



CSB

STUDENT GUIDE

Department of Chemical and Systems Biology
Stanford University School of Medicine

2020-2021

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Welcome to the Chemical and Systems Biology Ph.D. program! This guide lists the requirements for selecting rotations and coursework, passing the qualifying exam, and receiving a Ph.D. degree in Chemical and Systems Biology. Please do not hesitate to ask Elizabeth Kay or Eva Hy, the Student Services Team, should you have any questions. We look forward to welcoming you to our department!

Rotations

All 1st year graduate students take 3 quarter-long research rotations of their choice. Our goal is to expose students to foundational chemical, systems and cell biology concepts and to teach students how to plan and execute innovative biomedical research.

Two out of three rotations must be in the laboratories of the CSB faculty (Chen, Chistol, Cimprich, Ferrell, Jarosz, Mochly-Rosen, Qi, Wandless, or Wysocka) and the first rotation must be in one of the laboratories of the CSB faculty. The goal is to introduce students to the unique training and research environment that the CSB department offers.

Students are required to give an approximately 12-minute long presentation about their rotation project at the end of each of the first three quarters in the Science Circle Forum series (aka Pizza Talks), which meets Tuesdays at noon.

You may discuss potential rotations with CSB faculty at any time, even before you come to Stanford, but we request that you finalize your choice of first rotation laboratory only after the Departmental Retreat, which is typically held shortly before classes start in the fall quarter. The Retreat will give you a chance to meet people from different laboratories and to learn more about potentially interesting rotation projects you may not be aware of. Short talks and poster sessions at the retreat offer excellent opportunities to see which types of research projects are currently active in the labs.

Before finalizing the second and third rotation laboratories later in the year, students meet individually with the CSB Advisory Committee (currently Dan Jarosz and James Chen) to discuss whether the rotation will be a good match for the student's educational goals.

Students rotating in labs within the department sign up for the corresponding faculty member's CSB 399 section. Sign up for whatever number of units brings your unit total for the quarter to 10. Students rotating outside the department sign up for Dan Jarosz's CSB 399 section and have their research advisor submit a grade via email to Dan Jarosz for submission in Axess.

We limit the number of rotating students in the same laboratory in any one quarter to two to ensure that students have a chance to closely interact with the faculty during the rotation. Incoming students are sometimes concerned that this might mean they will be unable to rotate in some laboratory they are interested in. We will help make sure that if you do not get your first-choice rotation in the fall, you will in the winter or spring.

Selection of thesis laboratory

Selection of a thesis laboratory should be initiated by the student by discussing projects with a potential Ph.D. advisor, usually toward the end of the spring quarter. Joining a lab

is done by mutual consent. If you are unclear whether you have found the lab you want to join, it may be advisable to take a fourth (summer) rotation. Students must join a laboratory by the end of summer quarter. At the end of each rotation, 1st year students meet with Professors Dan Jarosz and James Chen to discuss their experiences in the lab they rotated in as well as their coursework. The Student Services office will reach out to 1st year students toward the end of each quarter to coordinate these meetings.

The majority of our students historically have chosen thesis labs within the CSB department. However, a student may choose any lab at Stanford for his or her Ph.D. research. We appreciate that interests change, and that a CSB lab may not be the best home for every student. Students planning to join a lab outside the department and wishing to remain in the CSB program will be asked to write a one-page summary of the proposed thesis project and how it fits within the intellectual focus of the department. The CSB faculty will discuss whether the thesis project aligns with the department's mission and whether CSB faculty have the necessary expertise to serve as thesis committee members. If the faculty have concerns about either question, the student will be asked to meet with the Student Services Manager, CSB Chair, and Director of Graduate Studies to discuss how the thesis project aligns with CSB in comparison to other home programs. This information will be communicated to the CSB faculty.

If a majority of CSB faculty determine that the laboratory or project is not a good match for CSB, or if a student would not be able to actively participate in the CSB seminars, pizza talks, retreat and other activities, then the student will be asked to transfer to a Ph.D. program that offers a better environment for them.

Regardless of what laboratory you join, if you are part of the CSB program, you are required to attend departmental Pizza Talks, the CSB annual retreat, departmental seminars and symposia, thesis defenses, and social events throughout your time at Stanford.

Quarterly student meetings during the first 2 years

At the end of each quarter, 1st year students meet with the Student Advisory Committee to discuss the program, their rotation host laboratories, and coursework, along with qualifying exam and career planning. This is also a good time to discuss ideas about student activities and to provide feedback on your early graduate training experience. Students are also encouraged to meet with the Student Advisory Committee members or the Department Chair individually should any issues come up throughout the year.

Per a combination of the University policy on graduate advising and the CSB departmental goals, please see the advising guidelines below.

Advising guidelines

CSB Ph.D. faculty advisers are expected to:

- Serve as intellectual and professional mentors to their graduate students.
- Provide knowledgeable support concerning the academic and non-academic policies that pertain to graduate students.
- Help to prepare students to be competitive for employment.

- Maintain a high level of professionalism in the relationship. Establish and collaboratively maintain expectations of the adviser/advisee relationship, consistent with departmental standards.
- Participate in CSB events, particularly those relevant to the training of the advisor's CSB advisee(s): pizza talks, department seminars, department retreats, etc.

Coursework

You will select courses in an individual quarterly meeting where you discuss with Dan Jarosz and James Chen your training goals and research interests. The goal of your coursework is for you to master foundational knowledge in the fields of systems biology, chemical biology and cell regulation so that you will be able to understand research seminars and papers across the biosciences. In addition, we will make sure that your curriculum is filling any key training gaps that you may have and preparing you for your planned thesis research. Please ensure that your units add up to 10 in each quarter (use CSB 399 to reach 10 units). From the second year on, students focus on research and typically fill their coursework primarily with CSB 399 units. After approximately 3.5 years and if the appropriate qualifications are met, students transfer to a terminal graduate registration status (TGR), which reduces the tuition cost. TGR status has different course enrollment requirements than non-TGR status so please ask Elizabeth Kay if you have questions regarding going TGR.

Coursework to be completed within the first two years:

Important note: Normally, if a course has the option to be taken as a letter grade, the student must take the course as a letter grade and receive a B- or better in order to have the course count towards the CSB Ph.D. requirements.

Please note that CSB counts all courses taken in academic year 2020-21 with a grade of 'CR' (credit) or 'S' (satisfactory) towards satisfaction of graduate degree requirements that otherwise require a letter grade provided that the instructor affirms that the work was done at a 'B' or better level.

Fall Quarter, Year 1

BIOS 200: Foundations in Experimental Biology

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

Please note: as of Fall 2019, BIOS 204 can and must be taken for a letter grade to count towards the CSB program requirements

CSB 201: Bootcamp

CSB 270: Research Seminar

CSB 399: Graduate Research

Subsequent quarters

CSB 270: Research Seminar (Fall, Winter, and Spring)

CSB 399: Graduate Research (Fall, Winter, Spring, and Summer)

MED 255: The Responsible Conduct of Research (Fall, Winter, or Spring) or BIOS 258: Ethics, Science, and Society (course offering varies)

Plus:

One chemical biology course chosen from:

CSB 220: Chemistry of Biological Processes

CSB 260: Concepts and Applications in Chemical Biology

Two CSB electives chosen from:

CSB 243: Biotechnology and Development of Therapeutics

CSB 221: Methods and Logic in Chemical and Systems Biology

CSB 240A: A Practical Approach to Drug Discovery and Development

CSB 240B: A Practical Approach to Drug Discovery and Development

CSB 242: Drug Discovery and Development Seminar Series

CSB 245: Economics of Biotechnology

CSB 250: The Biology of Chromatin Templated Processes

One additional elective:

This may be an additional CSB course (listed above) or a substantial (i.e. 3-5 unit) course offered by another department. Popular electives include:

BIOC 224/BIO 214/MCP 221: Advanced Cell Biology

BIOC 241/BIOE 241/BIOPHYS 241/SBIO 241: Biological Macromolecules

BIOS 221: Modern Statistics for Modern Biology

BIO 271/CSB 271: Principles of Cell Cycle Control

DBIO 210: Developmental Biology

GENE 205: Advanced Genetics

Other electives are possible with approval from the Student Advisory Committee.

Please note that CSB 272: Responsible conduct, rigor, and reproducibility in research is highly encouraged for first, second, and third year students. Starting in Fall 2021, CSB 272 will be required for second and third year students.

Qualifying exam

The CSB qualifying exam must be taken before the end of the second year (before the fall quarter that starts in September). Both the written thesis proposal and the oral part of the qualifying exam contribute to the qualifying exam committee's assessment of the student's performance. Students should make sure that they have fulfilled all course requirements before scheduling the exam. In rare circumstances, an extension of the exam date can be requested. This must be approved by the CSB department chair. The purpose of the qualifying exam is to determine whether the student is ready to carry out their Ph.D. thesis project. This comes down to four fundamental questions:

- 1. Has the student identified a good problem to work on?** Is the question being addressed (or, in the case of more technological projects, the technology being developed) important, or is this incremental, "me-too" work?
- 2. Does the student have the knowledge required to successfully carry out Ph.D. research?** Does the student have sufficient general background knowledge—the

type of information one typically obtains from courses and review articles—for the research project? Does the student have sufficient expert-level knowledge—the more focused but deeper knowledge one typically obtains from critical reading of the primary literature—for the project?

- 3. Is the research plan a good one?** Is the approach direct, feasible, and likely to be definitive? How will the work be followed up if the expected results are obtained, and how will it be followed up if they are not? What are the most likely obstacles? Is there a Plan B (and C and...)?
- 4. Is the student likely to make reasonable progress in a timely fashion?** A logical research plan is important for a successful Ph.D. thesis. So is the ability to get things done. Does the student have the preliminary results in hand to indicate that progress has been made, and will continue to be made?

The CSB qualifying exam lasts approximately 2 hours and is attended by the student and three eligible faculty (they have to be tenure track and on the Academic Council), of which at least 2 need to be CSB faculty. The exam committee is chosen by the student in consultation with the thesis advisor. The student has to ask one of the two CSB faculty members on the committee to be the qualifying exam chair in advance of the meeting. The thesis advisor must be present at the beginning of the exam and provide background about the student before leaving the room. In special cases, the thesis advisor may send instead a written report about the student to the three members of the exam committee.

Students present a research proposal orally and in writing. The written thesis proposal should be no longer than 5 pages (one-inch margin; single line, 11 or 12 pt; Abstract, Specific Aims, Background, Research Plan and timeline for completion of each aim; Figures are encouraged). The written report must be received by the committee and Elizabeth Kay no later than 7 days before the exam, or the exam will be canceled. During the exam, the committee will discuss the thesis proposal with the student and ask the student questions about the proposed work, the background in the field, and other relevant scientific topics.

A qualifying exam form will be used to record the results of the committee's decision. The student will leave the room at the end of the exam and the three committee members will decide by majority vote either (a) to pass, (b) to conditionally pass or (c) to fail the student. The student will be informed immediately after the vote whether he or she passed, conditionally passed, or failed. If a student passes or conditionally passes, the student will write a one-page report within one week summarizing the suggestions from the committee. This student report will first be sent to the committee members for additions and corrections. Once approved by the committee, the report must be sent to the thesis advisor and Elizabeth Kay and the student is expected to discuss the points raised by the committee with the advisor. Only after a pass decision and the approval of the student report will the student become a Ph.D. Candidate.

A conditional pass can either include a requirement for a rewrite of the proposal or a requirement for an oral re-examination. After a conditional pass, the committee members can only be changed with the agreement of the CSB department chair. If an

oral examination is required with the conditional pass, it must be completed within 6 months of the first examination. A final decision has to be made at this oral re-examination. There is only one chance to pass an oral re-examination. If the student passes the re-examination, he or she writes again a report and has it approved by the committee as at the first one. A re-writing of the proposal involves the submission of a revised proposal and requires approval by the committee. In some cases, this may involve more than one round of changes. Also, when re-writing is required, the student must pass in 6 months or less from the initial examination date. In all cases, a final pass or fail decision for the CSB qualifying exam has to be made before the end of winter quarter of the third year. Finally, in the case of a conditional pass, the final pass decision is only made after at least two of the three committee members have approved the revised proposal and the revised student report.

If the student fails, he or she must leave the graduate program. In consultation with the committee, the committee chair will write within a week a report to the student, the advisor and the department chair stating the reasons for the fail decision. The student has the right to appeal a "fail" to the department chair. Such an appeal must be made in writing within one month of the fail decision. In consultation with the CSB department faculty, the chair then has the option to either let the fail decision stand or to schedule a re-examination with the same or different faculty. If approved by a majority of the committee and the chair of the CSB department, a student leaving the graduate program may be qualified to obtain a master's degree.

Post qualifying exam requirements

Committee meetings are held once a year after the qualifying exam. When a student is in his or her fifth year, the committee meetings should be held twice a year. From the sixth year and on, the meetings should be held every quarter. **It is the student's responsibility to initiate and schedule the meetings.** It is strongly recommended to start scheduling at least 2-3 months in advance of the desired thesis committee date.

Committee meetings are one of the best opportunities for you to get feedback about your progress and to get second opinions about which types of experiments you should pursue to answer the questions you are trying to address in your thesis. To provide you with regular input, we mandate that you schedule committee meetings after the qualifying exam. Each of these meetings should be scheduled to be 90 minutes long and should include 4 faculty members counting the thesis advisor (faculty on the committee do not need to be tenure track). At least one of the four members must be CSB faculty, but the composition can be different from that in the qualifying exam and can also change during your thesis work as you may need to pursue different directions. In rare occasions when scheduling is difficult, not all members have to be present and you can meet with missing members separately. The committee is tasked to give you advice about your experiments, future directions, make recommendations about attendance of conferences, career plans and more personal laboratory issues. Each meeting should include a time plan to ensure that the thesis project can be completed within less than 5.5 years. At the beginning of each meeting, the student will exit the room to allow for a discussion between the advisor and the rest of the committee. A few minutes before the end of the meeting, the advisor is asked to leave the room to allow for the student and the rest of the committee to discuss issues about the lab, potential personal issues, training opportunities and to discuss possible differences in research

goals or issues relating to authorship. Meetings become more frequent in case the thesis is not completed by 5.5 years. If the expected number of annual committee meetings are not completed by August 31st, an enrollment hold will be placed on the student's account that may delay graduate funding.

Following each committee meeting, as with the qualifying exam, the student is required to summarize the discussion and formulate a revised plan for subsequent work. This summary should be discussed with the advisor and sent to the committee members within one week for comment. A final copy of the report will need to be submitted to Elizabeth Kay.

Fellowship applications

Students in the CSB program have to apply for possible funding from external fellowships. To have a good chance, you need to finish a first draft several weeks before the deadline. After the second year, we also request that all eligible students take a training class and apply for an NIH fellowship even if they have or had funding before. These fellowship applications are both an excellent learning experience and, if funded, are also a good addition to your CV.

Presentations

Starting in the 3rd year, students give a yearly 20-minute research progress update seminar to the department at the Tuesday Pizza talks. They also must attend the retreat and present a poster or give a talk. Furthermore, students must attend the departmental CSB Cutting lectures and departmental symposia; speakers for these talks are leaders in their scientific disciplines who are selected by students, postdocs and faculty with an emphasis on showcasing speakers who can explain their work to a broad audience. We strongly encourage students to meet with the speakers after the seminar for lunch (there is a signup email before each visit) or for breakfast. We ask students for input about selecting potential speakers and make sure that we have a few student-invited speakers every year. We also encourage students to attend department social events: a winter party in December, the annual alumni talks and summer barbeque, as well as happy hours in the summer.

External and Internal Speaking Engagements

Below are some options for students to present on and off campus.

While covering the cost of conferences is the responsibility of the thesis laboratory, students can obtain one-time in their Ph.D. career support from the department of up to \$1500 to attend a conference where they will give a talk or present a poster. Please make a request to Elizabeth Kay. We encourage students to attend conferences at least once a year starting in the 3rd year of their thesis.

Students may also approach CSB faculty about the possibility of attending or presenting at group meetings outside of the student's home lab. There should be synergies between the student's work and lab's research.

Best practices for authorships and publications

It is not uncommon that there are different opinions about the order of authorship and

the inclusion of authors on publications. We recommend that you discuss authorship early in a project—if at all possible, before a publication has been submitted. A good strategy is to periodically discuss authorship both with your co-workers and with the thesis advisor as a project advances since the authorship may change as contributions are changing. Contributions to a paper can include significant experimental or theoretical work as well as ideas or unpublished critical reagents or methods. If there is no satisfying solution after such discussions, you should discuss the issue with one or more members of your thesis committee. If there is still no resolution, you may contact the department chair. A final decision may in some cases involve the consultation of outside faculty to help clarify the relevance of different contributions.

Ph.D. exam

Upon completion of your experimental and analysis work, you will be writing a thesis and will be orally defending your thesis to the department and University. The decision to schedule an oral defense requires the support of each member on the committee including the thesis advisor.

The University mandates the format of the defense as described in the Stanford Graduate Academic Policies and Procedures (GAP). Please see the following link for more information: <https://gap.stanford.edu/handbooks/gap-handbook/chapter-4/subchapter-7/page-4-7-1>. Per the GAP policy, the oral exam committee must consist of at least five Stanford faculty members: four examiners and a committee chair from another department. Please refer to the University Graduate Academic Policies and Procedures for more information on the policies for doctoral degrees, university oral examinations and committees: <https://gap.stanford.edu/handbooks/gap-handbook/chapter-4/subchapter-7/page-4-7-1>

The Chemical and Systems Biology department requests that the oral examination committee includes at least 2 CSB faculty (all faculty have to be tenured or tenure track, members of the Academic Council). Thus, if only one CSB faculty member was on your thesis committee, an additional CSB faculty member has to be added. In addition, you will also need a committee chair. The thesis defense chair must be from a department other than CSB and the home department of your thesis advisor. Potential conflicts about scheduling the thesis defense should be resolved in discussions between the student, advisor and committee, or, if requested, in consultation with the CSB department chair. If you are interested in having an adjunct professor participate on a committee, please reach out to the Student Services Manager for more information.

Per the University Policy, the student needs to submit a draft of his or her thesis to the oral thesis committee before he or she defends. This is essential for the examiners to critically evaluate the work. **The Department of Chemical and Systems Biology expects students to submit their written dissertation in Stanford Thesis format to their oral examination committee in at least two weeks before the actual defense.**

Please refer to the following link for more information on the dissertation and thesis submission: <https://studentaffairs.stanford.edu/registrar/students/dissertation-thesis>.

Please refer to the University Graduate Academic Policies and Procedures for more

information on the policies for doctoral degrees, dissertations, and dissertation reading committees: <https://gap.stanford.edu/handbooks/gap-handbook/chapter-4/subchapter-8/page-4-8-1>

Our expectation is that the average time to degree for our students should be 5.5 years or less, which means that you should defend your thesis typically around the end of the 5th year to allow for a graduation quarter and/or a potential 3 month delay to the end of a quarter when the degree is actually granted. At the same time that we expect a time to degree of less than 5.5 years, we expect that each student complete for their thesis one first- author paper. By the time you are scheduling your thesis defense, this paper should be accepted for publication.

Service and outreach

Service and outreach are not requirements of the program, but we encourage students to participate in activities that impact our broader community. There are several volunteer and outreach programs in the Bay Area, and our Student Services Team, Elizabeth Kay and Eva Hy, can provide you with information about specific opportunities.

Graduate student resources

Please reach out to the Student Services Manager for more information on the resources below and for any questions or concerns.

- Graduate Life Office (GLO): <https://glo.stanford.edu/>
- Counseling & Psychological Services (CAPS): <https://vaden.stanford.edu/caps>
- Office of Accessible Education (OAE): <https://oae.stanford.edu/students>
- Leave of Absence: <https://gap.stanford.edu/handbooks/gap-handbook/chapter-5/subchapter-3/page-5-3-1>
- Vaden Student Health Center: <https://vaden.stanford.edu/>
- Additional Wellness Resources: <https://biosciences.stanford.edu/current-students/resources/health-and-wellness-resources/>