

Student Guidelines Section of Molecular Biology Program By-laws

First Year Requirements:

Colorado Residency: First year students who are U.S. citizens must take proper steps at time of arrival on the UCD campus to begin the process of establishing Colorado residency, so that this is complete by July 1 of the second year. **If residency has not been established by this deadline, the student is responsible for the non-resident portion of tuition that exceeds the resident assessment.**

Course Work During the first year, students are required to take the “Biomedical Sciences Core Course”, IDPT7801-02-03 (Fall, 10 hours total). This is a required course for all first year Ph.D. graduate students at UCD, and covers the fundamentals of biochemistry, cell biology, molecular biology, and physiology. One additional required course in Advanced Topics in Molecular Biology is taken in the Spring (MOLB7800-4hr) semester. These courses are intended to teach students how to critically evaluate scientific literature. Papers are chosen by the instructors and formal presentations are made by students. The topics vary somewhat each year, but typically cover nucleic acids, chromatin structure, DNA replication, RNA transcription and processing, cell cycle control and genetics. One additional elective course is taken in the Spring semester. An extensive list of electives is available in other departments of the University of Colorado Denver Graduate School. Electives should be chosen to meet the research interests of the student and should be made in consultation with the program student advisor. The elective courses most appropriate for molecular biology students are Developmental Biology (CDBI 7605), Immunology (IMMU7663), Molecular Virology (MICB7627), and Receptors and Cell Signaling (PHCL7606), Protein Chemistry I-II (BMST7350-7450) and Structural Analysis of Macromolecules I-II (BMST7354-7454). 1st year students take three laboratory rotations over the first year for 1 hr. credit each (MOLB 7650 Research). Registration for courses in the first year must be approved by the program student advisor.

Molecular Biology students must take Ethics in Research (PHCL 7605) in the fall semester of either their first or second year, with the stipulation that the course must be completed prior to taking the Comprehensive exam.

Students are required to maintain a 3.0 grade point average throughout the program. Additionally, the Molecular Biology Program requires students to make a grade of B (3.0) or better in all required courses, regardless of the overall grade point average. If a student receives a B- in any required course, he/she may be allowed, at the discretion of the program faculty, to either retake the course or perform remedial work acceptable to Molecular Biology faculty. Should the student be allowed to retake a required course in which they have received a grade of less than a B (3.0), it must be done by the end of the next academic year. Students are placed on probation by the Graduate School if their grade point average falls below 3.0 and are dismissed from the program if the grade point average is not raised to 3.0 within one semester.

No summer coursework is required.

Research Rotations: Students are required to take research rotations in the laboratory of three different faculty members of the program. Each rotation lasts for twelve weeks and they are generally taken over the Fall and Spring semesters. Selection of laboratories for research rotations should be a decision made mutually by the student and the participating faculty. However, students are encouraged to consult with the program student advisor before making a selection. Factors such as space, number of students in a laboratory and how much time and effort a faculty member can spend should be taken into account. Projects are selected to challenge the student, but are adjusted in scope so that a logical conclusion can be reached within a one-rotation period. These rotations are used to introduce students to the techniques of molecular research, facilitate the development of the logic required for conducting research and give the student an opportunity to view, first-hand, laboratories in which she or he may choose to perform their thesis research. Students are required to give an oral presentation at the weekly program seminar upon completion of each laboratory rotation. These are brief 10-15 minute slide talks that cover the work done during the rotation. Students should consult with the director of the rotation laboratory in putting together their talks.

Students take research rotations for 1 hour of credit (MOLB 7650, Research). They are evaluated on the basis of their performance by their rotation lab mentor, and this will be used as one criteria for advancement to the second year of the program. Evaluations will be two-fold. The director of the rotation laboratory will not only grade the student for 1 credit hour of research, but will provide a written critique of the student's understanding of the material, ability to design experiments, bench and organizational skills, and quality of laboratory notebook. Evaluations are co-signed by the faculty and student, and placed in the student's file.

Seminar Program: The program holds a weekly seminar in which faculty, postdoctoral fellows, students and invited outside speakers present talks on their research. The seminar series is a major focus for the program in that it draws everyone together weekly, keeps individuals abreast of research in progress as well as scientific techniques and expertise present within the program. This seminar series is beneficial to all participants in the program, both faculty and students. It helps students practice the presentation skills that will be important in their careers, provides examples from faculty presentations, and helps enormously in finding the appropriate colleague to consult when problems arise in individual research efforts. Outside faculty speakers are scheduled to maximize interactions between both students and faculty. Students do not register for this course the first year but are required to attend.

Retreat: The program holds an annual three-day scientific retreat at an off-campus site. Faculty, students and other members of faculty laboratories are asked to give either poster or oral presentations of their research in progress. The program of the retreat is arranged to ensure a vigorous exchange of information and to promote collegiality among participants. All students are required to attend and present at the annual retreat.

Preliminary Examination: At the completion of the first year, students take a written preliminary examination which is given in early June. The subject matter covers the first year

course work, but questions are constructed to test conceptual and problem solving skills. The examination consists of questions that require written answers and it is put together each year by the Student Advisor in cooperation with other departments and programs. The steering committee, in consultation with the Student Advisor, establishes the guidelines for pass/fail, reviews the exam results, and makes its recommendation to the program faculty. Students who fail the exam may be dismissed from the program or given the chance to retake the exam, depending on their performance in laboratory rotations and course work. Students who are allowed to retake the preliminary exam will do so in the next academic year when the exam is typically administered and the entire examination must be retaken.

Evaluation and Selection of Thesis Advisor: The program faculty will evaluate the overall performance of the student based on three areas: course work, laboratory rotations and the written preliminary examination. This will take place at the general faculty meeting in late June. Upon successful completion of this evaluation, students then select a thesis advisor and a project. Selection of the thesis advisor should be the mutual decision of the student and the program faculty member. At the completion of the third laboratory rotation (by June 1), students are asked to submit in writing (to the program student advisor), the name of the potential thesis advisor and a brief description of the proposed research project so that this request can be presented at the general faculty meeting in late June. The program faculty will review written requests and make final approvals. Every effort will be made to accommodate a student's first choice. However, factors such as the number of other students in a laboratory, space, and financial resources of the potential thesis advisor must be considered. Therefore, a student may be asked to make an alternate selection.

Graduate Student Advisor: Students in their first year should consult on a regular basis with the program student advisor. This provides a mechanism for continuous rapport to be established between one faculty member and students throughout the critical first year. This permits continuous monitoring of potential problems and a useful way for students to have input into the program. The program student advisor consults regularly with program faculty regarding student questions and concerns. The Program advisor approves registration for all first-year students.

Second Year Requirements:

Course Work: In consultation with the program student advisor and the thesis advisor, students may choose additional elective courses to round out their expertise in selected areas and to provide general knowledge in others. Students must register for Ethics in Research (PHCL7605, 1 hour) in the fall semester. Continued participation in the Research Seminar Program is required and students must now register for this as a course for credit (MOLB7661, 1 hour). The seminar course will be graded based on participation, and the spring semester grade will in part be based on the student's research seminar presentation (see below). Additionally, students must register for MOLB 7650 (Research in Molecular Biology) each semester during their second year. Graduate school requirements stipulate that students must accumulate or be registered for 30 semester credit hours prior to taking the comprehensive exam, scheduled no later than the end of fall semester of the third year. Thus, students are urged to transfer credits for any graduate

level courses taken from their previous universities. Registration forms for courses in the second year must be signed by the program student advisor.

No summer course work is required.

Research Seminar: In the Spring, second year students present a seminar on their research in progress. This is given as part of the program's weekly research seminar series. This serves to focus the student's research project and to provide training in oral presentation skills. Students should meet with their thesis advisory committee (see below) immediately following the Spring seminar presentation.

Retreat: Students are required to attend and participate in the Annual Molecular Biology Program Retreat each year of the program.

Mini-course: A novel component of the Molecular Biology Program is a series of "mini-courses" of variable length covering timely topics and using original literature instead of textbooks. The topics are selected jointly by faculty and students (2nd years) of the curriculum committee and the course is taught by prominent visiting scientists. Although the "mini-course" is not taken for a grade, all students are expected to participate, beginning in their second year and throughout the remainder of the program.

Journal Clubs: Beginning in the second year and throughout the remainder of the training program, all students are expected to participate and help organize a journal club. All faculty are invited to participate, but two faculty are assigned as moderators each semester. The journal club meets every other week.

Selection of Thesis Advisory Committee: Students are expected to form a thesis advisory committee by March 1 of their second year. This should be done in consultation with the program student advisor and the thesis advisor. The committee will have its first meeting with the student on the afternoon following the Spring seminar presentation. The first charge of the thesis advisory committee will be to guide and evaluate the student's research progress to this point, to set the guidelines for the upcoming comprehensive examination and to set a tentative date for the comprehensive examination. This committee (five members) is composed of one faculty from outside of the Molecular Biology program with the balance of the committee coming from program faculty; the Chair must be a Molecular Biology faculty member. After the Comprehensive Exam is completed and the student advances to Ph.D. candidacy, the student's mentor will become a member of his/her committee. All committee members must have faculty appointments in the Graduate School. It is the duty of the committee to advise the student and to monitor the student's progress, and report to the student advisor. Students must meet with their committee at least annually; more frequently is advisable. This committee is also charged with administering the comprehensive examination and guiding the student throughout their thesis project. It is the responsibility of the student to form the committee, submit the names of all members to the Molecular Biology office, arrange annual committee meetings (to take place after the seminar), inform the members and the Molecular Biology office in writing of the date and

place of the meetings (at least two weeks in advance), and prepare a written progress report of their research.

It is the responsibility of the committee chair to write a brief summary of each committee meeting and submit this to the program administrator, who places this in the student's file, distributing a copy to the Student Advisor. This summary should include: 1) the student's progress since the last committee meeting; 2) planned studies for the immediate future; 3) indication of how student's progress relates to the specific aims of the thesis proposal presented in the comprehensive exam; 4) manuscripts published, in press, or in preparation; and 5) number of years in the program as well as anticipated date of completion. Written summaries are signed by the student and the committee chair, and turned in to the Molecular Biology office within one week following the committee meeting.

Third Year Requirements:

Course Work: In the fall semester of the third year, students register for MOLB7650 (Research in Molecular Biology, 5 hours) if they still need research hours to complete the required 30 hours prior to the comprehensive exams. If the student has taken additional electives or has transferred credits from other schools, the 30 hours may already be fulfilled. In such cases, students will register for MOLB 8990 (Doctoral Thesis in Molecular Biology, 5 hours) throughout the remainder of time in the program.

No summer course work is required.

Comprehensive Examination: Students are expected to have demonstrated competence in research during their second year research and to have generated preliminary data to prepare for the comprehensive examination. This exam requires the written submission of two research proposals; a "major" proposal that describes the actual thesis project planned by the student and a "minor" proposal on an unrelated subject. Both proposals should be written in an NIH grant format to contain the following sections; specific aims, background and significance, preliminary data, experimental design and approach, and a supporting bibliography. Students should consult with their committee chair and NIH guidelines for how to format the written portion of the exam. The "major" proposal should be written to be as close as possible to the realistic goals of the thesis project and should not be an overly ambitious proposal for an entire laboratory group. However, the "minor" proposal can be written as a project for a small established laboratory as an exercise in grant writing. The student defends these proposals orally at the examination. The oral portion of the exam will also test general knowledge through questioning related to the proposals.

To schedule the exam, students must have completed or be registered to have 30 credit hours. A packet of appropriate forms and instructions must be picked up from the Graduate School office, and returned with all signatures at least two (2) weeks prior to the date of exam. Students should submit their completed written portion to committee members at least 10 days in advance of the exam date. Students must obtain written approval of the topics of their proposals from the chair

of their advisory committee and submit this to the Molecular Biology Office before beginning preparation of the written portion of the exam. The format of the oral portion of the exam will be set by the committee chair. Students are required to take the exam no later than the end of the fall semester, though earlier in the fall is preferable. Upon successful completion of this exam, the student is advanced to the Ph.D. candidacy.

Research Seminar: In the fall semester of the third year, students present a seminar on their research progress at the weekly program seminar series. Students do not register for Research Seminar MOLB 7661 for credit in the third year or in subsequent years, but attendance at the weekly research seminars is mandatory. Students must meet with their thesis advisory committee immediately following their fall seminar presentation.

Retreat: Students are required to attend and participate at the Annual Molecular Biology Program Retreat.

Mini-course/Journal Clubs: As in the second year, students are expected to participate in the mini-course and journal clubs.

Fourth Year and Beyond:

Course Work: It is the goal of the program for students to complete their thesis research and to successfully defend their thesis by the end of their fifth year. The fourth years and beyond are devoted almost entirely to research. Students during this period continue to participate in the mini-course series, the weekly seminar series and the annual retreat. Students also participate in individual research group meetings during this period. Students are strongly encouraged to make presentations at national meetings during their final two years. The program makes efforts to aid the students in developing independence and leadership skills during this period and to devote considerable thought to their career and postdoctoral research plans. Students are required to continue to meet at least annually with the thesis advisory committee during their final year(s). Again, it is often advisable to meet more frequently than this as the student nears completion of the thesis work. Students continue to register for MOLB8990 (Doctoral Thesis in Molecular Biology, 5 hours) during their fourth year and beyond, keeping in mind the necessity to complete 30 hours of thesis credit prior to thesis defense and graduation.

No summer course work is required.

Research Seminar: In the Fall of the fourth year, students present a seminar on their research progress. This is presented as part of the program's weekly research seminar series. This serves to focus the student's research project and to provide training in oral presentation skills. Students must meet with their committee immediately following seminar presentation.

Retreat: Students continue to be required to attend and participate at the Annual Molecular Biology Program Retreat.

Mini-course/Journal Clubs: Students are expected to continue participation in the mini-course and appropriate journal clubs throughout the remainder of their time in the program.

General Expectations: It is our intention to train students so that they can function as independent, imaginative, productive scientists in a research capacity in academia or other challenging environments. It should be understood by all students that their productivity during their tenure as graduate students will strongly influence the opportunities that are available when they seek employment. This requires considerable investment of time in developing experimental, critical thinking and organizational skills. Although the output expected can be influenced by a variety of factors including the importance and thoroughness of publications, most successful students graduate with the equivalence of three or more principal-author papers. Students should be prepared to invest a substantial amount of time above and beyond the normal work week during their training to place themselves in a competitive position upon graduation.