



CSB STUDENT GUIDE

Department of Chemical and Systems Biology
Stanford University School of Medicine

2012-2013

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INTRODUCTION

Welcome to the Stanford University Department of Chemical and Systems Biology! Graduate school is, or should be anyway, exciting and challenging, and we hope you will find your years here stimulating, enjoyable, and satisfying.

This CSB Student Guide is our attempt to spell out the requirements of the CSB Ph.D. program and to give you some basic orientation to the Department. You will also receive (or maybe you have already received) the Guide to University Resources for Graduate Students, which provides more general info about life as a Stanford graduate student.

The aim of the Ph.D. program in Chemical and Systems Biology is to take an outstanding group of students and provide them with the skills they need to carry out cutting-edge, rigorous, imaginative, scholarly research in chemical biology, systems biology, and drug discovery. The training includes a combination of formal didactic coursework; seminars, journal clubs, and discussion groups; and independent research.

Your progress during all of this will be monitored by various mechanisms. During your first year, the graduate program's ADVISORY COMMITTEE and COACHES will meet with you to help you choose classes and arrange research rotations. During your second year, the Advisory Committee, COACHES and your THESIS ADVISOR share responsibility. From the third year on, your thesis advisor and THESIS COMMITTEE are primarily responsible for overseeing your progress every 6 months. At any point, though, you are encouraged to discuss questions, problems, and anything else with any of us in the program. We (the ADVISORY COMMITTEE and COACHES) particularly want to encourage you to stop by and chat. We're here to help.

1. ADVISORY COMMITTEE

During the first two years, all students meet once per quarter with the ADVISORY COMMITTEE to discuss the students' progress and problems, to consider course offerings, plan the students' schedules, and to arrange laboratory rotations. Currently the Advisory Committee consists of Tobias Meyer, Mary Teruel, Dan Jarosz, and James Chen.

2. DIDACTIC COURSEWORK

Chemical/Systems Biology Track. Students in this track are required to take the following 5 courses, with a grade of B or better.

BIOS 200. The Nucleus

Open to first year graduate students in the Biosciences, or Stem Cell Biology, only. Multidisciplinary class that develops fundamental concepts in modern biosciences research and teaches how to solve cutting edge research questions in a variety of sub-disciplines. Concepts are introduced through didactic instruction, expanded in small group discussions of original papers, and used as the basis for identifying

important research questions. Basic and higher order topics, including evolution, networks, and information in biology are covered. Course develops critical skills in research design, critical interpretation of the literature, hypothesis testing and quantitative analysis. Modes of scientific communication and teamwork taught. No prerequisites. 8 units (Staff). Offered 2012-2013.

BIOS 204. Practical Tutorial on the Modeling of Signal Transduction Motifs

Basics of ordinary differential equation modeling of signal transduction motifs, small circuits of regulatory proteins and genes that serve as building blocks of complex regulatory circuits. Morning session covers numerical modeling experiments. Afternoon session explores theory underpinning that day's modeling session. Modeling done using Mathematica, Standard Edition provided to enrolled students. 2 units (Ferrell, J.). Offered 2012-2013.

CSB 210. Cell Signaling. The molecular mechanisms through which cells receive and respond to external signals. Emphasis is on principles of cell signaling, the systems-level properties of signal transduction modules, and experimental strategies through which cell signaling pathways are being studied. Prerequisite: working knowledge of biochemistry and genetics. 4 units (Meyer, T). Offered 2012-2013, and typically every other year.

CSB 220. Chemistry of Biological Processes (same as BIOC 220). The principles of organic and physical chemistry as applied to biomolecules. Goal is a working knowledge of chemical principles that underlie biological processes, and chemical tools used to study and manipulate biological systems. Prerequisites: organic chemistry and biochemistry, or consent of instructor. 4 units, Spring (Wandless, T; Herschlag, D; Chen, J). Offered 2012-2013, and typically every other year.

CSB 240A. A Practical Approach to Drug Discovery and Development. The scientific principles and technologies involved in making the transition from a basic biological observation to the creation of a new drug emphasizing molecular and genetic issues. Prerequisite: biochemistry, chemistry, or bioengineering. 3 units, Winter (Mochly-Rosen, D; Grimes, K.). Offered 2012-2013, and typically every other year.

Students also take at least one of the following “elective” CSB courses:

CSB 230. Current Methods in Proteomics. Introduces students to the instrumentation, experimental strategies, and computational methods used for identification and quantification of protein concentrations and posttranslational modifications on a systems-wide level. Topics include mass spectrometry (instrumentation configurations; polypeptide ionization; sample preparation and fractionation techniques; mass spectra interpretation; relative and absolute protein quantitation; and proteome-scale dataset analysis), protein and antibody arrays, multiparameter flow cytometry with Bayesian analysis, ribosomal protein translation profiling, and GFP and fluorescence imaging based quantification of protein abundance and post-translational modifications. Students present interpretations of current and classic literature. 3 units (Elias, J.; Teruel, M). Not offered this year. To be offered 2013-2014.

CSB 240B. A Practical Approach to Drug Discover and Development

(Continuation of 240A) Advancing a drug from discovery of a therapeutic target to human trials and commercialization. Topics include: high throughput assay development, compound screening, lead optimization, protecting intellectual property, toxicology testing, regulatory issues, assessment of clinical need, defining the market, conducting clinical trials, project management, and commercialization issues, including approach to licensing and raising capital. Prerequisite: 240A. 3 units, Winter (Mochly-Rosen, D; Grimes, K.). Offered 2012-2013, and typically every other year.

CSB 250. The Biology of Chromatin Templated Processes. Topics include eukaryotic gene activation and silencing; DNA replication, recombination, and repair; mechanisms of checkpoint activation; chromatin structure and modification; epigenetic phenomena in biology; RNA-mediated gene regulatory mechanisms; and nuclear reprogramming. 4 units, Winter (Cimprich, K; Wysocka, J). Offered 2012-2013, and typically every other year.

CSB 260. Concepts and Applications in Chemical Biology. Current topics include chemical genetics, activity-based probes, inducible protein degradation, DNA/RNA chemistry and molecular evolution, protein labeling, carbohydrate engineering, fluorescent proteins and sensors, optochemical/optogenetic methods, mass spectrometry, and genome-editing technologies. 4 units (Chen, J. and staff). Not offered this year. To be offered 2013-2014.

CSB 271. Principles of Cell Cycle Control (same as BIO 271). Genetic analysis of the key regulatory circuits governing the control of cell division. Illustration of key principles that can be generalized to other synthetic and natural biological circuits. Focus on tractable model organisms; growth control; irreversible biochemical switches; chromosome duplication; mitosis; DNA damage checkpoints; MAPK pathway-cell cycle interface; oncogenesis. Analysis of classic and current primary literature. 3 units, Fall (Skotheim J. and Ferrell, J). Not offered this year. To be offered 2013-2014.

Medical Pharmacology Track. The coursework for this track includes the courses in signal transduction and drug discovery described above for the Chemical Biology track. In addition, students take a four-quarter, integrated course in medical physiology, histology, microbiology, pharmacology, and pathology titled Human Health and Disease. This track is particularly appropriate for Masters of Medicine and M.D./Ph.D. students.

Students in the Medical Pharmacology are required to take:

INDE 220 Human Health and Disease I
INDE 221 Human Health and Disease II
INDE 222 Human Health and Disease III
INDE 223 Human Health and Disease IV.

Study units are organized by organ system and integrate histology, physiology, pathology, microbiology, and pharmacology. Organ system units cover normal structure and function, response to disease (including infection), and treatment (therapeutics). Morning sessions are correlated with problem-based cases and physical diagnosis skill training in the afternoon Practice of Medicine block. Final unit on multi-organ systems provides pathophysiologic integration of material from prior units. Four quarter sequence running winter, spring, fall, winter.

Students in the Medical Pharmacology track are also required to take two of the CSB courses described above.

Finally, students in this track are also required to take one of the four “core” bioscience courses described above.

3. CSB SEMINARS

Seminars provide another focal point for the CSB Ph.D. program, and first and second year students are required to participate in the Chemical and Systems Biology Research Seminar (CSB 270) whenever it is offered. CSB 270 is a series of weekly seminars from distinguished visiting scientists. The purpose of this course is four-fold: (1) to enrich the student’s understanding of the seminar material; (2) to improve the trainees’ ability to analyze and interpret data, to formulate important experimental questions, and to lead a scientific discussion in a logical, coherent fashion; (3) to give the students a chance to meet and interact with seminar speakers from a range of disciplines, institutions and companies; and (4) to give the students an additional opportunity to interact with the faculty members who guide the post-seminar discussions.

Before each seminar, students are asked to read one or two of the speaker’s recent papers, and then meet to discuss and critique the papers. A faculty member is present to facilitate the student-led discussion. After the seminar, our students have the opportunity to meet with the speaker to discuss various aspects of science in an informal setting. In addition, students with particularly strong interests are invited to lunch with the speaker to provide further opportunity for discussion with leaders in the field.

In some quarters the seminar is incorporated into a didactic course (e.g. Signal Transduction Pathways and Networks and Drug Discovery often make use of seminars). In this way, the seminars introduce additional variety and perspective into the course, while the course helps to place the seminars into a broader scientific context.

4. LAB ROTATIONS

Students rotate through different laboratories during the first year, spending one quarter in each of three laboratories. During that time you will be meeting at least once every month with your two assigned coaches (separate or together), discussing your classes and rotation research. The purpose of a laboratory rotation is to broaden the students’ research experience, to familiarize students with the ongoing research projects, and to find a lab that matches their needs both intellectually and culturally.

The fall rotation is performed within the Department of Chemical and Systems Biology itself. The winter and spring quarter rotations may be within the Department, or, alternatively, students may, after discussions with the ADVISORY COMMITTEE, arrange to rotate with faculty in other programs and departments. Faculty mentors provide written assessments to the students. These assessments are also kept in the student's departmental files and are reviewed at the time of the Qualifying Exam.

How do you choose a lab to rotate in? (1) Check out the lab's interests. Pubmed searches, the Stanford Community Academic Profiles website, and the lab's individual website are good sources of information. Make use of the advisory committee and your coaches to discuss your (changing) research interests and what laboratories may best suite these interests (2) Talk with identified faculty member about what rotation projects are available and his/her ability to accommodate a grad student. Ask to participate in a lab meeting to get a feel for the lab. (3) Talk with students and postdoctoral fellows in the lab about their experiences. The Advisory Committee will then help match students up with labs.

5. CHOOSING A THESIS ADVISOR

Students should try to be open-minded about what lab they wish to ultimately join until they have completed their three laboratory rotations. The earliest date when a student may commit to a particular lab, and when a faculty member may commit to a particular student, is April 1 of the student's first year (which is typically around the start of the Spring Quarter and third rotation period). Some students do a fourth rotation during the Summer Quarter before choosing a lab. Final assignment of the student to a laboratory is made after consultation with the Advisory Committee and the faculty member in question.

After a student selects a laboratory, the coaches will keep meeting with the student to make sure the thesis project is getting on track. At two informal meetings 4 and 8 months after the student chooses a laboratory, students and coaches will discuss the developing thesis plan and the research progress. This will be helpful for preparing for the qualifying exam at the end of the second year.

Currently there are about 15 faculty members affiliated with the Chemical and Systems Biology Ph.D. Program as trainers, including many faculty members outside the Dept. of Chemical and Systems Biology. If a student wishes to join the lab of a faculty member who is not a member of the training program, there are two options: (1) the faculty member may petition to join the CSB Ph.D. Program; (2) the student may petition to transfer to a different Ph.D. program. The decision of which option is most appropriate is made on an individual basis by the student, the faculty member, the Advisory Committee, and the relevant Department Chairs.

6. ANNUAL CSB RETREAT

Each year the Program has a mandatory two-day retreat at an off-site location. The retreat is held at the beginning of the Fall Quarter and provides an opportunity for new trainees to rapidly acquaint themselves with the research going on within the

department. Short oral presentations are made by a selection of pre- and postdoctoral trainees from each group. Students not giving an oral presentation are required to present a poster on their work. Students are required to attend the annual retreat each year and to present talks or posters every year starting at year 2.

This retreat is an opportunity for all the members of the program to discuss their research, interact, and have a bit of fun.

7. PIZZA LUNCHESES

Every other week, the students, postdocs and faculty gather for one hour to hear two talks on current research. Every student has to give one pizza lunch talk per year starting in the second year. A five-ten minute question and answer session follows each talk. Members of each laboratory in the CSB Program, and occasionally people from outside the program, present their latest research on a rotating basis. Delicious pizza and nutritious soft drinks are served.

8. TRAINING IN RADIATION SAFETY, LABORATORY SAFETY, AND SCIENTIFIC ETHICS

During the first year of the Ph.D. program, students are required to be trained in laboratory and radiation safety as well as scientific ethical conduct. Marisol Urbano and Robert Pearce can provide more information about these courses.

- Radiation Safety, 8 hours, 1st quarter
- Lab Safety, 2-1/2 hours, 1st quarter
- Medicine 255: Ethics and the Responsible Conduct of Research. This course must be successfully completed before your Qualifying Examination.

9. FELLOWSHIPS

Outside fellowships are a real feather in a student's cap, and our students have historically been highly competitive for the most prestigious predoctoral fellowships. Students are therefore expected to apply for outside funding (e.g. NSF predoctoral fellowships) if eligible. This is typically done in the first quarter of the first year, and is done in consultation with the Student Advisory Committee and the first rotation advisor. Additional opportunities may also arise during later years to obtain outside funding. In this case, the student will work in consultation with his/her thesis advisor to prepare the fellowship application.

10. QUALIFYING EXAM AND ADMISSION TO CANDIDACY

During the summer of their second year, CSB students are expected to take and pass their Qualifying Exam. Each student, in consultation with the Advisory Committee and his or her research advisor, organizes a Qualifying Exam Committee in the spring of his or her second year.

Who is on the Qualifying Exam Committee? The Qualifying Exam Committee should be composed of three (or occasionally four or five) faculty members. The thesis advisor is not a member of the Qualifying Exam Committee and does not participate in the

qualifying exam itself. However, the advisor can and should advise the student in preparing for the exam.

If the student's thesis advisor is not a member of the CSB faculty, he or she needs at least two CSB faculty members on his/her Qualifying Exam Committee. One of the members of the prelim committee needs to be from the CSB steering committee (currently Tobias Meyer, Tom Wandless or Jim Ferrell). If the student's thesis advisor is a member of the CSB faculty, then he/she needs at least one CSB faculty member on the committee.

The Chair of the Qualifying Exam Committee must be a member of the Dept. of Chemical and Systems Biology. He or she is responsible for writing a report assessing the student's performance in the Qualifying Exam.

Reviewing the student's file. The student and the student's advisor should review the student's file prior to scheduling the exam to make sure that all requirements have been satisfied. **It is the student's responsibility to ensure that the file contains a report from the advisor documenting the student's research progress during the second year.**

What exactly is the Qualifying Exam? The Qualifying Exam has a written component and an oral component. The written component consists of a research proposal describing the student's intended dissertation research. The written proposal should address a well-defined hypothesis and should discuss alternative experimental approaches, appropriate controls, anticipated results, and interpretation of the data. **The length is limited to 10 double-spaced pages (or five single-spaced pages), including references and figures.** A brief guide to writing a good research proposal is in this Guide (Appendix 4). The written proposal should be given to the Qualifying Exam Advisory Committee at least one week prior to the exam.

The oral component of the Qualifying Exam consists of a verbal defense of the written proposal, during which the student will be evaluated on his/her depth of understanding of the proposal itself, as well as his/her breadth of knowledge of areas of science that underpin the proposed research. On the basis of the written and oral components of the Qualifying Exam, the Qualifying Exam Committee may award the student an unconditional pass, which allows the student to proceed to candidacy; a conditional pass, contingent upon rectifying some deficiency through additional coursework, a revision of the written proposal, and/or further discussions with Qualifying Exam Committee members; a fail with the option to retake the Qualifying Exam, often after a period of 3-6 months; or a fail with no option to retake the Qualifying Exam. A student who fails the Qualifying Exam may be asked to leave the Program. A student who leaves the Program may be awarded an M.S. degree; this generally requires satisfactory completion of the student's coursework and the writing of a master's thesis.

Important Deadlines for Second Year Students:

- Select Qualifying Exam Committee members and submit their names to Marisol Urbano (Student Services Coordinator, CCSR 3155), **by April 15, Spring Quarter**
- Schedule Qualifying Exam (with Marisol's help), **by the end of Spring Quarter**
- Complete Qualifying Exam, **by July 31, Summer Quarter**

Following the Qualifying Exam, the Qualifying Exam Advisory Committee decides whether the student is to be admitted to Ph.D. candidacy. The decision is subject to final approval by vote of the CSB faculty. If the committee determines that the student is not suitable for candidacy, certain remedial options remain open, such as retaking the exam after further intensive study. The Chair of the Qualifying Exam Committee should write a report on the exam within a week for the student's academic file, with copies to committee members, the student, and the Department chair.

Admission to Candidacy. After the Qualifying Exam has been passed the student must file an "Application for Candidacy" form. This indicates that the student has formally qualified for Ph.D. candidacy and is in good academic standing. It implies that the Department has made a careful review of the progress of the student and he/she is not on probationary status. This form lists which courses have been completed and what will be completed during the remainder of the program.

The candidacy is valid for five years after filing, subject to termination by the department if progress is unsatisfactory, and may be renewed by the submission and approval of a new application or extended upon the Department's recommendation. Any interruption of graduate work must be on an official leave of absence.

If the student finds a need to make changes in the program, the changes should be made on a "Change of Academic Program" form, available in the office.

11. YEARS 3-5: THE THESIS YEARS

If the first two years of the Ph.D. program focus on both coursework and research, the remaining years focus almost exclusively on independent research. The research mentor is the trainee's primary advisor. Formal requirements for the students during these years are attendance at Departmental seminars and retreats, a recurring 6 month meeting of the student's Thesis Committee, and satisfactory progress in the laboratory.

Thesis Committee. After admission to candidacy, the student picks a Ph.D. DISSERTATION READING COMMITTEE (which is more commonly referred to as his/her THESIS COMMITTEE). The Committee is chosen after consultation with his or her advisor, and subject to approval by the Department Chair. The Thesis Committee must include at least four faculty members, at least two of whom are members of the Dept. of Chemical and Systems Biology. The thesis advisor is always a member of the Thesis Committee. Members of the Qualifying Exam Committee often serve on the Thesis Committee, although this is not a requirement; very commonly, the Thesis Committee will consist of the student's advisor plus the three members of his/her

Qualifying Exam Committee. A “Ph.D. Dissertation Reading Committee” form can be obtained from the Student Services Director (Marisol Urbano, CCSR 3155), and should be filed with the university through Marisol.

The student has one formal meeting with his/her Thesis Committee per year, making a formal 30 minute presentation of the previous year’s progress and the next year’s research plan to his/her committee. **The student should provide a 1-3 page summary of his/her progress to the committee members at least one week before the meeting.** The Thesis Committee determines whether the thesis research is progressing satisfactorily, and, if not, makes remedial suggestions. The Chair of the Thesis Committee (usually the student’s advisor) is responsible for providing a written progress report to the trainee after the meeting, a copy of which should be included in the student’s file. **Failure to have annual meetings will jeopardize student’s academic standing within the program.** To guarantee that assessment of progress occurs on a regular basis, the Student Services Director schedules the Thesis Committee meeting each year.

12. TERMINAL GRADUATE REGISTRATION

After students have passed 135 units of coursework and research, which normally occurs at the end of the Winter Quarter of Year 4, students can and should petition for “Terminal Graduate Registration” status to start in the Spring Quarter. This provides the Program with a substantial financial break; it is critical that the student “go terminal” as soon as he or she is eligible. Petitions for TGR status are available the Student Services Director (Marisol Urbano, CCSR 3155).

13. THESIS DEFENSE, THE PH.D. DISSERTATION, AND THE UNIVERSITY ORAL EXAMINATION

The dissertation research culminates in a written thesis, a public thesis seminar and a closed oral examination in accordance with guidelines established by the University. The examining committee consists of the student’s Thesis Committee (typically the student’s advisor plus three other committee members who have been following the student’s work) plus a University Chair from outside of CSB (and, if the student’s advisor’s primary departmental affiliation is not CSB, outside of that Department as well). The University Chair’s primary rule is to ensure that the University’s rules are followed during the thesis defense.

Since the thesis must represent a new and significant contribution to knowledge, the department expects that its contents include the work encompassed in at least one significant paper accepted for publication in a respected peer-reviewed scientific journal. In many cases, a collection of reprints preceded by an introduction briefly defining the framework of the dissertation research is acceptable as a thesis. In any individual case the format and standards of the thesis are to be determined by the thesis committee. The Ph.D. degree is awarded following the successful completion of all preceding steps. Abstracts of Ph.D. theses are published in *Dissertation Abstracts*. Details associated with this process are described in Appendix A.

14. NATIONAL/INTERNATIONAL MEETINGS AND TRAVEL

Students are expected to present their work at the Departmental Retreat at least twice. Ideally one of these times would be after the second year of graduate school. Students are also encouraged to present their work at a national/international meeting. The Department will provide up to \$1000 total to each student during their graduate career to attend such meetings. Some students may have travel money in their own Fellowships; in these cases, the Department will supplement the travel money up to a total of \$1000. Any additional required funding should be provided by the student or the student's advisor.

15. TEACHING ASSISTANTSHIPS

Chemical and Systems Biology Ph.D. students are not required to teach or serve as a teaching assistant (TA). Nevertheless, many CSB students are considering a career in academia that includes teaching. Obviously it might be a good idea to find out if you like doing it, if you have any talent for it, and so on, before committing yourself to a life of teaching. TA positions also provide some extra money to the student.

The Department of Chemical and Systems Biology typically recruits students to serve as TAs for several courses, including Chemistry of Biological Processes, Signal Transduction Pathways and Networks, and Drug Discovery. TA positions are coveted, so interested students should keep an eye out for the opportunity. Interested students should also discuss the position with both his/her thesis advisor before applying for one.

16. OVERVIEW OF THE VARIOUS COMMITTEES MONITORING YOUR PROGRESS

Confused about all these various committees? Here's a summary:

Years 1 and 2: Meet at least once a month with the two coaches (alone or together) to discuss classes and rotation research. Meet each quarter with the Advisory Committee to discuss courses and rotations. The Advisory Committee currently consists of Tobias Meyer, Mary Teruel, Dan Jarosz, and James Chen.

Summer after Year 2: A three-person Qualifying Exam Committee (not including your advisor) assesses the merit and feasibility of your proposed thesis research. Additional committee members may be added as appropriate.

Year 3-The End: A four-person Thesis Committee, including your advisor and chaired by him/her, meets to monitor your progress every 6 months. Typically the three members of your Qualifying Exam Committee become members of your Thesis Committee. Substitutions are possible, and additional committee members may be added as appropriate.

The End: A five-person committee, normally consisting of your four-person Thesis Committee plus an outside University Chair, assesses the merits of your thesis research and defense.

Appendix 1. DISSERTATION DETAILS

A. Procedures. The student should obtain a copy of the general directions for preparing a dissertation from Marisol Urbano or the Graduate Degree Progress Office, Room 132, Old Union. The dissertation should be a contribution to knowledge and the result of independent work, expressed in satisfactory form. The work for the dissertation will be in progress from the time the student chooses a lab in which to work and an advisory Dissertation Reading Committee. The final version will incorporate any alterations required by subsequent meetings with the Dissertation Reading Committee.

It is the student's responsibility to obtain all required signatures on all forms and on the dissertation. Students are strongly advised to remain in the Stanford area until the dissertation has been turned in to the Graduate Degree Progress Office.

The dissertation and copies, plus the required accompanying papers, must be filed at the Graduate Degree Progress Office on or before the last day of instruction in the degree quarter, as specified on the University calendar and no extensions are allowed. The following must be turned in:

- a. Signed "Certificate of Final Reading of Dissertation" form
- b. Publishing agreement (available at the Graduate Degree Progress Office)
- c. "Survey of Earned Doctorates" (available at the Graduate Degree Progress Office)
- d. Signed abstract (original and 1 copy)

B. Request for Oral Exam. At least 3 weeks before the proposed date for the oral exam, and after first finding a time which is agreeable to the Oral Examination Committee (see Section I, N), the student submits a "University Oral Examination Schedule" to Marisol Urbano in CCSR 3155, who will reserve a room (noting it on the form), notify Public Events for publication in Campus Report, send announcements to affiliated Departments, and complete the proper routing of the form. The Department Chair signs the form, as does the student. The orals should not be scheduled during the first two weeks of a quarter or after the last day of instruction.

In most cases the oral exam is a defense of the dissertation or based on dissertation research. Therefore, an abstract or resumé should be submitted with the "University Oral Examination Schedule".

C. Examiners for Oral Exam. The committee of examiners for the oral exam consists largely of the Dissertation Reading Committee. The Department appoints a Chair for the Oral Exam Committee. The Chair must be an Academic Council member from a department not represented by either the Ph.D. candidate or his/her principal advisor. The Chair reads the dissertation abstract and supervises the Oral Exam. In addition to the Chair, four examiners are required, at least three of which must be on the Academic

Council. A fourth member who is not on the Academic Council may be substituted if he or she contributes an area of expertise not readily available from the faculty and if approved upon petition (see Marisol Urbano). Additional members may be appointed. All members of the Academic Council may attend all phases of the oral examination. Members of the Oral Examination Committee must be provided with draft copies of the dissertation two weeks prior to the oral exam.

D. Oral Exam. The student's department delivers to the Chair a University oral examination schedule, University Guidelines for Oral Examination Procedures, and an abstract for oral examinations that are a dissertation proposal or defense.

The University requires that the oral exam be no longer than three hours, and that there be a brief recess before the questioning period.

The oral examination in pharmacology is usually composed of a 50-minute seminar, open to the public, after which there is a 10-minute discussion period. The candidate and the Oral Examination Committee then hold a closed session during which the candidate answers questions pertaining to the dissertation and the candidate's research area in pharmacology. The seminar and questions should assess the candidate's work within the broader context of the field of pharmacology.

Voting, by secret ballot, takes place after the candidate has been questioned and dismissed. Only members of the Oral Examination Committee may vote. The candidate will pass the orals if at least 3/4 of those voting are in favor of a pass. The Chair of the oral examination must record the results of the vote on the University Oral Examination Schedule form and note any changes in the examining committee membership. Copies of the form are then distributed to the departmental graduate studies administrator and the Graduate Degree Progress Office within five days of the examination.

In the event that the committee votes to fail a student, the committee will review the results. The chairman of the committee will transmit to the department chairman a written evaluation of the student's performance. The committee may recommend the length of time that should intervene before the student may retake the orals and any conditions to be met before the orals may be retaken. The committee may recommend that the student not be permitted to repeat the orals. The Chairman of the Department should discuss the recommendation with the student and the advisor to decide on the action to be taken. The student should receive a written statement indicating the final action of the department within 30 days of the orals. The statement should include a reference to the academic grievance procedure available to all students as stated in the Information Bulletin.

E. Procedural Outline for Ph.D. Program

The student must be registered each quarter, including summer quarters.

1. All course work should be completed by the end of 9 quarters. The student should check carefully that all requirements, including minimum grades, have been met.
2. Qualifying exam: Oral examination on general knowledge in pharmacology and allied fields and defense of a tentative dissertation proposal should be taken by the sixth week of the summer quarter after the second year.
3. After passing Qualifying Exam, file "Application for Candidacy" and "Ph.D. Dissertation Reading Committee" form.
4. If you have any changes in what was listed on "Application for Candidacy" form, file a "Change in Academic Program" form.
5. When you actively working on dissertation, obtain copy of "Directions for Preparing Doctoral Dissertation" from Marisol Urbano or the Graduate Degree Progress Office.
6. One year before the anticipated date for completing the Ph.D., begin search for postdoctoral positions or fellowships; deadlines are normally one year before appointment begins.
7. File "Notice of Intention to Complete Advanced Degree Requirements" in last quarter (preferably by the second week of the degree quarter).
8. If tables, photographs, slides, etc. for the dissertation need to be made by Visual Arts, plan to submit them at least 3 weeks before they are needed.
9. Obtain copyright permission if needed; allow sufficient time.
10. Complete dissertation: final version of text, tables, photos, etc., assembled and collated.
11. Update "Ph.D. Dissertation Reading Committee" form (if needed) and appoint Oral Examination Committee members. This committee usually consists of the Dissertation Committee plus additional members and each member must sign the form.
12. Three weeks before the expected date of orals, complete the "University Oral Examination Schedule". The department chairman signs this, signifying approval of members selected. Turn in to Marisol Urbano in CCSR 3155.
13. Take orals.
14. Incorporate any changes requested by Dissertation/Orals Committees into dissertation.
15. Make sure there are enough copies of tables, photos, etc. for final copies of dissertation.
16. Arrange for duplication of dissertation.
17. Take signature pages to all members of Dissertation Committee; original signatures must be on each page.
18. Have one member of Dissertation Committee read the final version of dissertation and have "Certificate of Final Reading of Dissertation" signed by him/her, certifying this has been done.
19. Turn in dissertation to the Graduate Degree Progress, Old Union 132, along with the other materials listed in Section I, L1.
20. Receive degree. Celebrate.
21. If you ordered your own bound copy of the dissertation, Graduate Degree Progress Office will send you a postcard when it is ready for pick-up. They will distribute the four required copies.

APPENDIX 2. FINANCIAL INFORMATION

A. General Information. Graduate support can come from a number of different sources. Some students enter with an NSF Fellowships, NIH-Minority Predoctoral Fellowship, or other competitive outside fellowships. These can also be awarded during the student's second year. Our students have been quite successful in receiving these prestigious fellowships and are expected to apply during their first year. Other students are initially supported by an NIH training grant administered by the Department of Chemical and Systems Biology, by an interdepartmental NIH training grant, or by a Stanford Presidential Fellowship. After the first three years, students are usually fully supported by the lab in which s(he) is doing research as a Research Assistant. Again, the student is expected to apply for outside support with the advice of the advisor.

B. Methods of Payment. Students supported by stipends (e.g., the CSB Training Grant) are issued checks at at the beginning of each quarter. Checks are mailed to the students' homes.

Students supported as Research Assistants (e.g., by a grant to their advisor) receive payments on the 7th and 22nd of each month. You should arrange to have checks deposited automatically to your bank account; see Marisol Urbano for forms.

Income Tax . Training grant stipends are taxable, but taxes will not be withheld from your check; training grant students pay an estimated quarterly tax. Students receiving a salary will have taxes withheld based on the information on their W-4 form.

APPENDIX 3: REGISTRATION INFORMATION

You will receive information about registration from the Registrar's Offices; complete instructions on registration procedures are detailed in the University Time Schedule.

A. Study Lists. Students should file a study list each quarter (see the current Stanford Time Schedule) through the on-line AXESS web site. You can get to AXESS simply by typing "AXESS" in the URL box on any Stanford computer. Fill this out all information carefully.

NOTE: If enrolling in Chemical and Systems Biology 399 (Individual Research) or TGR one must sign up for the correct faculty member on AXESS. Please see Marisol Urbano in CCSR 3155 if you cannot find your faculty member's section, or if you have any other questions.

B. Required Registration. Please register 10 units each quarter until you are eligible for TGR. Traditionally, TGR students register for 0 units.

NOTE: "Application for Candidacy" and "Reading Committee" forms should be filed after passing the Qualifying Exam. Please see Marisol Urbano in 3155. The form must be filled out indicating all required courses have been taken or registered for; it must be approved by the faculty advisor and signed by the department chairman. These forms should be completed and turned in to Marisol Urbano (3155).

C. Registration During Final Quarter. You must be registered during the quarter you defend your thesis. If you have preregistered for a year and finish before the year is completed, please make sure the registrar's office "de-registers" you so that you do not receive additional billing. Please see Marisol Urbano if you have any questions.

APPENDIX 4: GUIDE FOR WRITTEN PROPOSALS (QUALIFYING EXAM)

The format should be that of an NIH grant application (R01) but it will be shorter in length (**up to 10 double-spaced pages**). Use type of standard size (12 pts. in a type style such that there are no more than 15 characters per inch). The title should not exceed 56 characters.

The instructions below are similar to those for an NIH research grant.

1. **Specific Aims.** (What are you going to do?) List objectives and describe concisely what the research is intended to accomplish (*1 page maximum*).
2. **Background and Significance.** (Why do you want to do it?) Briefly sketch the background to the proposal, evaluate existing knowledge, and identify the gaps which the project is intended to fill. Relate the specific aims to broad long-term objectives and to health relevance (*1-2 pages are recommended*).
3. **Preliminary Studies.** (What have you already done?) It is not necessary to present preliminary data, although you may do so.
4. **Research Design and Methods.** (How are you going to do it?) Describe the research design and the procedures to be used to accomplish the specific aims of the project. Include the means by which the data will be collected, analyzed, and interpreted. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims. Provide a tentative sequence or time-table for the investigation. (*Although no specific number of pages is recommended for this section of the application, the total for items 1-4 may not exceed 5 single-spaced pages, including all tables and figures.*)

[It is more important to outline the logic of the proposed project than to provide extensive details for each experimental procedure. State clearly which specific aim or hypothesis is being tested in each experiment. Discuss the possible outcomes and interpretations. Make certain to include and discuss all the necessary controls. It is usually more valuable to propose several alternative approaches to unambiguously answer a key question(s) than to try to answer multiple questions more superficially. The overall goal is to obtain new mechanistic insights into biological and pharmacological phenomena. This section is the most important one of your proposal and deserves the most thought.]

5. **Literature Cited.** Do not scatter literature citations throughout the text. List them at the end of the Research Plan. Each literature citation **must include** the title, names of all authors, book or journal, volume number, page numbers, and year of publication. Be judicious in compiling a relevant and current list of literature citations; it need not be exhaustive.

APPENDIX 5. HEALTH & SAFETY

Stanford University's health and safety mission is to provide a safe and healthy environment for faculty, students and staff, protect the University resources against losses arising from various types of occurrences such as injuries, earthquakes, fires and explosions, and to assure compliance with federal, state and local health, safety, and environmental regulations. Safety is an integral part of your performance in the lab.

The Principal Investigator is responsible for providing information and training about lab procedures, equipment, and any specific hazards in his/her lab. He/she may delegate this responsibility to a Research Assistant or other lab member. You will be asked to read and sign the Chemical and Systems Biology Department's Health and Safety Guidelines before beginning your work in the lab.

The Medical School Health & Safety Program offers a monthly Lab Safety Training Seminar. Topics include safe lab practices, hazardous materials management and disposal, and emergency preparedness. Attendance at this three-hour seminar is required during your first quarter at Stanford.

Health Physics manages Stanford's radiation safety program. Before working with radioactivity, new students must complete a Statement of Training Experience and pass a course offered by Health Physics. A test may be substituted for this course at the discretion of Health Physics.

If your research involves potential exposure to blood, blood-borne pathogens, and/or other potentially infectious materials, additional training is required.

Copies of the Stanford Safety Manual, the Radiation Protection Manual, and the Biosafety Manual can be found in each lab. Material Safety Data Sheets and the Emergency Response Plan are located in CCSR 3226. Many of the University's health and safety documents are available on the Department of Environmental Health and Safety website: <http://www.stanford.edu/dept/EHS/>

The Department Safety Team is composed of representatives of the administrative staff, research staff, postdoctoral fellows, and students. The role of the Safety Team is to disseminate information (focusing mainly on compliance issues, education and training, and disaster preparedness), to resolve problems or concerns of department members, to establish and update department health and safety policies and procedures, and to interpret University policies regarding health and safety.

Contact Robert Pearce (CCSR 4145C) for further information.