminated by the department for unsatisfactory progress. An extension of candidacy may be obtained for a maximum of one additional year. In order to receive candidacy status, the student must file the [Application for Candidacy for Doctoral Degree Form](#) to the Student Services Officer. This form is to be approved and signed by the Principal Dissertation Advisor, PhD Program Director or Co-Director.

Terminal Graduate Registration (TGR)

TGR status is reached when PhD students have been admitted to candidacy, completed a minimum of 135 units of coursework, and submitted the Doctoral Dissertation Reading Committee form. Student Services will contact students when they are approaching TGR eligibility. Students must complete the following paperwork and submit it to the Student Service Office *before the beginning of the quarter* in which they first become eligible for TGR status:

Request for TGR Status

Students should then register for TGR Dissertation, STEMREM 899 through AXESS. TGR Grading is as follows: "S" for satisfactory progress, "N-" for unsatisfactory progress, and "P" for a final grade when everything has been finished. A hold on registration is placed for a student who receives an "N-" grade for more than two consecutive quarters. Students register at a special tuition rate, \$2,604/qtr in 2011-2012. As course work is no longer considered necessary during this advanced stage of study, units are no longer counted towards residency. Within certain restrictions and after tuition adjustment to the appropriate unit rate, TGR students may enroll in additional courses at their own expense. The TGR tuition rate will cover 3 units of tuition.

Thesis Advisor and Thesis Committee

Any member of the Academic Council may serve as the principal dissertation adviser. If former Academic Council members, emeritus Academic Council members, or non-Academic Council members are to serve as the principal dissertation adviser, the appointment of a co-adviser who is currently on the Academic Council is required.

Your thesis committee is an important complement and counterbalance to your advisor. Although it is important to choose committee members who can contribute scientifically, it is also important that they be supportive of your graduate career. Your committee influences when you graduate and will be writing you letters of recommendation, so choose them carefully. At least two members of your committee must be SCBRM Graduate Program faculty.

Meet with your committee at least once a year—and more often if you are having problems. Ask them candid questions about your progress towards graduation (time frame, remaining experiments, constructive criticism, etc.).

Committee meetings are your chance to bring up new and interesting data, problems you're having with experiments or choosing a direction, potential implications, and new projects that come out of your work. These are very valuable opportunities for you to get feedback, suggestions, and advice on anything pertaining to your PhD. With that in mind, you should prepare for your committee meeting and have a sense of what you want to get out of it when you walk in. If you want help in specific areas, be ready to bring them up and discuss them.

Your committee is there to help you, but the initiative is yours to get what you want. Help them help you.

Annual committee meetings are not something to be feared. This is an opportunity for you to talk about your work with a group of people who are giving you their undivided attention. Turn it into an interactive discussion, and enjoy it!

University Dissertation Reading Committee Requirements

The thesis committee is the same as the dissertation reading committee.



Each PhD candidate is required to establish a thesis committee for the doctoral dissertation within six months after passing the department's PhD Qualifying exams. The qualifying exam committee may also serve as the thesis committee but students may also substitute committee members to better suit the thesis topic and/or the student's professional goals. The student should consult frequently with all members of the committee about the direction and progress of the dissertation research.

SCBRM Students must have at least three faculty members on the Dissertation reading committee: the principal dissertation advisor and two other readers who read and certify the dissertation. Stanford University limits the reading committee to a maximum of 5 members. At least three members must be members of the Academic Council. It is expected that at least one member of the Stem Cell Biology and Regenerative Medicine faculty be on each reading committee.

[The Doctoral Dissertation Reading Committee Form](#) is to be completed and filed with the Student Services Officer *before* scheduling a University oral examination that is a defense of the dissertation. On occasion, the department chair may in some cases, approve the appointment of a reader who is not on the Academic Council, if that person is particularly well-qualified to consult on the dissertation topic and holds a PhD or equivalent foreign degree. Approval is requested on a Petition for Non-Academic Council Doctoral Committee Members Form.

Preparation of the Doctoral Dissertation

Each doctoral student must compose a written dissertation, which presents novel research contributing to the larger scientific community and exemplifying the highest standards in scholarship. The dissertation represents research that the student has completed during graduate training. The purpose of the dissertation is to demonstrate that the student has critical thinking skills and the ability to develop interesting and testable hypotheses; and that the student is prepared to become an independent researcher. The student will work closely with the Primary Research Advisor to prepare the Dissertation in advance of the Dissertation Defense.

The Dissertation should be a culmination of the student's research and should address at least the following critical areas:

- Table of contents, including a list of all tables and illustrations
- Background and significance of the research problem
- Hypothesis and specific aims

- Outline of experiments to test the central hypothesis, including materials and methods
- Data and results
- Discussion and interpretation of the results
- Future directions
- Literature cited

The Thesis should be formatted according to University requirements, found on the [Student Services Website](#). While preparing the Thesis, the student is advised to consult with Student Services for the most current University requirements and formatting specifications. The student is encouraged to include research that has already been published and to which the student contributed as an author. However, there must be adequate information detailing the student's contribution to the work, and written permission is required for copyrighted information.

Once the Dissertation has been prepared, it should be submitted to the Thesis Reading Committee at least one week in advance of the Thesis Defense.

Defense of the Doctoral Dissertation

The student will confer with the Primary Thesis Advisor and Doctoral Dissertation Reading committee that the requirements of the PhD program have been fulfilled and that the Thesis studies have been completed to the satisfaction of both Advisor and Reading Committee. At that time, an oral exam committee will be selected that consists of a Chair, the reading committee, and at least 2 SCBRM faculty members. A Dissertation Oral Exam Chairperson will be selected from a Department or Program outside of the student's home program. The Chair must be an Academic Council Member. The Defense of the Dissertation should be scheduled at least six months before the student intends to leave the University, to allow sufficient time for thesis revisions.

At least 2 weeks before the oral exam, the student will provide the committee members with a draft of the written Dissertation. The PhD Candidate will prepare a 1 hour lecture and the title and topic will be advertised to the Stanford University research community.

The 1 hour lecture by the PhD Candidate will be open to the public. The lecture will be followed by a brief public question and answer period (approximately 15 minutes). The audience will be excused and a closed final exam session will commence. The Dissertation Oral Exam

Chairperson will moderate and the Reading Committee members will examine the PhD Candidate on any topic deemed relevant to the Thesis or the Candidate's training, professional accomplishments, and preparedness to receive a Doctoral Degree. The exam will last no longer than 1.5 hours. The Candidate will be asked to leave the room. The Chair and Oral Exam Committee will then confer on the Candidate's performance and vote by anonymous ballot to pass or fail the candidate. The Reading Committee may pass the student, may require revisions to the Dissertation, or may require an additional Thesis Defense.

The student is responsible for obtaining the necessary signatures, as required by the Stanford University. This includes signature pages for the written Dissertation as well as signatures for the oral exam completion form.

Practical Issues Regarding Graduate Study

SUNet ID

- 1) Students will be assigned a University ID number.
- 2) The SUNet ID is an account name that identifies each student, uniquely and permanently, as a member of the Stanford community. It is what is used to log into Stanford computer systems. Computing and Communication is a central source for information about Stanford's technology-based tools, from software and servers to cell phones and networks.

Request a SUNet ID here:

<https://sunetid.stanford.edu/main/SUNetIdApp/CreateApp>

The SUNet ID will be used as the student's Stanford email address and provides access to the Stanford web page and intranet.

AXESS

<http://axess.stanford.edu>

This is the University's web based administrative system wherein most student business is conducted. Students must use Axess to accomplish the following tasks:

- File or adjust a study list (the list of courses in which the student wishes to enroll) and elect grading options each quarter.

- Confirm, through Axess, that the University has your correct address and telephone number.
- Update emergency contact Information.
- Print a history of courses and grades.
- Complete necessary safety training.
- Check registration status each quarter (i.e., pending holds).
- Review grades.
- Ensure University bill is paid.
- Apply to graduate in final quarter.

Axess also provides students with the following services:

- Official transcript request.
- Campus housing application.
- Print an enrollment certification.

Identification Cards

Each student is required to get two Stanford ID cards: a student ID card and a School of Medicine ID card. The student ID card is required to access libraries and recreational facilities.

The Stanford Card Office issues ID cards. The Card Office's website provides further information at:

<https://itservices.stanford.edu/service/campuscard/cardoffice>.

Students will need to have their photo taken and pick up student ID cards from the ID Card Office location in the Tresidder Student Union on main campus. The photograph is maintained in an online database and, as stated in the "Directory Information" section of this bulletin, is available for classroom, student residence, and other use upon specific request and without student consent unless the student has designated that the photograph not be released. Photographs can be designated as private using the Privacy function of Axess.

The student's spouse or domestic partner may apply for a Courtesy ID Card for a fee. This will enable access to libraries, recreational facilities, discounted event tickets, and so forth; review the guidelines on the Card Office website.

The School of Medicine ID card can be obtained from the Hospital Security office and is required for access to academic buildings and animal facilities. Before obtaining the Stanford School of Medicine badge, students need to complete the Stanford University and School of Medicine mandatory training,

outlined below. Students can view their training needs in the [Axess](#) portal. Login to Axess, click the STARS (Training) tab, and click “My Training Needs” to get started.

Laboratory Safety Training

Every student working in a laboratory is required by various agencies to be trained in all aspects of laboratory safety. Prior to working in the lab, new graduate students are required to complete the Training Advisor found online through Axess – STARS (Training) tab by clicking on the “My Training Needs” link.



Investigator examines cells under microscope.

Students in the SCBRM program must complete the following training online:

- 1) General Safety and Emergency Preparedness (EHS-4200);
- 2) Bloodborne Pathogen Training (EHS-1600);
- 3) Chemical Safety for Laboratories (EHS-1900);
- 4) Biosafety (EHS-1500);
- 5) Laboratory Ergonomics (EHS-4800)

Also, depending on the nature of the student’s research, additional training includes:

- 6) Compressed Gas Safety (EHS-2200);
- 7) Radiation Safety Training (EHS-5250);
- 8) Laser Safety Training (EHS-4820);
- 9) Laboratory Animal Care and Use (VSC-0001).

In addition, all School of Medicine affiliates must take the on-line HIPAA training and agree to abide by the School of Medicine’s policies and procedures. To take the on-line training please check-in with your Student Services Officer who will register you through LawRoom www.lawroom.com and email a login ID and password to you in order for you to proceed.

- Discuss required (and recommended) training and its related priority with your mentor and/or lab manager.
- After you have completed the Training Needs Assessment in Axess and discussed options and priorities with your mentor, log back into Axess, click the STARS (Training) tab, and click the link to “My Learning” to review courses that have been added to your Learning Plan. Click Enroll next to the session you wish to attend.

After completing this training, please report to [amy.erickson@stanford.edu, 650-721-1017], to obtain the building access form. Amy is located in the Stem Cell Research Building Administrative Suite located on the 3rd Floor, Room G3101F. This form will require the signature of the Lokey Building Manager, Linda Heneghan [heneghan@stanford.edu, 650-906-2381, G1100]. The Amy Erickson will provide you with directions to the ID Card Office located in the Stanford Hospital.

Building Access

The Lorry I. Lokey Stem Cell Research Building is open weekdays from 7:00am to 6:00pm. The Stanford School of Medicine badge serves as a dual purpose in that it identifies you as an employee of Stanford and allows you access to the facility after hours.

Card Readers

There are card readers located at all entrances and hallways. To access any door with a card reader, simply pass the School of Medicine badge along the reader. When the badge is recognized, the card reader will beep, the light will turn green, and the door latch will release, allowing access to the door.

Finances

Stanford ePay, the University’s online billing and payment services located on Axess, provides a convenient way for students to view their student bill and make a payment to student accounts. Students with questions regarding billing should contact the Student Service Office at 650-723-7772.

Check Distribution/Information

Students with research, teaching, or course assistantships will be on the regular University payroll. Checks will be available in the Department's Student Service Office on the 7th and 22nd of each month, or the preceding workday if these dates fall on a weekend or holiday. Graduate

student salaries are taxable, and federal taxes will be withheld following the completion of W-4 Tax Data form in the Axess under the “ePay” menu. This form and other payroll forms can be completed at orientation.

Students not on an assistantship are paid on a quarterly basis and have their checks mailed to their home address each quarter on the first day of classes. It is important for all students to update their mailing address through Axess. Students must complete all registration and financial paperwork, pay registration fees, and satisfy all stipulated departmental requirements before receiving stipend checks. No taxes are withheld, but the stipend is reportable and taxable.

Direct Deposit

Stipend Checks and bi-weekly assistantship checks may be direct-deposited in local banks. Students can enroll for direct deposit on Axess. Click on “Enrollment Instructions” for more information.

Holds: Stipend checks will not be issued if University requirements such as submission of the federal employment eligibility form, federal and state tax withholding certificate, and patent agreement form, or if departmental requirements have not been fulfilled. Outstanding bills from the library, University, or Vaden Health Center will also result in holds. Holds must be cleared with the originating office before stipend checks will be issued.

Loans and External Awards

Graduate Students who believe they will require loan assistance can apply for federal Stafford Student Loan, Federal Perkins Loan, and University loan programs. Inquiries for publications outlining loan program terms can be directed to the Financial Aid Office, Montag Hall, 355 Galvez Street, Stanford, CA 94305; phone 650-723-3058. International students who are not permanent residents are not eligible for long-term loans.

Graduate Fellowships awarded by external sources (i.e. NSF, NDSEG, Ford) are administered in Montag Hall by Maureen Grey, 650-725-0868.

Email: mogrey@stanford.edu

Taxes

Tax information (limited) is available in:

1. The Student Financial Gateway.
2. The Bechtel International Center (for international students).
3. Graduate Student Council (GSC).

Health Insurance

At the start of each academic year, students will be automatically enrolled in Cardinal Care in their first registered quarter (Autumn Quarter). At that time, and that time only, they will be able to waive Cardinal Care for the rest of the year by documenting equivalent health insurance in Axess. Generally, the deadline for waiving the right to Cardinal Care is mid-September of each academic year (check with the Student Services Officer). The decision made at the start of each academic year will be applied to the remainder of that year.

To waive Cardinal Care, a student must enter Axess and follow the health insurance waiver link and complete the steps indicated. A health plan name and group policy number are required to complete the health insurance waiver. A student must waive health insurance for the entire academic year. Contact Info: 650-723-2135, Email: healthinsurance@stanford.edu.

Student Housing

We highly recommend you live on campus your first year. Living in [student housing](#) connects you to the full range of opportunities that Stanford has to offer as well as to graduate students from a variety of backgrounds and interests. This is why more than 50 percent of graduate students—and nearly all first-years—choose to call Stanford graduate housing home. There is also more information on the [Bioscience Website](#).

Parking

Students may purchase a yearly or monthly parking permit for use while at Stanford University. Permits are valid from September 1, 2012 to August 31, 2013. "A" permits are for parking located closest to the medical center. "C" permits are usually farther away. Because of cost differences, most students procure a "C" permit and park in the parking structure located behind the medical center. Parking permits for 2014-2015 cost \$852 for an "A" permit, or \$330 for a "C" permit. Stanford also has a Clean Air Cash reward for students who choose to opt out of a parking pass. Please visit http://transportation.stanford.edu/alt_transportation/CleanAirCash.shtml for more information.

Student Travel

Traveling to conferences is an important part of your professional and

academic development. A student must first get prior approval from their advisor. After doing so we ask all students to first see if their fellowship supports travel, if not then try applying for a travel grant from the conference they wish to attend. There are also other travel grant opportunities available in the school of medicine. To find out more please visit the [Biosciences Website](#).

1. **PRE-APPROVAL:** You must be pre-approved to travel. You are responsible to find out if your fellowship will cover your travel costs before any reservations are made. If you are unsure please see your advisor or student services officer.
2. **PI CERTIFICATION FORM:** Fill out the [student travel certification](#) and get it signed before you make any reservations.
3. **BOOKING TRAVEL:** We have a department travel card, which means we book all travel for you to avoid waiting to be reimbursed. To help save time please look up the lowest fare (American carrier and Economy class ONLY). You can then email Nadia Shapiro at nadias@stanford.edu the information and the flight will be purchased for you. If you plan on staying extra time for a personal trip, please notify the program in advance. Stanford will only pay a portion of your flight, if this is the case.
4. **BOOKING HOTELS:** We can book your hotel. You will need to attain a pre-authorization form from the hotel in order for the program to pay for this, or you can be reimbursed.
5. **MEALS:** If Meals are covered by the conference then Stanford does not reimburse for meals. We follow the GSA Government Meal rates. Please do not go over this rate. <http://www.gsa.gov/portal/category/21287>
6. **PERSONAL MILEAGE:** Stanford will reimburse your personal mileage to and from the airport from Stanford. This is 25 miles each way.
7. **BUSINESS PURPOSE:** You will need to supply a business purpose. Here is an example WHO:WHAT:WHERE:WHEN:WHY: Billy Bob, a

postdoc in the XYZ lab(or XYZ Program), presented a poster with the title “Stem Cells are Awesome” at the Annual American Stem Cells are Awesome Seminar in Nowhere, CA from October 11-15th. Billy Bob was representing the XYZ lab and this meeting is benefiting the research of the Stem Cells are Awesome project Billy Bob is working on.

8. **RECEIPTS:** You must turn in all receipts as soon as you return. Please provide all itemized receipts (not just the credit card receipt) with an explanation of what they are. This includes hotel, airfare, ground transportation, parking, food, & boarding passes. IE 10/1/12 lunch, or 10/11/12 taxi from airport to hotel. Please tape (not staple) all receipts on 8 ½ by 11 paper and put them in order by date. Don't tape them on the back of the paper because they need to be faxed.
9. **AGENDA:** Please print out the agenda and include it in your receipts.
- 10 Please print out your **CREDIT CARD STATEMENT** for any major purchases. IE airfare, hotel, registration.

If you would like to learn more about Stanford's travel policies please visit http://www.stanford.edu/group/fms/fingate/faculty/travel/travel_policies.html

Student Organizations

[Stanford Biosciences Student Association \(SBSA\)](#)

SBSA's mission is to represent students studying biosciences at Stanford in the Schools of Medicine, Engineering, and Humanities and Sciences, and to enhance their quality of life by hosting social and academic events.

[Biomedical Association for the Interest of Minority Students \(BioAIMS\)](#)

BioAIMS addresses the needs and concerns of current minority graduate students in the biosciences through advocacy and programming.

[Graduate Student Council](#)

The Graduate Student Council (GSC) is the student government for Stanford graduate students. The GSC hosts various events and represents student needs through advocacy.

[Directory of Stanford Student Organizations](#)

Stanford University also has a multitude of other student organizations.

Summary

This handbook provides overall guidance for your graduate career. However, some changes will occur and updates may be available. Please check with the Director of the SCBRM graduate program and/or student services management if you have questions regarding the material.

Appendix: Additional courses outside of the School of Medicine

Note that this list is not comprehensive; check web listings for latest course offerings

Engineering

SEE (Stanford Engineering Everywhere) programming includes one of Stanford's most popular engineering sequences: the three-course Introduction to Computer Science taken by the majority of Stanford undergraduates, and seven more advanced courses in artificial intelligence and electrical engineering.

Introduction to Computer Science

Programming Methodology CS106A
Programming Abstractions CS106B
Programming Paradigms CS107

Artificial Intelligence

Introduction to Robotics CS223A
Natural Language Processing CS224N
Machine Learning CS229

Linear Systems and Optimization

The Fourier Transform and its Applications EE261
Introduction to Linear Dynamical Systems EE263
Convex Optimization I EE364A
Convex Optimization II EE364B

Additional School of Engineering Courses

Programming Massively Parallel Processors CS193G

iPhone Application Programming CS193P
Seminars and Webinars

Mathematics/Statistics

STATS 166: Computational Biology (BIOMEDIN 366, STATS 366)
STATS 167: Probability: Ten Great Ideas About Chance (PHIL 166, PHIL 266, STATS 267)

STATS 202: Data Mining and Analysis
STATS 203: Introduction to Regression Models and Analysis of Variance
STATS 205: Introduction to Nonparametric Statistics
STATS 206: Applied Multivariate Analysis
STATS 207: Introduction to Time Series Analysis
STATS 208: Introduction to the Bootstrap
STATS 211: Meta-research: Appraising Research Findings, Bias, and Meta-analysis (HRP 206, MED 206)
STATS 215: Statistical Models in Biology
STATS 217: Introduction to Stochastic Processes
STATS 222: Statistical Methods for Longitudinal Data (EDUC 351A)
STATS 253: Spatial Statistics (STATS 352)

Business

CON 90/190. Introduction to Financial Accounting
ECON 91/191. Introduction to Cost Accounting
FINANCE 221. Finance for Non MBAs
LAW 226. Accounting
LAW 262. Corporate Finance
LAW 327. Introduction to Organizational Behavior
PUBPOL 204. Economic Policy Analysis
ECON 150, PUBLPOL 204.)
PUBPOL 301A. Microeconomics
MATH 51 or equiv. (Same as IPS 204A.)
PUBPOL 301B. Cost-Benefit Analysis and Evaluation
ECON 51. (Same as IPS 204B.)
GSBGEN 111Q. Seminar in Entrepreneurial Communication

Law School

Science, Technology, and Intellectual Property Law

Biotechnology Law & Policy
Communications Law: Broadcast and Cable Television
Communications Law: Internet and Telephony
Computer Crime Seminar
Cyberlaw Clinic
Cyberlaw Clinic: Advanced
Cyberlaw: Difficult Problems
FDA's Regulation of Health Care
Health Care Regulation, Finance and Policy
Health Law & Policy I

Health Law & Policy II
Intellectual Property and Antitrust Law
Intellectual Property as a Strategic Asset
Intellectual Property Strategy for Technology Companies
Intellectual Property: Advanced Topics in Patent Law
Intellectual Property: Commercial Law
Intellectual Property: Fair Use in Film
Intellectual Property: Innovation Industries
Intellectual Property: Copyright
Intellectual Property: Patent Litigation
Intellectual Property: Patents
Intellectual Property: Trade Secrets
Intellectual Property: Trademark
International Intellectual Property
Internet Business Law and Policy
Introduction to Intellectual Property
Law and Biosciences
Law and the Biosciences: Genetics
Law, Science and Technology Colloquium
Legal Design for the Entertainment and Information Future
Patent Litigation Workshop
Scientific Evidence and Expert Testimony: Patent Litigation

Humanities and Sciences

Hume Writing Center - Workshops

Writing the Dissertation: Getting Started
Publishing the Journal Article: Writing and Submitting
Creating Effective Multimedia Presentations
Writing the Research Statement for Fellowship and Grant Proposals
Finishing the Dissertation
Developing an Online Presence
Publishing the Journal Article: Resubmitting the Journal Article

Social Sciences, Humanities, and Interdisciplinary Policy Studies in Education (SHIPS)

Anthropology
Economics
Educational Policy
Higher Education
History
International Comparative Education (ICE)

Linguistics
Organizational Studies
Philosophy
Race, Inequality, and Language in Education (RILE)
Sociology