

# Computational Biology and Bioinformatics Doctoral Program Handbook

Quantitative and Computational Biology  
Dornsife College, USC

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This handbook is a reference for students in the Computational Biology and Bioinformatics (CBB) doctoral program. The CBB program was founded in 1990 as one of the first programs in the field. The program brings together deep expertise across disciplines to train exceptional students towards advancing biological and biomedical science through quantitative approaches.

This handbook replaces an earlier handbook for the CBB program. The earlier handbook, although complete and consistent, was difficult to navigate and did not have the best emphasis to guide CBB students and QCB faculty. The present handbook aims to be slightly more useful, emphasizing topics noted as sources of confusion. Many paragraphs in this handbook are identical to those in earlier CBB handbooks.

This handbook covers regulations, guidelines, policies and advice. This is the only written documentation available for students that explains regulations specific to the CBB program. It also covers a subset of those determined by the School and University, which are included if our experience suggests they are worth clarifying. Information in this handbook is intentionally redundant between sections.

Several sections from past CBB program handbooks are not included here. We now provide that same information through other means, including direct communication by email and pointing students to other documentation.

The CBB handbook is an evolving document. If, at any time, it becomes inconsistent with regulations determined by the School or University, then those take precedence.

# 1 Program overview

## 1.1 Department and program organization

Quantitative and Computational Biology (QCB) is a department within the David and Dana Dornsife College of Letters, Arts and Sciences (Dornsife). In this document, unless otherwise noted, “Department” refers to QCB, “School” refers to Dornsife, and “University” refers to USC.

The Computational Biology and Bioinformatics (CBB) PhD program is housed within, and administered by, QCB. The CBB program is managed by the Director of Graduate Studies (DGS) for QCB along with the QCB department leadership (Chair and Vice Chair). CBB program regulations and curriculum are determined by QCB faculty.

## 1.2 Personnel

Several QCB and CBB leadership and staff positions are referenced in this handbook. Still more provide essential help to CBB students. These include:

- Director of Graduate Studies (DGS): Prof. Andrew D Smith
- Graduate Academic Advisor (GAA): Christian Robbie
- Department Chair: Prof. Remo Rohs
- Department Vice Chair: Prof. Fengzhu Sun
- Program Manager: Rokas Oginskis
- Administrative Assistant: Tanya Moore
- Systems Administrator / Scientific Computing Specialist: Luigi Manna

The people (faculty and staff) filling the above roles may change as students progress through the CBB doctoral degree.

## 1.3 Facilities and resources

The QCB department is physically located in Ray Irani Hall (RRI) on the UPC Campus of USC. Most QCB faculty have offices and lab space in RRI. All QCB staff work in RRI. Some QCB faculty have offices and lab space outside of RRI, including most faculty jointly appointed in QCB.

All CBB students are provided office space. First year students are provided with office space in RRI. After a student’s first year, when they have an advisor, the student moves to the workspace of their advisor. This may be in a different building. Space arrangements can change at any time, and such decisions are made by QCB faculty.

Additional information on facilities and resources is provided during orientation for first year CBB students.

## 1.4 Program faculty

CBB faculty fall into two categories:

- Faculty with an appointment in the QCB department (referred to as *core* faculty in this handbook).
- Faculty with a joint appointment in the QCB department (referred to as *joint* faculty).

The names of these faculty members can be found on the QCB departmental website. An appointment may change without immediate reflection on the web site. Each student is responsible to verify departmental appointments prior to making any decisions regarding advising or composition of a student committee. Students are encouraged to consult with the GAA or DGS whenever uncertain. Note: USC faculty not associated with the CBB program may mistakenly assume they can act as advisor to CBB students. Confusion on this issue has the potential to delay student progress.

## **2 Advisement**

Doctoral studies might be more demanding than any prior education or employment encountered by students. Students in the CBB doctoral program can expect to be guided, mentored and trained in our field by a faculty member acting as their advisor. This is the primary form of advisement for any CBB student (see Section 2.1 below).

As students progress through their degree, they are responsible for knowing and following the rules. The CBB program staff and faculty leadership want to help students navigate their degree. We therefore offer advising to help students adhere to rules, policies, timelines, etc., with the goal of keeping students focused on their studies and research. Although the responsibility remains on the student, CBB staff and leadership are always eager to help students – and strongly recommend that students seek guidance proactively to avoid problems.

Initial advisement involves guiding students on course registration and rotations. Students will communicate with the GAA on these issues at the start of their first semester in the program. Throughout their first year, students are expected to communicate with the GAA and DGS if unexpected challenges emerge during course work. Near the start of their first semester in the program, students begin a rotation with a QCB faculty member (see Section 2.2 below). Students should feel comfortable communicating with their rotation advisors about progress in courses and any other issues that arise during the transition into life as a doctoral student. Between the GAA, the DGS and rotation advisors, first year students have access to a strong support system.

### **2.1 A student's dissertation chair**

By the end of their first summer in the CBB program, students must have selected a “dissertation chair.” This faculty member will act as the student's advisor throughout their time as a CBB student and will bear primary responsibility for training the student. In the rest of this document, the term “advisor,” unless further qualified, is assumed to be the student's dissertation chair and is equivalent to a student's faculty mentor. Note: the term “Mentor” is also used in Section 12 to avoid altering preexisting text. The CBB program makes no distinction between these roles.

One strength of QCB faculty, as a group, is our diverse intellectual and scientific backgrounds. This diversity influences the expectations that different advisors may have of the students they advise. The nature of interactions between student and advisor will depend on the specific advisor and the specific student, as is true for all long-term interpersonal professional relationships. All QCB faculty understand their important role in training CBB students, but each may approach this responsibility in different ways. When students select an advisor, we suggest they consider both the advisor's area of expertise and their advising style. Students should also keep in mind that the way a first-year PhD student interacts with a prospective advisor

(i.e., during a rotation) likely can differ substantially from the interactions between an upper-year student and the same advisor.

You can find much information on the web concerning what might be an “ideal advisor”, and such information is likely useful. However, the relationship between advisor and student will evolve over a degree that typically requires five years. The key factor is the “fit” between advisor and student.

As previously explained, students are responsible for knowing and adhering to the various regulations, policies, timelines and milestones required for the CBB doctoral degree. However, each QCB faculty member has significant prior experience to share, both with respect to the CBB program and how to become an impactful scientist. After a student has an advisor, approval by the student’s advisor is required for subsequent choices the student makes concerning their degree, and in virtually all cases the advisor’s signature is required (e.g. for elective courses, composition of committees, etc.).

Here is a subset of important points CBB students must know about advisors:

- Students must have chosen an advisor (dissertation chair) prior to the end of a student’s first full year in the CBB program (i.e. before the end of the first summer).
- The choice regarding a student’s advisor is mutual: no faculty member is required to serve as advisor to any particular student.
- A CBB student must have an advisor who is among the QCB faculty, either a core or joint member (see Section 1.4).
- Even if a student and faculty member have agreed that they will be advisor/advisee, the arrangement is not officially recognized by the CBB program until the end of the student’s first full year in the program. Until then, all advisor/advisee arrangements are treated like rotation arrangements.
- All advising arrangements must be communicated to the QCB department as soon as they are formed or if they change. This must be done by email to the GAA.
- A faculty member jointly appointed in QCB may be advisor to at most one CBB student at any given time.
- If a student is unable to find an advisor according to the timeline indicated above, they must inform the program and request assistance.
- To continue in the CBB program beyond the first year, a CBB student must have an advisor.

We recommend that students attempt to find an advisor by the end of the Spring semester of their first year in the program. Typically, the student will complete summer research (see Section 2.2.2) with the faculty member who will be their advisor.

## **2.2 Rotations with faculty**

Students in the CBB program rotate with faculty for two primary reasons:

- Rotations allow the student and prospective advisor to learn if they would be a good mutual fit as advisor/advisee.
- Rotations ensure that each first-year student is in regular communication with a QCB faculty member, so the student can easily and quickly find guidance when needed. (Note: all CBB students may also consult with the GAA or DGS at any time.)

Although rotations are typically only done by first year students, if a CBB student past their first year is without an advisor (dissertation chair) for any reason, that student must start a rotation.

Note that the regulation on joint QCB faculty advising one CBB student does not extend to rotations. Students may rotate with a joint QCB member who is already advisor (dissertation chair) to one CBB student. However, this is not recommended unless there is strong evidence of that the CBB student advised by the joint QCB faculty member is nearing graduation.

### **2.2.1 First two semesters**

All first-year students need to complete at least two faculty rotations during their first two semesters. Students and rotation advisors must both confirm the rotation arrangement to the Department by email to the GAA. Rotation advisors must be eligible as dissertation advisors for CBB students (see Section 1.4). The requirements of a rotation differ depending on the rotation advisor. For example, the student may be expected to participate in research activities, interact with other students or collaborators, or have assigned lab responsibilities during a rotation. In other cases, a rotation advisor may only require the student to attend regular meetings. Rotation advisors will respect the course load of CBB students during their first two semesters. Students are discouraged from changing rotation advisor mid-semester. Even the optimal relationship may take some time to evaluate. Such a change can lead to incomplete assessment, both for the rotation that concludes early, and for the new rotation that begins late. If a student or rotation advisor feels they must conclude a rotation mid-semester, the Department must be informed by communication with the GAA.

Rotations need not be with different rotation advisors to fulfill the requirement of two rotations indicated above. Students should not rotate with any faculty member if they are already certain they would not want that faculty member as dissertation advisor (e.g., if they have no interest in the possible research topics, or if the student is already certain they will have a different advisor).

### **2.2.2 Summer research**

All first year CBB students must do research in the summer at USC. This is a form of rotation but differs from rotations done during the first two semesters. CBB students do not usually take courses during the summer, so full emphasis is on research.

All first-year students must make arrangements for this mandatory summer research before the end of the Spring semester. Students must inform the GAA of the name of the faculty member with whom they will work during that summer. Students must have a summer advisor who is eligible to act as dissertation advisor. The student must perform their summer research at USC. Summer internships are not allowed (see Section 6). Typically, summer research during the first year is done with a faculty member who will be the student's advisor (dissertation chair).

## **3 Course work**

Course work serves multiple purposes for doctoral students. First, it ensures students have a robust foundation for conducting research. Students with a more robust foundation can progress more quickly and confidently. Such a foundation allows students to learn advanced topics more effectively on their own. Without rigorous training through course work, students have no basis even for trusting their own expertise as they attempt to progress in research. Course work also provides breadth to the doctoral education. When a CBB student takes a course, we expect that student will aim to learn as much as possible from the course,

beyond attaining a high grade. The CBB program expects academic excellence from all CBB students. Attempting merely to attain a passing grade is not an acceptable attitude. Experience shows that success in courses is highly correlated with success in research.

Students must complete at least 60 units of courses carrying graduate credit and approved by the QCB department. Students must complete these 60 credits with a “B” average. No more than 8 units of 794 may be applied towards the degree.

The rest of this section outlines requirements on courses for the CBB program. Students entering the CBB program at the same time almost always take required courses at the same time, so students can assume they will follow a “typical” schedule through their first year. Many students select the same elective courses or take their electives in similar semesters. CBB students should aim to complete course work as early as possible so they can most effectively conduct their research. Section 3.4 indicates an example selection of courses that meets program requirements.

### **3.1 Required courses**

Required courses include: CSCI 570, MATH 505a, MATH 541a, QBIO 578a, QBIO 578b, QBIO 577a and QBIO 502. These courses should be taken in the 1st year and the first semester of the 2nd year in the program.

Students are required to enroll in QBIO 593 (2 units) during the fall semester of their second year for TA preparation. Note: this course must be completed prior to, or concurrent with, a first TA assignment. All students must complete this course. QBIO 593 is graded as pass/fail (see Section 8).

Students must complete at least 4 units of Dissertation Research (QBIO 794a and QBIO 794b). See Section 6. Students may not register for QBIO 794a and QBIO 794b during the same semester. Additional information on 794 courses can be found in the USC Catalogue.

Within the first 3 years in the program, students must register for QBIO 542 a total of 4 times, QBIO 547 for one semester and QBIO 555 for one semester.

### **3.2 Elective courses**

An additional 6 units of *elective* courses must be taken. The USC Catalogue section for the CBB program lists courses that are preapproved as electives. Registering in preapproved electives requires approval from a student’s advisor, in the form of an email to the GAA, but does not require approval from the Department.

Alternative electives: Courses not listed among preapproved electives may be approved by the program as alternative electives, on a per-student basis. Approval requires written application, including justification, by the student’s advisor, to the DGS. Approval must be granted by the DGS. Justification must relate to the student’s education or research relative to the CBB doctoral degree. Keep in mind, by the time a CBB student has transitioned to candidacy, they are expected to be capable of acquiring knowledge on their own, having matured intellectually beyond the need to take courses corresponding to each new topic that might be relevant for their research. At the same time, in many situations, learning a topic by taking a course is still the most effective approach. The list of approved electives may be updated at any time, so students should check with the GAA or DGS in order to avoid seeking approval for an alternative elective that has already been approved.



Important: With respect to course registration, failure to obtain appropriate approval prior to registration is a violation of CBB program regulations and may lead to dismissal.

The 6 units of electives must come from courses that each contribute at least 3 units. Students often reach 7 or 8 units since many popular electives contribute 4 units.

### 3.3 Grade requirements

Students must complete, with a “B” average or greater (GPA at least 3.0), a minimum of 60 units of courses carrying graduate credit and approved by the DGS or QCB chair (see Section 8).

Students must complete each required course with a grade of “B” or above (see Section 8). The Department reserves the right to allow a student to replace a required course if that course was completed without attaining a grade of “B”.

### 3.4 Sample course schedule

The tables below indicate an example schedule for courses through the first and second year in the CBB program, along with the units for each course. This example results in a minimum of 41 units, and allows the student to take their qualifying exam after 7 semesters in the program (see Section 5).

First year (23 units)	Fall (10 units)	Spring (11 units)	Summer (2 units)
	QBIO 505a (3)	QBIO 578a (3)	QBIO 790 (2)
	CSCI 570 (4)	MATH 541a (3)	
	QBIO 542 (1)	QBIO 542 (1)	
	QBIO 577a (2)	QBIO 502 (4)	
Second year (18-20 units)	Fall (9-10 units)	Spring (7-8 units)	Summer (2 units)
	QBIO 578b (3)	QBIO 542 (1)	QBIO 790 (2)
	QBIO 542 (1)	QBIO 790 (3)	
	QBIO 593 (2)	2nd Elective (3-4)	
	1st Elective (3-4)		

CBB students tend to follow this sample schedule quite closely. Variation is usually due to availability of electives chosen by the student. Examples: a student may choose electives that are only available in the Spring semester; or a student may choose an elective that happens to be taught during the summer.

If a student entering the CBB program believes they will strongly benefit from taking additional courses alongside or prior to the required courses and their electives, they should consult with the DGS.

### 3.5 Transfer of credit

No transfer of credit will be considered until the screening examination is passed (see Section 4). A maximum of 30 units of graduate work at another institution may be applied toward the course requirements for the CBB doctoral degree. A grade of B- (with A=4.0) or lower will not be accepted and at most two courses with a grade of B will be accepted.

## 4 Screening

The Graduate School at USC requires that all PhD programs include a screening procedure, and that passing screening is a prerequisite to continuation in the doctoral program. The screening procedure for the CBB program involves assessment of course work and written examinations. The screening procedure is common to all students, unlike subsequent milestones in the CBB program.

The screening procedure is applied independently for each student. The performance of other students does not influence the outcome of screening for any given student.

Failing the screening procedure means dismissal from the CBB program. There is no appeal process for dismissal due to not passing the screening procedure. The QCB department reserves the right to allow a CBB student to retake a failed screening exam the following year. This is at the discretion of the Department and the Department exercises this right only in exceptional circumstances.

### 4.1 Criteria and timeline

The screening procedure includes written screening exams, in addition to other criteria that apply to all CBB students (see Section 8): maintaining a GPA of at least 3.0 and passing all required courses with a grade of “B”. Screening exams are held in May each year, and decisions on screening are typically made and communicated to students by the end of May. If a student receives a grade lower than “B” during either the Fall or Spring semester of their first year must inform the GAA and DGS immediately (see Section 8).

### 4.2 Screening exams

Written screening exams help ensure that all students have a baseline level of knowledge on fundamental topics that are important to the research of the vast majority of CBB students, regardless of precise specialization a student may choose. This also ensures graduates of the CBB program can be confident in the breadth and depth of expertise held by their fellow alumni, regardless of advisor or specific research topic.

The written screening examinations are in the following areas: one in mathematical probability and statistics, one in computer algorithms and one in molecular biology. Exams are held each year in May, following the end of the exam period for the Spring semester. Students are given three hours to complete each exam.

Screening exams are considered comprehensive exams on the respective topics. Students should not view a screening exam as associated with a particular course. Students are given guidance early in the Spring semester on what to expect of the screening exams. Students are cautioned that, as with all comprehensive exams, success in screening exams is not likely to follow from a brief period of intense study (i.e., “cramming”). Students should attempt to establish expertise towards screening continually, starting as soon as they enter the CBB program. Students must pass each screening examination to remain in the CBB program.

## 5 Qualifying

The examination that qualifies a student for candidacy tests the student’s fitness to undertake independent research (from the USC Catalogue). In general, CBB students demonstrate this fitness in two ways. Students should demonstrate that they are capable of doing independent research. Here, evidence is usually related to work the student has already completed. Students should also demonstrate that they are likely to complete their degree in a timely manner. This is usually done by formulating a convincing plan with timeline and

milestones. Depending on considerations unique to each student and qualifying committee, the relative emphasis in the qualifying exam can vary.

## **5.1 Timeline for qualifying**

The USC Catalogue indicates that a student must have met all university and CBB program requirements for the PhD degree, except the dissertation and successful qualifying exam, prior to taking the qualifying exam. For CBB students, this includes all required courses and at least two approved electives.

In the CBB program students are expected to complete their qualifying exam by the end of their third year. Failure to complete the qualifying exam on time may result in a departmental assessment that the student is not making satisfactory progress towards their degree.

The earliest time a CBB student may take their qualifying exam is at the start of their 8th semester in the program. Currently, this is determined by the total number of required units of QBIO 542. This timeline may change to allow a student to qualify as early as the start of their third year, during their 7th semester. Any student who believes they will be prepared to qualify during their 7th semester should consult the DGS. If a student is not able to qualify by the end of their third year, they are still required to have formed their qualifying committee by the end of their third year, and communicated the delay to the Department by email to the GAA and DGS.

Students must seek guidance from the GAA at the earliest stages of planning for their qualifying exam.

## **5.2 The qualifying committee**

The qualifying committee is composed of five members, including at least one core QCB faculty member. In addition to the committee chair (the student's advisor), at least two committee members must be QCB faculty (core or joint). The qualifying committee must include at least one outside faculty member who is not a core member of QCB. Note: following these guidelines is necessary for committee approval, but do not guarantee committee approval.

The student selects the qualifying committee in consultation with their advisor, and the advisor must agree to committee members. Students may not include on their qualifying committee any faculty member who has not agreed to serve on the committee. Students must turn in the "Appointment of Committee" form (available from the USC Graduate School), with signatures of all committee members, to the GAA who manages the approval process. This form must be submitted 45-60 days prior to submitting their written qualifying exam (see Section 5.3). After committee approval is received, students must then submit the "Request to take the PhD Qualifying Examination" form (available from the USC Graduate School) to the GAA. This form must be submitted at least 30 days prior to submission of the written qualifying exam. Students without an approved qualifying committee may not take the qualifying exam.

Students are encouraged to form their qualifying committee as early as possible – ideally as soon as they have found an advisor. Since the advisor/advisee arrangement is not officially recognized until the end of the first year in the CBB program, the qualifying committee cannot officially be formed until then. However, students are encouraged to begin thinking about an appropriate qualifying committee as early as possible.

### **5.3 Written qualifying examination**

As part of the qualifying exam, students must submit a written qualifying document to their qualifying committee. Since CBB is an interdisciplinary field, the CBB program includes faculty with varied academic backgrounds. Consequently, the CBB program allows for variation in the style, content and length of qualifying documents. Students should consult their advisor and qualifying committee members to determine expectations on organization and content of the document. However, for all CBB students, the qualifying document must demonstrate proficiency in written communication. As such, the qualifying document is expected to be of high quality in all respects.

The qualifying document must be sent to members of the qualifying committee and the GAA at least 10 days prior to the scheduled date of the exam. Failure to do so may result in cancellation of the exam.

### **5.4 Oral qualifying examination**

The oral portion of the qualifying examination consists of a closed-door presentation by the student to the qualifying committee. The student is required to answer questions posed by the committee, including questions about the written portion of the qualifying exam. As part of the oral qualifying exam, the qualifying committee will discuss their evaluation without the student present. Note: if the written portion of the qualifying exam is determined to be unsatisfactory, the oral portion of the qualifying exam may be canceled.

### **5.5 Outcomes of a qualifying examination**

Possible outcomes for the qualifying exam are explained in the USC Catalogue, and the CBB program follows the guidelines determined by the Graduate School. Upon passing the qualifying exam, a CBB student advances to Candidacy for the PhD degree. Advancement to candidacy for the CBB degree is by action of the Dean of the Graduate School.

The student's dissertation chair will receive the *Report on Qualifying Exam* from the GAA in advance of the scheduled oral qualifying exam. The dissertation chair will be responsible for submitting the completed form following the oral qualifying examination.

## **6 Candidacy**

### **6.1 Course registration for candidates**

Upon successful completion of the written and oral qualifying examinations, the student is advanced to candidacy for the PhD. As candidate, the student must register for QBIO 794 (Doctoral Dissertation) during every semester in residence, excluding summers, until completion of defense and must register for these courses in order (a, b, c, d, and then z until graduation). The USC Catalogue includes regulations concerning registration in 794. Candidates for the CBB doctoral degree typically do not register for any further electives. If a candidate wants to register for another course, they should consult the DGS.

Candidates are allowed to participate in internships, but this requires approval by the student's dissertation committee. CBB students may not participate in internships prior to qualifying.

## 6.2 The dissertation committee

Upon advancing to candidacy, the student must select their dissertation committee. The choice of committee members is made by the student in consultation with their advisor (dissertation chair). The student may only include committee members if they have agreed to serve on the committee.

The CBB program requires students to form their dissertation committee before the end of the first full semester following advancement to candidacy.

The dissertation committee must be composed of at least three faculty members and no more than five. At least two members must be QCB faculty. At least one member must be a core QCB faculty member. All dissertation committees for CBB students must include an outside member. All committees must have a majority of members from the student's home program (QCB faculty). The dissertation committee members are usually members of the student's qualifying committee, but this is not required.

Students must turn in the signed "Appointment of Committee" form (found on the Graduate School website) to the GAA in order for the USC Dornsife College to approve the dissertation committee. This form requires 30 days for processing.

Upon approval of the dissertation committee, the student must open a Thesis Center account through the Graduate School website. Note that dissertation approval and upload processes are fully managed through the Thesis Center. Students must seek guidance from the GAA at this stage.

## 6.3 Annual progress meetings

Students are required to meet with their dissertation committee each year of candidacy. The first meeting after the passing the qualifying examination must include a proposal of the dissertation topic and a tentative dissertation title. Failure to meet with the dissertation committee each year result in the student losing good standing in the CBB program.<sup>1</sup> Suitable progress in research towards the dissertation must be demonstrated at each yearly meeting. Students who fail to make satisfactory and timely progress lose good standing in the CBB program (see Section 8).

A brief report of each annual progress meeting, written by the dissertation chair, must be filed with the QCB department (by email to the GAA).

## 7 Doctoral dissertation

From the USC Catalogue:

*"A dissertation is an original contribution to current knowledge in the field and a demonstration that the PhD candidate has achieved sufficient mastery in the field to pursue independent research and scholarship. A dissertation represents the individual candidate's research and writing. In fields where collaborative research has become the norm, the candidate is the sole author of the dissertation. Candidates must specify their contribution to the research and delineate colleagues' contributions."*

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<sup>1</sup>Good standing in the CBB program is not the same "good standing" defined in Academic Standards in the USC Catalogue. In particular, standing in the CBB program, by itself, does not influence whether a student is eligible to register for classes.

## **7.1 What is a doctoral dissertation?**

Consider these questions one might ask about a dissertation: How many pages does it need to be? What format must it have? How many references do I need to cite? Is there an example that is good enough?

The above questions are counter to the spirit of a doctoral dissertation. They seek the lowest bar and the minimal that might be adequate. Experience has shown that if a PhD student aims low, they will struggle. It is also unlikely that the “mastery” indicated above in the quote from the USC Catalogue will be demonstrated unless a student’s dissertation is their best possible work.

Students in the CBB program will read doctoral dissertations before they write their own. This should happen through the natural course of research and CBB students will almost certainly read drafts of dissertations written by other students. Be very careful not to use any “example” as an indication of what might be sufficient. The best examples are likely those most easily found on the web – which might be so visible because of their impact. The best use of any examples is as inspiration for what you might accomplish. Keep in mind that uniqueness is often among defining criteria for a dissertation.

If you find yourself asking the question that titles this section, search the web for answers. Among the answers you find, first discard information that seems most convenient, then try to form a clear picture from the rest. Discuss this picture with your advisor and other members of your dissertation committee to ensure a mutual understanding. Do this as early as possible.

The opposite extreme can also lead to problems: sometimes the most ambitious doctoral students attempt to accomplish too much during their dissertation research. If ambition seems to be a problem, often the real problem is scope. Your advisor will help ensure that your dissertation research is not too broad in scope and that it can be accomplished in a reasonable time frame.

## **7.2 Defense of the dissertation**

Students are required to defend their dissertation in a public seminar that is advertised to the QCB department. The defense is evaluated by the student’s dissertation committee. Students will be examined by the dissertation committee following their public seminar in a private session. The dissertation committee will deliberate without the student present. This may happen between the public presentation and the private examination, and also following the private examination. For a successful dissertation defense, the dissertation committee must unanimously accept the written dissertation, the oral presentation and the examination.

Prior to scheduling a dissertation defense date, and upon approval from their dissertation chair, students must meet with the GAA to ensure all program requirements have been met.

The student must register for QBIO 794 in the semester that the defense is planned (unless the defense is scheduled during the summer session) and submit the title and date of the defense to the Graduate School and the GAA at least 30 days prior to the defense. In the CBB program, a copy of the final draft of the dissertation must be provided to committee members and the GAA at least 30 days before the defense to allow for thorough evaluation. Failure to do so may result in cancellation of the defense. The dissertation committee may request revisions prior to final acceptance. These rules and timelines may change, and if the change is determined by the School or University, this handbook might not immediately reflect the change. Therefore, CBB students must consult with the GAA as they begin to determine their timeline for dissertation submission and defense.

The student must have all dissertation committee members sign the “Approval to Submit” form. On the

morning of the scheduled dissertation defense, the student will log into the Thesis Center and generate the form to be emailed to all committee members. Submission instructions can be found on the Graduate School website.

The Department will prepare 3 bound copies of the dissertation at no charge to the student. One copy is for the student, one for the dissertation chair, and one for the Department. Additionally, the student is responsible for paying the \$115 dissertation processing fee.

## 8 Academic performance evaluation

This section provides a summary of academic performance evaluation for CBB students. Most information in this section, but not all, is also explained elsewhere in this handbook.

The University and the CBB program expect that all CBB students will demonstrate both academic proficiency and research accomplishment. To ensure satisfactory progress, the QCB department continually reviews the performance of all CBB students.

The following criteria on academic performance may for the basis of a performance evaluation for a CBB student at any time:

- **GPA:** Students who fall below the required GPA (3.0) have failed to demonstrate minimal qualification for the program. At the end of the first year, students who do not have a minimum of a 3.0 GPA are dismissed as part of the screening procedure. For students who have passed screening, if their GPA falls below 3.0 they will lose good standing in the CBB program.
- **Required courses:** A CBB student may not receive a grade below “B” in a required course. In the first year, failure to meet a grade of “B” in required courses constitutes failing the screening procedure (see Section 3.3). In subsequent years, such a failure results in the student losing good standing in the CBB program.
- **Teaching qualification:** International (foreign) students are sometimes required to pass language exams to qualify them for teaching. As stated in the offer letter, this is required for entry into the program. Students who do not pass the English exam may be allowed to remain in the program for one semester only if they can be funded as RA, but they will lose good standing in the CBB program. Students who fail the exam a second time will be dismissed from the program.

An example timeline is given below, along with corresponding academic performance evaluations relevant for each year. These are relevant for CBB students meeting expected milestones. If a student has a delay in their degree progress, the appropriate evaluation will correspond to their stage, and the evaluation will also consider the delay itself.

- **First year:** Evaluation is through the screening procedure (see Section 4). Students who do not pass screening are dismissed from the program.
- **Second year:** Evaluation is based on individual grades, GPA and the advisor’s assessment of satisfactory progress by the student.
- **Third year:** Evaluation is based on the qualifying exam (see Section 5), with outcomes that corresponds to those of the qualifying exam (as indicated in the USC Catalogue).
- **Fourth year:** Evaluation for candidates is based on progress assessment by the dissertation committee following the annual committee meeting (see Section 6.3).

- Fifth year: If the student has finished their dissertation, academic performance evaluation is by examination of the doctoral dissertation (see Section 7).

All students are required to be evaluated at least once every 3 semesters. This holds even for students who have progressed faster than the above timeline. For example, if a student passes their qualifying exam in the Fall of their 3rd year, they must hold their annual dissertation committee meeting before the end of the Fall semester of their 4th year; they may not wait until the end of their 4th year.

If an evaluation indicates the student is not making satisfactory progress, the student loses good standing in the CBB program. Note: academic performance of a CBB student may be evaluated at times other than those listed above.

Any student who loses good standing in the CBB program will receive a written warning letter as explained in the Graduate School section of the USC Catalogue under the heading “Academic Warning and Dismissal”. The purpose of a warning letter is to clarify reasons for poor performance and outline steps for the student to regain good standing in the CBB program.

## 9 Student financial support

*The information in this section is very similar to, and consistent with, more detailed information provided to first-year CBB students during orientation.*

It is the intention of QCB to provide or arrange for the provision of financial support for all CBB students. Students must feel assured that the faculty will do everything possible to meet this goal. Please note that Graduate School rules prohibit full time students from accepting any employment above and beyond their graduate assistantships (see Graduate Assistantship Handbook). There are 3 main sources of support for CBB students: Teaching Assistantships, Research Assistantships, and Individual Fellowships and Grants.

If a CBB student does not remain in good standing in the CBB program (see Section 8) they risk losing eligibility for financial support.

**Teaching Assistantships (TA)** TA positions, which are generally awarded each semester, carry a stipend and 12 units of tuition remission. You must maintain at least a 3.0 GPA to receive this support. Four and a half months of payments are guaranteed for each semester of TA-ship.

The authority to offer TA positions rests exclusively with the Department Chair.

The workload associated with TA positions varies depending on the course in question and the familiarity of the TA with the subject matter. TAs are employees of the university; TA-ships are a 20 hour per week job. Whatever course you are assigned, you must take your responsibilities very seriously. You are under a moral and legal obligation to do your best for your students. Undergraduates are entitled to your best efforts. Learn the subject matter diligently and find creative ways to explain it. Practice your verbal communication skills. Make yourself available and approachable. Conform to high ethical standards and respect the confidentiality of your position. All of these skills will be directly useful to you in your future careers. Faculty view TA-ships as an important part of graduate student training. Be aware that as with any other job, your TA position can be terminated for poor performance. In addition, any TA who behaves dishonestly will be subject to University disciplinary proceedings, which may result in permanent dismissal from the University.

The Department reserves the priority for graduate students to serve as TAs if needed.



**Research Assistantships (RA)** Research Assistants are paid on the same scale and receive identical benefits as TAs. Formally, the university considers an RA-ship a 20 hour per week job. Students however put in more time depending on the relationship between RA duties and the dissertation project. The relation between the RA project and the dissertation project varies depending on the faculty member involved, the area of research, and other considerations. In most cases, the RA work coincides with research projects and you will in effect be paid for doing your research. In other cases, efforts are made to keep the work separate.

Before you start an RA-ship, be sure you understand what is expected of you, what you can expect from the professor, and what relations might (or might not) exist between your RA work and your dissertation research.

*TA vs. RA:* Your teaching assistant experience can be very rewarding. You will learn a great deal and have the satisfaction of seeing that knowledge take root in others. You may establish lasting friendships or mentor relationships with some of your students, co-TAs, and faculty. On the other hand, you are here primarily to do research, not teach. If you are not very efficient in organizing your time, progress on your dissertation research may be slowed by extended service as a TA. Most agree that RA-ships are preferable, but flexibility is key. As grant budgets wax and wane, it may be necessary for graduate students to take TA-ships unexpectedly.

*Summer Support:* Your decision to be a PhD student is a year-round commitment. You must view the summer as an opportunity to engage intensively in research, free from the distractions of coursework and other academic duties. We expect CBB students to be engaged in progress towards their doctoral degree 12 months a year. Students will receive the remaining amount of money in the summer, either through a fellowship or as an RA, to reach their guaranteed annual stipend specified in their original offer letter. There are only a small number of summer TA-ships available.

**Individual fellowships and grants** Various outside grants and fellowship programs are available to students. Detailed information can be obtained from various sources, including a web page maintained by the Graduate School and databases that list hundreds of grants or fellowships (including those from NIH and NSF). Please consult the GAA for additional details. Receiving an individual fellowship or grant carries much prestige. When such an award appears on a student's CV, it shows that the student can be independently successful and may accelerate that student through early career stages or lead to more desirable positions immediately upon graduation.

## 10 Expectations on students

As a doctoral student in the CBB program, you are in training as a future scientist who will lead others in research, industry, or along some other career path. Your formal training involves completing the degree requirements stated in this handbook and the USC Catalogue. However, your scholarly, academic and scientific activities extend further. You are expected to interact frequently with faculty, students and other scientists. You will discuss science, attend seminars, give presentations, help fellow scientists and receiving help from others. CBB students are expected to contribute to the intellectual environment of the CBB program and the QCB department.

CBB students are expected to follow the rules outlined in this document, along with those of the School (Dornsife), the Graduate School and the University. The CBB program expects academic and research

excellence from all CBB students. CBB students are required to follow a strong code of ethics (Section 12) and strive to uphold the principles of DEI (Section 13).

*Departmental Seminars:* As indicated above, an important part of graduate student training is the opportunity to attend and participate in research seminars. Currently, QCB seminars are held on Thursdays at 2pm in RRI 101. Faculty and students select seminar speakers. CBB students are required to attend the QCB seminars, and attendance is a requirement for passing QBIO 542 or QBIO 547. Other departments and schools across USC offer seminars of interest include, including Biological Sciences, Chemistry, Computer Science, Mathematics, Physics, etc.

## **11 Limitations of degrees**

Students enrolled in the CBB program are not allowed to pursue another degree unless they have:

- written approval from their dissertation advisor,
- written approval from the DGS or Department Chair, and
- passed their qualifying exam and advanced to candidacy.

If a student applies to and is admitted to another program without first meeting the above criteria, they may be dismissed from the CBB program. The student and the advisor must send a signed letter to the DGS outlining why the request to enter an additional degree program should be considered. The request needs to be made at least one semester before enrolling in the additional degree program. We expect all students to be primarily focused on completing their PhD while they are enrolled in the CBB program.

## 12 Ethics and academic integrity

“A false statement of fact, made deliberately, is the most serious crime a scientist can commit.”  
- C.P. Snow, *The Search*

It must be obvious that we aspire to excellence in all aspects of our science. Therefore, we expect the highest level of ethical behavior and academic integrity from our students, as well as from our staff and faculty.

Plagiarism, academic dishonesty, research dishonesty, teaching dishonesty, and any scientific misconduct including fraud, falsification, or plagiarism of data are all grounds for dismissal from the program. Note that plagiarism or academic dishonesty carries a “zero tolerance” policy, and applies to any oral presentations such as lab meetings or conference talks, as well as any written materials, including “rough drafts.” Failure to maintain adequate records, or removal or destruction of scientific data or reagents also constitute misconduct and may result in dismissal. Materials and research data are not the property of the student, but are legally the property of the University. The Advisor (Faculty Mentor) is the University’s representative. Research records and reagents must be available to the Advisor (Faculty Mentor). It is the advisor’s responsibility to ensure accuracy of all reported research. This means the advisor must have access to the primary data and materials at all times. No materials, notebooks, or reagents are to be removed from the laboratory without the written permission of the Advisor/Faculty Mentor. Similar requirements affect publication. Students may not submit data for publication or presentation without the permission of the Advisor/Faculty Mentor, and authorship is at the Advisor/Faculty Mentor’s discretion. These rules apply regardless of the student’s source of funds, whether Fellowship, TA, RA, or other sources. The CBB program and the QCB faculty do not support any form of cheating as it pertains to exams that measure the students foundational and technical knowledge.

Upon departure from USC, students are required to leave all data and reagents with the Advisor/Faculty Mentor. Because much of the research carried out in QCB is federally funded, the Advisor/Faculty Mentor must retain records and be able to verify all results even after students have departed. Any concerns or questions regarding ethics must be brought to the attention of the student’s faculty advisor or the Director of Graduate Studies.

The University has explicit policies on these issues:

- [On Graduate Student Integrity](#)
- [Scientific Misconduct](#)
- [Misappropriation of Assets](#)
- [Intellectual Property](#)
- [Guide to Research](#)
- [USC Policies and Policy Governance](#)

## 13 Diversity, Equity and Inclusion

“The function of education is to teach one to think intensively and to think critically. Intelligence plus character – that is the goal of true education.”

– Martin Luther King Jr.

The Department of Quantitative and Computational Biology celebrates diversity, equity and inclusion (D.E.I.).

We strive to prepare QCB’s students to thrive in a diverse world while ensuring that our students and staff feel safe, supported, and respected. We support members of groups that are currently and have historically been underrepresented in science, and we are actively working to promote a more diverse, equitable, and inclusive community of computational biologists.

### **DIVERSITY**

People are diverse in many ways, including but not limited to race, ethnicity, gender, gender identity and expression, sexual orientation, socio-economic class, ability, religion, family structure, age, and core values. We value diversity in our community.

### **EQUITY**

Equity requires providing every student and staff member with the resources and opportunities needed to reach their fullest potential. Our understanding of equity recognizes that 1) inequities have acted as barriers to success for marginalized groups and 2) there is a need for continual reflection and responsiveness to prevent and remedy potential inequities going forward.

### **INCLUSION**

Inclusion means that every member of the QCB community should be supported in order to feel valued and respected, and be invited to contribute to the culture of QCB. QCB emphasizes the intentional maintenance of a welcoming climate of care. QCB works to foster a sense of belonging for all.

### **RESOURCES**

A list of available D.E.I. resources can be found at the QCB departmental website: [qcb-dornsife.usc.edu/dei](http://qcb-dornsife.usc.edu/dei)