Cell Biology, Stem Cells and Development Program

UNIVERSITY OF COLORADO
DENVER | ANSCHUTZ MEDICAL CAMPUS

STUDENT HANDBOOK

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I. Mission

The primary goal of the **Graduate Program in Cell Biology, Stem Cells and Development** (CSD) is to train talented scientists in cell and developmental biology. The Program strives to attract outstanding students with the highest potential, and to provide them with quality training that stimulates independent and creative scientific thinking; ultimately helping students to develop their full potential in becoming independent investigators and leaders in biological science.

The CSD Program is committed to promoting an inclusive and equitable training environment that embraces diversity, eliminates structural biases from recruitment and training, and supports the identities and values of our students.

Program/Student Learning Outcomes: The CSD Program trains graduate students to become

proficient and successful investigators who are able to:

1. Demonstrate a basic knowledge of central concepts in the biomedical sciences.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Read and critically evaluate the scientific literature.
4. Formulate hypotheses based on current concepts in the field and design, conduct, and interpret their own research projects.
5. Present research results in peer-reviewed publications and in a dissertation.
6. Communicate research results effectively through oral presentations at scientific seminars, conferences, and other venues.
7. Write a competitive application for research funding.
8. Develop ancillary skills, where necessary, to obtain positions outside of scientific research.

The Program's emphasis is on the definition and resolution of biological problems rather than the application of technologies. Thematically, the program is focused on cell, stem cells and developmental biology and offers a wide range of research opportunities. The nature of this program will best serve those students who are interested in developing independent research careers and who wish to pursue problems in biomedical science from an interdisciplinary perspective.

After the initial period of coursework, students choose their specialty fields from a diverse list of topics, and proceed with research until the generation and defense of a thesis leads to the award of a Ph.D. in Cell Biology, Stem Cells and Development.

II. Graduate School Administration

The Graduate School is the degree-granting institution for the PhD programs; as such, students should be familiar with Graduate School Policies.

The University of Colorado Denver Graduate School makes their "Graduate School Policies & Procedures Guide" available on their website. This guide includes general information and policies concerning graduate students, as well as specific information on Honor Code and Grievance Procedures. This information applies to students in all programs: (https://graduateschool.cuanschutz.edu/forms-resources).

The purpose of this Student Handbook is to relay additional information specific to the CSD program.

Student Support.

At present, students accepted in the Ph.D. program are provided full tuition, health insurance, and a stipend of $34,000 per year for living expenses (for the academic year 2022-23). Continued support is contingent upon satisfactory academic and research performance by the student. When a student enters a thesis lab, the thesis mentor assumes complete responsibility for the student's stipend, tuition, fees, and associated research costs. In order to qualify for in-state tuition for the following year, **all out-of-state students must establish Colorado residency by the end of summer of the first year.** See the Registrar's website for complete details: https://www.cuanschutz.edu/registrar

Student Advising.
During the first year, CSD students will meet with members of the Graduate Advisory Committee (GAC) on a rotating basis to discuss the student's progress in the CSD Program and any questions that may come up. Students will be expected and encouraged to seek advice from the GAC, Director, and/or other CSD faculty and student members prior to lab rotations, Comprehensive Examination, and any other situation requiring faculty consultation.

Transfer Credits.
Please see the Graduate School's "Policies & Procedures Guide" for information about transferring credits towards your degree with the Cell Biology, Stem Cells & Development PhD program. That guide is available on the Graduate School website under the "Resources" tab: https://graduateschool.cuanschutz.edu/forms-resources

III. Program Components

1ST YEAR STUDENTS

COURSEWORK, LABORATORY ROTATIONS, AND PRELIMINARY EXAMINATION

A. COURSES

Fall Semester - Required Registration

Foundations in Biomedical Sciences – Section 001
BMSC 7806 6 units
Course Director: Drs. T. Evans, C. Musselman, K. Fantauzzo, R. Prekeris, C. Pearson, J. Moore
This section of the course covers basic biochemistry, molecular biology, genetics, and cell biology.

Core topics in Biomedical Sciences
BMSC 7810 Sections 001-010
First year students will register for two sections, one section in Core Topics A (Section 001-005) and one section in Core Topics B (Sections 006-010). Each section is a 3 week intensive special topics course, the Core Topic A sections start immediately after BMSC 7806 followed by Core Topic B sections. Course offerings vary by year but includes topics courses in immunology/microbiology, stem cell and regenerative medicine, developmental biology, cancer biology, and exploratory data analysis in R/R Studio. An updated list of the course offerings will be provided to students prior to registration in the fall. CSD are **strongly encouraged but not required** to take the section offered by the CSD program, "Stem Cell Biology to Regenerative Medicine" and "Intro to Animal Models & Experiments in Developmental Biology"; see descriptions below. First-year students who would like to take Core Topics offerings other than the options that are strongly encouraged should consult with the Program Director prior to enrollment.

Stem Cell Biology to Regenerative Medicine
BMSC 7810 Sec. 005 2 units
Course Director: Dr. H. Russ
Students will be introduced to the concept of stem cells with an emphasis on embryonic, pluripotent, and tissue stem cells. Besides their role in normal development of different organ systems, we will specifically address the use of stem cells in tissue engineering and disease modeling. We will then discuss new approaches using stem cells in regenerative medicine. Lastly, we will discuss ethical issues regarding the use of these cells (e.g. the creation of human/animal chimeras for research purposes).

Introduction to Animal Models and Experiments in Developmental Biology
BMSC 7810 Sec. 009 2 units
Course Director: Drs. L. Barlow & K. Artinger
Introduction to animal models in developmental biology: This course offers a hands-on approach to the study of developmental biology including an opportunity to perform experiments on model

systems used in the study of development. In addition, general principles and definitions used in developmental processes will be discussed as well as a focus on specific processes such as gastrulation and neurulation. This knowledge can be directly applied to the study of stem cells and cell biology.

Research in CSDV (Lab Rotations**)**
CSDV 7650 (001 & 002) 1 unit each
(Register for both sections 001 and 002)
Coordinated by the GAC Chair, Dr. Joe Brzezinski
Students will perform research in the laboratory of one of the members of the program. The rotation will be followed by an oral presentation.

Cell Biology, Stem Cells & Development Seminar
No registration required 0 units
Course Director: Seminar Committee
Seminar series designed to present recent important findings in cell and developmental biology research. Different topics are presented weekly by CSD Training Program faculty, students and visiting faculty. **Attendance is required**. Individual seminar details will be sent by the Program Administrator; additionally, upcoming seminar details are available on the program's website.

Spring Semester - Required Registration

Stem Cells and Development: An Integrated Approach
CSDV 7605 4 units*
Course Directors: Drs. Joe Brzezinski, Eszter Vladar, Stephen Santoro
This course aims to familiarize students with fundamental principles in cell, developmental, and stem cell biology. Students will critically evaluate important scientific concepts and develop compelling new hypotheses through in class discussions, 'thought question' exercises and presentations. Finally, students will gain important grant writing and critiquing skills through instruction, practice, and peer evaluation. Completion of the course should facilitate successful pursuit of basic and translational research.
*There is a version of this course that is offered at 3 credits, for students in other programs who do not participate in the writing portion of this class. CSD students are required to enroll in 4 credits of this course and complete the writing portion.

Critical Analysis of Research in Cell Biology, Stem Cells and Development
CSDV 7606 3 units
Course Director: Dr. Santos Franco
First-year students will learn to critically evaluate the scientific literature in preparation for conducting original research in their thesis labs and writing and critiquing research grant proposals. Primary literature will focus on cell and developmental biology topics related to CSDV 7605. The course consists of four blocks, each includes a lecture and 3 paper discussions. Each block session concludes with written mini-proposals and peer critiques.

Research in CSDV (Lab Rotation)
CSDV 7650 (section 001) 1 unit (for 3rd lab rotation)
Coordinated by the GAC Chair, Dr. Joe Brzezinski

Students will perform research in the laboratory of one of the members of the program. The rotation will be followed by an oral presentation.

Cell Biology, Stem Cells & Development Seminar
No registration required 0 units
Course Director: Seminar Committee
Seminar series designed to present recent important findings in cell and developmental biology research. Different topics are presented weekly by CSD Training Program faculty, students and visiting faculty. **Attendance is required**. Individual seminar details will be sent by the Program Administrator; additionally, upcoming seminar details are available on the program's website.

Summer Semester

Research in CSDV
CSDV 8990 1 unit
All students must be registered during the summer months to be maintain full-time status

B. LABORATORY ROTATIONS IN THE FIRST YEAR.
Rotations serve several important purposes. First, they enable the student to explore and compare several areas of cell and developmental biology research and aid in the choice of a mentor and project for thesis work. Second, rotation seminars provide intense training in the craft and art of public presentation, an essential aspect of future career success. Third, they allow program faculty to evaluate the motivation and intellectual preparedness of students to undertake independent research

ROTATION SCHEDULE FOR 2022-2023:

Fall 1st Rotation: August 29, 2022 - November 18, 2022

Fall 2nd Rotation: November 21, 2022 - February 24, 2023

Spring 3rd Rotation: February 27, 2023 – May 19, 2023

Number of Rotations.
Students must perform 3 rotations before the start of their second year. Students should start their first rotation in the fall semester. Students must complete 3 rotations in 3 separate laboratories in order to advance to their second year. Register for the first 2 rotations (Sections 1 & 2) in the fall; register for your 3rd rotation (Section 3) in the spring. Medical Scientist Training Program (MSTP) students must complete two rotations (during the summers of the first and second year of Medical School. Under exceptional circumstances and at the discretion of the GAC, a student may be allowed to perform an additional rotation during the summer following the first academic year, for the express purpose of enhancing the mentor selection process. CSD will make every effort to assist a student in finding a suitable thesis advisor.

Identifying Rotation Mentors
CSD seeks to maintain a training environment that is supportive, rigorous and aligned with the mission of the program. All CSD training faculty are eligible to serve as rotation mentors; however, opportunities in each lab may be limited by space, funds, etc. Students should discuss their

interests with several potential faculty mentors, several weeks or more before the start of the rotation.

The program strongly discourages rotations with mentors who are not training faculty in CSD. Such rotations will only be allowed if the faculty member has already applied to become training faculty in CSD, and the rotation is approved by the GAC chair and the Program Director.

Rotation Expectations.
For professionals in training, it is not appropriate to require a minimum number of hours for rotation work. Strong self-motivation is an absolutely essential characteristic for an independent scientist, and we expect our students to demonstrate this quality throughout their training. In this regard, students should expect to be in the lab beyond the normal working hours, i.e. evenings, weekends, and possibly over vacation days during the term. This commitment of time is especially important when long, complex experiments are being done. A major part of the mentor's rotational assessment (as well as their willingness to accept a student) will be based on the degree and quality of lab effort. Students should always discuss time off and/or vacation days with their lab mentor in advance, both in their lab rotations and once they enter a thesis lab.

A short, written evaluation of the student's rotation will be provided by the faculty mentor. Students are required to give an oral presentation of their rotation progress. After completing the requirements, rotation grades will be assigned by the first-year advisor in consultation with the rotation mentor and discussed with the student.

Rotation Seminar.
At the end of each rotation the student will present a seminar. The purpose of the seminar is to provide intense training in the craft and art of public presentation, an essential aspect of future career success. Each seminar should be approximately 15 minutes in length (12 minute talk + 3 minutes for questions). The student must rehearse the seminar with their rotation mentor prior to the public presentation. The seminar is an essential component of the research rotation. Students are expected to present a well-organized, clear, and thoughtful seminar. Students should consider the following elements when designing their presentation (although the order need not be strictly followed):

Introduction - a short statement of the question or problem addressed by the rotation, and the hypothesis to be tested.

Background - describe the significance of the question in broad terms for a diverse audience. Describe previous work and its relationship to the project.

Specific experimental aims - what were the particular experimental goals proposed to test the hypothesis?

Methods and Design - briefly explain any unusual strategies or techniques employed.

Results – negative and positive results should be reported

Conclusions and future directions – what can you conclude from your results, and what would you pursue if you remained on the project?

Suggestions for Effective Seminars

1. Avoid reading or memorizing your presentation "word-for-word". Wooden, canned deliveries are dull and very hard for audiences to follow.
2. Prepare and use simple, effective visual aids. Remember that effective communication of data and ideas is your goal! Do not spend undue effort and expense on fancy multicolored slides (especially for text), if color is not required to simplify complex data or concepts. Colored visuals tend to require a darkened room and are often much harder to read than black on white line drawings or letters. Keep text very brief and do not read directly from the screen (audiences are much faster at reading silently!).
3. Use the marker board when appropriate. Diagramming or outlining while you are talking is a highly effective means of explaining concepts difficult to describe with the spoken word. Use of the marker board can also help answer spontaneous questions from the audience.
4. Consider audience questions carefully! Both faculty and students are encouraged to ask questions during and after rotation seminars. A few of these questions may be intended to probe your understanding of your research rather than illuminate an area of confusion. Part of your evaluation will concern your effectiveness in responding to questions. Thus, make sure that you understand the question before answering. Repeat the question or ask for a rephrasing if you need to. Second, relax and take a moment of silence if you must before answering to formulate a coherent answer. Third, if after contemplation you don't know the answer, don't be afraid to say so. We all get stumped from time to time!

For more guidance on effective seminars, students are strongly encouraged to attend a workshop on "How to Give a Scientific Talk" which will be run by Dr. Tom Evans during the Fall semester.

C. Transfer to the Thesis Lab at End of First Year

An important aim of the rotations is to enable the student to obtain a thesis mentor. After the completion of the three rotations for regular graduate students or two rotations for MSTPs, the student must come to a mutual agreement with a faculty member to act as their thesis mentor. The chair of the GAC and the Program Administrator must be notified on the choice of mentor **on or before June 1st** of the first year. Official transfer to the thesis lab takes place on July 1st. Under exceptional circumstances and at the discretion of the GAC, a student may be allowed to perform an additional rotation during the summer following the first academic year, for the express purpose of enhancing the mentor selection process.

D. Preliminary Exam at the End of the First Year

1. The general format of a preliminary examination for the Cell Biology, Stem Cells and Development Graduate Program is a written grant proposal followed by an oral examination by a preliminary examination committee.

2. The preliminary examination committee will consist of five faculty members. Every year, following the first 2 years after initiation of this preliminary exam format, two committee members will be replaced with new faculty. Each member will serve a minimum of two consecutive years. The committee will also consist of faculty representing different aspects of the research within CSD, such as Development, Cell Biology and Stem Cell Biology.

3. Four weeks before the oral examination, students will be provided with five research topics; one topic from each committee member. Each topic will be represented by 2-3 papers that have

been selected by the committee members. Each student will need to pick one topic for their proposal. While students can select the same topic, obviously, students are not allowed to work together on their proposals. The topic cannot have a significant overlap with student's research interests in their future lab and will have to be approved by the committee.

4. Each student will have one committee member assigned as a preliminary examination mentor. The same committee member will also serve as a chair during examination of this student. The main role of the mentor will be to serve as a "go to" person for the student if they (the student) has questions regarding the written and oral portions of the examination. The mentor can advise the student regarding the expectations of the written and oral examinations. The mentor cannot, however, be directly involved in editing or re-writing the student's grant proposal. Mentor also cannot be directly involved in suggesting/designing the experiments or interpretations of potential outcomes that will be described in the proposal.

5. Students will complete the written proposal and deliver it to the prelim exam committee chair by the specified deadline, before the oral examination. This deadline is firm. The proposal is to follow the NIH pre-doctoral fellowship format and can be no longer than 7 pages (1 Specific Aims page plus a 6 page research plan; excluding references).

6. In addition to the written proposal, the student will be examined orally by the committee. The examination for each student will last approximately one hour, unless the committee decides additional time is needed.

7. Students will be evaluated based on the preliminary exam rubric; see Appendix 1. The exam is designed to test each student's understanding of key concepts and ability to think through experimental design, both of which are important for research in biomedical sciences, with a focus on development, cell biology and stem cell biology. While the main focus of the questions will be related to the written proposal, students should expect questions outside the immediate scope of written proposal. All questions, however, will be limited to the material that the student was exposed to during courses and rotations that they had within the first year of a graduate program.

8. After each exam, the exam committee will deliberate and come to a consensus score in each of the 4 areas described in the rubric. Those scores, along with any comments, with be provided to each student at the end of the exam day.

9. If a student scores a 1 in any area of the rubric, that will trigger a need for remediation in that area. If a remediation is needed, it will be individually tailored to that area and each student's needs. Regardless of how the remediation is structured, it must be completed within one month of being assigned. **The students performing a Preliminary Exam Remediation are not allowed any outside assistance. The work must be entirely their own.** However, student questions will be answered by the preliminary exam committee faculty.

10. If a student fails to increase their scores through the remediation, and still scores a 1 in any area of the rubric, this is considered a failed exam. The student will be dismissed from the program.

CSD Preliminary Exam Guidelines (*developed by CSD GAC, October 27, 2020*)

All CSD students will complete the Preliminary Exam at the end of their first year of coursework. This exam typically takes place in the third week of June. Four weeks before the exam, students will be provided research topics from each of the Preliminary Exam Committee faculty members. This committee typically has five faculty members and will thus provide five topics that students can choose from for their Preliminary Exams. Each member will provide 2-3 scientific papers as guidance for completing the Preliminary Exam on their topic.

Each student will choose one of the five topics for their Preliminary Exam. A student may not choose the topic of a faculty member for whose lab they anticipate joining. Students should avoid picking a topic given by any faculty member that they rotated with as well. The Preliminary Exam consists of a NIH F31-style grant proposal followed by an oral defense of their written document. The written proposal is due one week prior to the oral exam date – this is a firm deadline and extensions will not be provided. The proposal will follow the standard F31 format: one page for the Specific Aims and up to six pages for the Research Strategy.

Before the written portion of the exam is submitted, students ***may not*** receive help from their advisor, non-exam committee faculty members, postdocs, or more senior students. The first-year students may discuss topics and ideas amongst themselves but *must* write proposals on their own. Students are allowed and encouraged to reach out to any of the exam committee faculty members, *preferably the one whose topic the student is pursuing*, with questions about their proposals. This helps to ensure that the proper level of assistance is given to each student.

Only after submitting their proposals to the exam committee, students may send their proposals to other students from whom they would like to get feedback. Additionally, students are **strongly encouraged to host and participate in a Mock Oral Exam** with the more experienced students in the program. This event provides an excellent opportunity to get helpful tips from more senior students and to practice answering questions related to their written proposals.

If a Preliminary Exam Remediation is needed, it will be individually tailored to each student's needs. Regardless of how the remediation is structured, it must be completed within one month of being assigned. The students performing a Preliminary Exam Remediation ***are not*** allowed any outside assistance. *The work must be entirely their own*. However, student questions will be answered by the preliminary exam committee faculty.

D. Applying for the Genetics of Development, Disease and Regeneration (GDDR) T32 Training Program

CSD students entering their 2nd or 3rd year of training are encouraged to apply for the GDDR T32 training program. The application period will open in May of each year and selections will be announced by the end of June. For more information on program eligibility and selection process, please refer to Appendix 2.

2nd Year Students

COURSEWORK, PRE-THESIS RESEARCH AND THE COMPREHENSIVE EXAMINATION

A. COURSES

Fall and Spring Semesters – Required Registration

The fall and the spring semesters must each total at least 5 units. Students who are considering enrolling in more than 5 credit hours in either of these semesters should first discuss their enrollment with their faculty advisor, as the faculty advisor will be responsible for the additional expenses incurred. Once you have approval from your faculty mentor to take more than 5 credits, forward the email approval to the Program Administrator.

Research in CSDV
CSDV 7650 (Section 0V1) 1-5 unit*
Course Director: Dr. Jeff Moore
Laboratory research with CSD Training Program faculty.

CSD: Advanced Topics Discussion (Journal Club)
CSDV7000 1 unit

All CSD students are required to complete a course in statistics by the end of the fourth year. Two options exist to meet this requirement (see below). MOLB7950 is typically offered in the fall semester. BIOS 6606 is also offered in the fall semester. CSD students are strongly encouraged to take MOLB 7950, and to take this course during their second or third years. Students who have already completed a similar course or have identified a different course they would like to take may request an exemption from the Program Director. If the exemption is granted, the student must forward that confirmation to the Program Administrator.

Informatics and Statistics for Molecular Biology
MOLB 7950 (course number may change)* 4 units
Course director: Jay Hesselberth
***This course will be offered every other year, in fall 2022, 2024, etc.**
This course teaches students to design and analyze experiments commonly used in molecular biology. The course is organized around the Central Dogma (DNA > RNA > Protein) wherein each block presents 2-3 experimental approaches. Each week, a new experiment is introduced with a discussion of appropriate design and statistical considerations. The remaining weeks' classes are devoted to digging into the analysis of a sample data set with hands-on programming. GDDR Training Grant trainees are required to take MOLB7950 during years 2 or 3 of their graduate studies.

Statistics for the Basic Sciences
BIOS 6606 3 units
Course Director: Kathleen Torkko
This course is designed for those wishing to obtain a basic understanding of statistics and its application in biological research. Students will develop statistical literacy and an ability to perform basic statistical analyses, basic graphical statistics, data summarizations, and estimation and inference using statistical software.

NOTE:	Each fall semester, all students enrolled in at least one credit are automatically enrolled in the university's student health insurance plan. You may opt out if you provide proof of your own insurance, but you must do so by the Student Health Office's deadline. Contact the Student Health Office, studentinsurance@cuanschutz.edu with questions.

Summer Semester – Required Registration

Doctoral Thesis
CSDV 8990 1 unit
All students must be registered during the summer months to be maintain full-time status

B. Update Talks

Beginning in the second year, each student is required to give an annual update presentation to the program. The first update should be before May 31 of the 2nd year, and is scheduled prior to or at the beginning of the academic year. We also recommend that you form a committee and have one pre-comprehensive exam meeting at the time of your first update seminar. To schedule a committee meeting, you will need to be sure all your members can attend, and coordinating faculty schedules can be challenging. Again, we want to emphasize that arranging this update is your responsibility, and urge you to make plans with your committee, and schedule your presentation with the program administrator well in advance.

C. Comprehensive Exam

At the beginning of the second year of study CSD graduate students will begin preparing for the Comprehensive Exam. It is highly recommended that the student carefully read the Graduate School Policies & Procedures guide on Comprehensive Examination policies and deadlines, and check the instructions and forms from the Graduate School website well ahead of the planned examination so all required paperwork can be completed on time. Completed paperwork must be submitted to the Program Administrator no later than one month prior to the examination date: (https://graduateschool.ucdenver.edu/forms-resources).
Note: A student must be registered at the time they take the Comprehensive Examination.

Application to the Graduate School for Admission to Candidacy
Applications must be completed no later than one month before the exam. The *Application for*

Candidacy form and the *Exam Request* form are available from the Graduate School and must be approved by the Program Director and returned to the Program Administrator. The date of the Comprehensive examination and the composition of the committee must be registered with the Graduate School. The student must have completed a minimum of 30 didactic credit hours to be eligible to schedule the exam; Pass/Fail classes and CSDV 8990 credits do not count toward the 30 hour minimum. Coursework taken in the semester in which the exam takes place counts towards the 30 hour minimum.

Students must take the Comprehensive Examination for admission to candidacy for the CSD Ph.D. **between June 1st of their second year and December 31st of the third year**. Any deviation to this requirement must have approval from the PI, Graduate Advisory Committee, and the Program Director. The Comprehensive Examination Committee shall consist of a minimum of five Graduate Faculty members. At least one of the members must be outside the Program's core training faculty. The thesis advisor may not serve as a member of the Comprehensive Exam Committee. The majority of the members, including the chair, must be from the training faculty of the CSD Program. Students should contact members of the Graduate Faculty whom they wish to be on their committee, in consultation with the Director of the Program and their thesis advisor. Students should inform the committee members of their background, the topic of their thesis research and their preliminary results. In addition, the student arranges the time and location of the exam, and informs the members of the committee that the examination requires three hours. The student should provide the names of the committee members to the GAC, and also submit to the Program Administrator; additional paperwork may be required for outside committee members.

The examination will have as its focus a thesis research proposal written by the student using the format of a NIH pre-doctoral fellowship. Although preliminary data collected by the student are helpful, it is not essential for the proposal. The written proposal must be distributed to the Comprehensive Exam Committee **at least two weeks prior** to the examination. The student must adequately demonstrate the scientific knowledge and ability to defend this proposal, as well as satisfying the overall requirements for the examination as set forth by the UCD-AMC Graduate School Policies & Procedures guide. The examination will consist of a 30-minute seminar by the student, with 10 minutes of general questions from the audience, and then detailed questions from the Thesis Committee. As stated in this Graduate School guide, the comprehensive examination "will test your mastery of a broad field of knowledge, not merely the formal course work completed." *Students are strongly encouraged to consult with their committee members prior to the exam to discuss the plans for the exam and subject areas each member expects the student to have mastered*.

Comprehensive Exam Goals

- The exam process is intended to help students advance their scientific and communication skills. Think journey rather than destination.
- The exam process is meant to help students focus their thesis work, increase their knowledge of CSD topics, and improve their productivity in the lab. The exam is not meant to be punitive.
- Another goal of the exam is to prepare students for future scenarios that require public speaking and "chalk talk" style defense of their data and ideas.

Comprehensive Exam Guidelines:

1. The exam should be completed by December 31st of the student's third year in the program.

2. The written exam follows the formatting guidelines of a F31 NRSA application:

Title	
Short Introduction and Specific Aims	1.0 page
Research Strategy	6.0 pages
Significance and Background	
Any preliminary data	
Experimental Design & Methods	
Expected Results & Interpretation	
Alternative approaches	
Total	7.0 pages

Literature citations are additional to the 7 pages. Full references with titles are required.

The written proposal **must** be given to all members of the committee **at least two weeks before** the comprehensive exam.

3. The public seminar should be 25-30 minutes with questions. The talk will be open to the university community. After the talk, questions from those in attendance will be requested. After the questions have been addressed, all but the graduate faculty on the Comprehensive Examination Committee will be requested to leave.

4. Examiners will be provided with the student's preliminary exam results to determine training progression. Examiners should ask questions that evaluate the criteria present in the four-area scoring rubric (see Appendix 3). The exam chairperson is responsible for keeping the questioning focused.

5. Examiners should consider the stage of the student when scoring. A "4" is a strong performance score for the level, not a perfect one.

6. A passing exam will have scores of 3 or 4 in each area. The exam score in each area is based on the collective consensus opinion of the examining committee. Thus, only one report will be generated with a single score in each area.

7. A score of 1 or 2 in any area requires remediation. This does not indicate a failed exam. Instead, additional conditions need to be met to satisfy the exam requirements. This involves completing a remediation plan (below). The intent of remediation is to improve the student's skills and knowledge. It is not meant to be punitive.

8. Remediation plans will be given to the student in writing. Remediation plans should be focused, completable in ≤ 6 weeks, and be designed to specifically improve the area(s) of deficiency. A revised rubric will then be completed to reflect the outcome of the remediation.

9. If remediation is unsuccessful, the exam is then considered a "fail".

10. The completed comprehensive exam rubric, including the scores and comments, will be uploaded to the student's permanent record by the exam chairperson. In the case of a remediation, the remediation plan and both the original and revised rubrics will be uploaded to the record.

11. The mentor acts as an observer during the exam. They do not provide or determine scoring. The mentor is permitted to answer questions from the examining committee about the student's aptitude and performance in the lab.

Possible Results
Pass (no conditions)
Conditional Pass (conditions must be detailed)
Fail (the student must leave the graduate program)

NOTE:	After passing the comprehensive exam, all PhD students are required to register for Doctoral Thesis CSDV 8990 (instead of CSDV 7650 section 0V1) each fall and each spring. Failure to do so can result in the student being required to retake the comprehensive exam. A student may register for up to 10 units of CSDV 8990 in the semesters before and the semester in which the comprehensive exam is taken and passed.

D. Applying for Fellowships

All students are encouraged to apply for fellowship support from outside agencies, e.g. NIH, NSF, Howard Hughes Medical Institute, March of Dimes, American Heart Association, etc. Many students work with their mentor to edit their comprehensive exam proposal, which utilizes a NIH F31 NRSA predoctoral fellowship format, for submission to external funding agencies. Students can prepare and submit a fellowship application prior to the comprehensive exam and are encouraged to do so. If students submit a predoctoral fellowship prior to the comprehensive exam, students can adapt a submitted fellowship application for use in the comprehensive exam written document. The plan to adapt the fellowship in this way must be communicated to the exam committee **at least one month before** the comprehensive exam.

A. COURSES

Fall and Spring Semesters – Required Registration

The fall and the spring semesters must each total at least 5 units. Students who are considering enrolling in more than 5 credit hours in either of these semesters should first discuss their enrollment with their faculty advisor, as the faculty advisor will be responsible for the additional expenses incurred. Once you have approval from your faculty mentor to take more than 5 credits, forward the email approval to the Program Administrator.

NOTE: Comprehensive exam (see p. 14) must be taken by December of Year 03.

Elective or Advanced Topics Course

Students are required to take at least one elective or advance topics course each year during years 3-5. Options include CSDV7000, CSDV7100, MOLB7950/BIOS6606, and courses listed on p. 26-28. If a student would like to satisfy this requirement by taking another course, which is not listed on p. 26-28, they must receive approval from the Program Director and the Chair of the Curriculum Committee.

Doctoral Thesis

CSDV 8990 1 – 5 units*

Students will generate an original body of research that constitutes a significant contribution to the field of cell and developmental biology. Suitability of thesis research is judged by the Thesis Committee. Students write a PhD thesis and defend the document at an oral examination.

NOTE: Each fall semester, all students enrolled in at least one credit are automatically enrolled in the university's student health insurance plan. You may opt out if you provide proof of your own insurance, but you must do so by the Student Health Office's deadline. Contact the Student Health Office, studentinsurance@cuanschutz.edu with questions.

Summer Semester – Required Registration

Doctoral Thesis

CSDV 8990 1 unit

All students must be registered during the summer months to be maintain full-time status.

Continuous Registration Requirement.

Students must register continuously following successful completion of the comprehensive examination, i.e., 5 credits for fall and spring semester and 1 hour of thesis research (CSDV 8990) during the summer. All students must register for both the fall and spring semesters. It is the

student's responsibility to register for the correct courses in a timely manner – all late fees and finance charges will be the responsibility of the student.

B. Update Talks

Third year students will not be required to give an update talk in the same academic year that they take their comprehensive exam.

Students in their 4th year and beyond are required to give an annual update presentation to the program. Update talks are scheduled prior to or at the beginning of the academic year.. Although the presentation can be scheduled at any time during the year, earlier is better. Again, we want to emphasize that arranging this update is your responsibility, and urge you to make plans with your committee, and schedule your presentation with the program administrator well in advance.

C. Thesis Committee Meetings

Students are required to meet at least once each year with the thesis committee although more frequent meetings can be scheduled at the discretion of the student or thesis committee. The candidate should provide the program with a 20-30 minute talk as well as a brief written summary of the progress made on the stated aims given to the committee at least one week prior to the meeting. A template for the progress report is provided in Appendix 4 of this handbook. Following the meeting, the committee chair is required to submit a Thesis Meeting Assessment in Gaia that includes the following:

- Date of the meeting.
- Committee composition.
- Numerical rating (scale of 1-3) of student's performance in areas of research progress, evaluation of literature, program concepts, conducting research and oral communication.
- Description of accomplishments since the previous meeting.
- Description of any concerns from the committee.
- Recommended goals to be accomplished by the student for the next meeting.

Ph.D. Thesis

After passing the Comprehensive Examination, the student enters Ph.D. candidacy. During the following years the students perform research towards a thesis defense. Students must give annual reports on the progress of their thesis research to the CSD faculty in the form of 30-minute seminars, and meet at least annually with their Thesis Committee. The Chair of the Thesis Committee will submit a report of the meeting and any resulting recommendations using the online evaluation system provided by the Graduate School (https://gs.ucdenver.edu/gaia/splash.php).

Upon completion of a body of original research that constitutes a significant contribution of new knowledge to the field of cell, developmental or stem cell biology, students will write a Ph.D. thesis containing this information, and defend this document at an oral examination scheduled by the Graduate School. Check with the Graduate School for current deadlines, thesis format requirements and required paperwork prior to writing the thesis and scheduling the defense.

1. Guidelines

All doctoral students are required to submit a thesis (or dissertation) to the Graduate School as partial fulfillment of the requirements of the degree of Doctor of Philosophy. The form and scope of this thesis is determined by the student, the thesis advisor, the Advisory Committee, and the Program. The thesis should be based upon original investigation and showing mature scholarship and critical judgment as well as familiarity with tools and methods of research. It must be essentially approved by the examining committee before the final examination can be taken.
The Graduate Program in Cell Biology, Stem Cells and Development amplifies the definition of the thesis as follows:

> The successful thesis presents a problem-orientated, original and substantive investigation. The methodology and results contained in the thesis must be conclusive and of quality. The standards are to be those maintained by quality, peer-reviewed scientific journals. It is the expectation of the program that the student have 1 or more first author publications submitted prior to the thesis defense.

2. Thesis Committee

Once a student is admitted to candidacy, they should establish a Thesis Committee with the advice of the thesis advisor and the Director of the Graduate Program. The committee need not be the same as the Comprehensive Exam Committee but should be composed of five Graduate Faculty members; at least one member must be outside the program and the majority from within the program. The thesis advisor is a voting member of this committee. One faculty member of the program should be selected to serve as a chair of the Thesis Committee. This committee can be the same as the Comprehensive Exam Committee.

3. Graduate Advisor

The Chair of the Thesis Committee serves as the advisor to the student and will monitor their progress. The Chair must be a member of the Program. It cannot be emphasized enough, however, that each student is responsible for their own progress.

4. Guidelines for Supervision of Thesis Work

1. Because all students present their work each year, all Graduate Faculty should follow the progress of all students. When concerns arise they should be discussed immediately with the student, the Thesis Advisor and/or the student's Thesis Committee.

2. Students are encouraged to meet every six months, but must meet at least once a year, with their Thesis Committees. Students must submit a written update on their progress to the Committee at least one week before the Committee meeting (see template in Appendix 1). Students are encouraged to schedule their committee meeting soon after their yearly update talk. The Chair of the Committee will file an evaluation and summary of the meeting and recommendations of the thesis Committee using the online student assessment portal provided by the Graduate School. The meetings should be documented (date of meeting, items discussed, committee recommendations, list of attendees, signatures of the student and committee chairperson) and a copy provided to the Program Administrator for inclusion into the student's file. The Thesis Committee can recommend more frequent meetings when the members feel more careful monitoring is warranted.

3. When the student and their thesis advisor agree the work for the thesis has been completed, the student must meet with the Thesis Committee and receive formal approval to begin writing the thesis.

5. Preparation of Thesis and Thesis Defense

1. Watch the Graduate School's instructional video on how to format your thesis.

2. The Thesis Committee must formally approve the written thesis before the final examination can be taken. Written PhD thesis approval from the chair of the Thesis Committee is required prior to scheduling of the thesis defense with the Graduate School. The Thesis Approval Form may be obtained from the program administrator. Furthermore, the thesis advisor must find the thesis acceptable prior to submission to the rest of the committee. It is inexcusable for everyone concerned if the student reaches the point of their PhD thesis defense and encounters major difficulties with the thesis.

3. In addition to completing the thesis document, prior to the defense of the thesis, each CSD student must submit a minimum of one original research manuscript for publication in order to receive the PhD. The paper must be first-authored by the student, and represent a component of the student's overall thesis work. Second or middle authorship or authorship of a review article or chapter does not meet this requirement.

4. Arrangements for the thesis defense must be made with the Graduate School office at least one month in advance. Check the Graduate School's "Defense and Graduation Deadlines" form for relevant deadlines for paperwork submission, dissertation defense, and more. The student must be registered for a minimum of 5 credits of CSDV 8990 at the time of the thesis defense (including during a summer semester). In addition, a copy of the thesis must be given to the Thesis Committee **at least two weeks** before the defense, and this copy must be signed by the student's faculty mentor indicating the mentor's approval of the document.

5. The thesis defense is the final examination of the thesis and related topics. It includes an oral examination of the salient points of the research, its conclusions and its integration with the rest of the field. The oral examination will be conducted by the Thesis Committee and only members of the Graduate Faculty may be present. The final decision regarding the result of the thesis defense is made by the Committee.

6. All corrections to the written thesis required by the Thesis Committee must be completed within thirty days from the date of the thesis defense. The signed, written document must be submitted to the Graduate School at that time.

7. The student must receive affirmative votes from the majority of the committee. The examination may be attempted only once. Disqualification of the thesis examination results in dismissal from the Graduate Program without a degree.

IV. Graduate School standards and ORE Policies

A. Credits. The Graduate School requires at least 30 semester hours in course work (rotations and Research CSDV 7650 count as course hours) and 30 semester hours of thesis research (CSDV 8990) for the PhD. All work undertaken as a graduate student must be in compliance with the academic Code of Honor (see the Graduate School's website).

B. Maintenance of a 3.0 GPA. All students must maintain an average of "B" or better in their course work. Students are expected to earn a "B" or better in all required courses. Only in *exceptional* circumstances may a "B-" in a required course be acceptable, as determined by petition to the GAC. Required courses completed with a grade of below "B-" cannot be counted towards PhD requirements.

C. Preliminary exam. In order to continue in the program, a student must pass the Preliminary Exam at the end of the first year. If the Preliminary exam is failed, the student will be asked to retake part of the exam (i.e., remediation; see p. 11, point 9). If the student fails the retake, they will be asked to leave the PhD training program.

D. Remedial and Disciplinary Actions. Students whose cumulative GPA falls below 3.0 will be placed on Academic Probation by the Graduate School. The student must earn a GPA of 3.0 in each of their next two semesters in order to be removed from Academic Probation. The Graduate School requires that after a student is put on academic probation, they must maintain a 3.0 in all subsequent semesters. Failing to meet either condition will lead to immediate dismissal from the Graduate School. A "B-" or below in any required course is considered unsatisfactory academic progress and more than one "B-" or below is grounds for immediate dismissal from the Program.

A graduate student who receives an unsatisfactory grade in a course (a B- or below) may repeat that course once or successfully complete an alternative assignment, upon written recommendation from the GAC and approval by the Graduate School Dean (provided the course has not been previously applied toward a degree). The two grades received will be averaged in calculating the grade point average, and all grades received will appear on the student's transcript. The course may be counted only once toward satisfying the unit requirement for the degree.

After two semesters, a GAC meeting will be held to determine the student's progress. If the student's cumulative GPA is 3.0 or above, the student will be removed from probation. If the student's cumulative GPA is below 3.0, the chair of the Thesis Committee, the thesis advisor and the student will meet with the CSD Steering Committee. The Steering Committee will make one of the following determinations:

1. The student is not in good academic standing and will be placed on probation again for not more than 30 days.
2. The student is not in good academic standing and will be released from the program.

All meetings will be thoroughly documented and given to the Program Administrator for placement into the student's file.

E. Time Limit of PhD Studies. Students have eight years from the time they enter Graduate School to complete all requirements for the degree. Continuation after eight years requires the approval of the student's Thesis Committee, the CSD Steering Committee & the Graduate School.

F. Leave of absence. Students who need to leave a graduate program for a period of time (up to one (1) year) should consult their program directors for guidance on a Leave of Absence (LOA). Personal LOAs are reviewed and approved entirely through the program and ORE. Medical LOAs are managed through the CU Anschutz Student Outreach and Support Office in collaboration with

the program and the ORE. An approved LOA pauses the student's academic record and automatically extends the time limit for completing a degree by the equivalent amount of time that the student spends on leave. Requests for LOA that exceed one (1) year may be approved with sufficient justification to the Dean of the Graduate School. Students who do not return from their approved LOA will be considered to have withdrawn from their program and will either be required to formally re-apply for admission, or, at the discretion of the program, may be re-admitted through an expedited process.

G. Faculty member who leaves the institution. The Office of Research Education (ORE) and the School of Medicine (SOM) PhD programs work to ensure that all ORE PhD students have optimal PhD training conditions. Major challenges occur, however, when a student's PhD mentor leaves the institution, and the student has not completed the PhD requirements. Depending on the student's stage in her/his/their research and the program, the challenges will vary. ORE's policy regarding students whose mentors leave the institution is defined in Appendix 5.

V. Obligations and Record Keeping

A. Attendance. All graduate students are **required** to attend the weekly Cell Biology, Stem Cells and Development (CSD) seminars (usually, but not always, held on Wednesdays at noon) and specialized research forums. These seminars are a mixture of talks by invited speakers and research reports from the faculty, students and postdoctoral fellows in laboratories of the Cell Biology, Stem Cells and Development Program faculty.

All graduate students are **required** to attend post-rotational seminars, comprehensive examinations, student update presentations, and Thesis Defense Seminars given by CSD program students.

All notebooks, original data and reagents from rotational and thesis work are the property of the advisor and must be left with the advisor at the completion of the work.

It is the student's responsibility to register for courses in a timely manner – all late fees and finance charges will be the responsibility of the student.

B. Colorado Residency. First-year students who are domestic students must obtain a Colorado Driver's License at the time of arrival at the University of Colorado School of Medicine to begin the process of establishing Colorado residency. If residency has not been established by the beginning of the second year, the student is responsible for the non-resident portion of tuition that exceeds the resident assessment. The paperwork for establishing Colorado Residency must be filed with the Registrar prior to second year registration. Please check the Registrar's website for full details: https://www.cuanschutz.edu/registrar

C. Student's Files. A file for each student will be kept by the Program Administrator. All relevant records should be given to the Program Administrator for the files, including published abstracts and papers, notifications of awards and honors, and copies of forms filed with the Graduate School. These files should reflect the total record of the student during their entire graduate career. Upon written request, the records may be examined by the student.

VI. Other CSD Program events

A. Annual Student Research Retreat.

Each fall, the students host an out-of-town retreat for the students and faculty in the Graduate Program in Cell Biology, Stem Cells and Development. The purpose of the retreat is twofold: 1) to provide everyone with the opportunity to get together and interact on a scientific/intellectual level so as to cultivate new interactions and strengthen existing ones; and 2) to provide an opportunity for incoming first year CSD and Biomedical Sciences Program (BSP) graduate students, and 1st and 2nd year MSTP students to become familiar with the research activities and faculty within the CSD Program. The retreat is usually held in September or October. Current senior students (2nd year and beyond) are expected to present their work either via a poster or a talk.

B. Participation in Recruitment Functions.

During February/March each year, prospective student applicants visit our program for interviews. It is in the Program's best interest to attract and retain the best of these prospective students. To do this we need the help of current students and CSD faculty who can convince these individuals that our Program is the place to be! When asked, please be willing to spend some time with prospective students during dinners or other functions. Our CSD Program can and has flourished with your irreplaceable help.

C. Description of committees.

Each committee within the program has a student representative. Below is a description of the duties for each position:

Recruitment: This committee reviews submitted applications to the graduate program, selects candidates to interview in person or by Zoom, organizes recruitment weekend, and ultimately selects who will be admitted to the program. The student members participate fully in the entire process, and in particular are in charge of enlisting and organizing the student body to help with both academic and social recruitment efforts.

Advising: The Graduate Advisory Committee helps students maintain progress toward their Ph.D. degree. As a member of this committee, the student member helps discuss student progress and may be recruited to and/or advise the committee to tutor first year students in need. This committee requires that the student member be a doctoral candidate, i.e., has passed the Comprehensive Exam.

Curriculum: This committee discusses the current curriculum and suggests and implements changes in the best interest of the program and students, including but not limited to selection of Advanced Topics courses to be offered each academic year based on faculty availability and student interests.

Membership: This committee is responsible for faculty membership within the program. The student member participates in the establishment of guidelines for faculty membership, reviews current faculty participation, and makes recommendations concerning new faculty applicants.

Retreat: Every fall, the program has a retreat (typically overnight) in a mountain location. It is the role of the students (two) on the Retreat Committee to organize the retreat with the oversight of a

CSD graduate program faculty representative. With a pre-determined budget in mind, the students have a role in selecting the location as well as an invited speaker.

Diversity, Equity and Inclusion (DEI) Coordinator: The CSD Program is committed to promoting an inclusive and equitable training environment that embraces diversity, eliminates structural biases from recruitment and training, and supports the identities and values of our students. The DEI Coordinator is a faculty leadership position that focuses support for these efforts, and seeks to develop new education and training activities within CSD that may be shared across CU AMC Ph.D. programs.

Steering Committee: This committee consists of the chairs of each of the program committees plus additional members as deemed appropriate by the director of the program.

Student Executive Committee: Consists of the student members of the Program Committees (Advising, Recruitment, Curriculum, Membership and Retreat) and additional members to represent each cohort in the student group, and is chaired by a student member of the Advising Committee. The goal of this committee is to organize student activities and provide a mechanism to discuss student issues that can be directed to the Steering Committee and/or program director.

D. Advanced Topics and Electives.

Advanced Topics in CSD (e.g. CSDV 7000, 7100, 7670 and 7675, content varies year to year) are special interest courses intended for 2nd year students and beyond. These are 1-2 credits and comprise 15-30 hrs of meeting time within a semester. Students are encouraged to submit ideas for CSDV Advanced Topics Courses to the Curriculum Committee.

Students are required to take at least one elective or advance topics course during years 3-5. Students who are in the program for longer than five years are not required to take an Advanced Topic during the academic year of their defense. This requirement has been in effect since the 1991-92 academic year.

CSD: Advanced Topics Discussion (Journal Club)
CSDV 7000 1 unit

Advanced writing workshop
CSDV 7100 1 unit
Course Director: Dr. Charles Sagerstrom
This course is a student-led writing workshop focusing on developing writing skills through the submission, editing and discussion of drafts. Document types will be chosen by the students enrolled and may include manuscripts, figures, theses, and documents related to career development. Students may only enroll in CSDV7100 after they are post-Comps. GDDR Training Grant trainees are required to take CSDV7100 during their graduate studies.

Advanced Topics in Cell Biology Stem Cells and Development: Organoids
CSDV 7670 2 units
Course Director: Peter Dempsey
This 2 credit course is an introduction to concepts and practice of organ and tissue modeling using both adult and pluripotent stem cell organoid culture systems combined with bioengineering applications. Lectures/article reviews will be balanced with a significant, hands-on lab component to gain experience in organoid culture techniques. This course is offered in Fall or Spring

semester, please contact course directors for information on when the class will be held during the academic year.

Practical teaching experience in Cell Biology, Stem Cells and Development
CSDV 7675 1 unit
Course Director: Julie Siegenthaler
Students will be paired with a CSD faculty mentor to develop a class session for IDPT 7801 courses directed by CSD faculty, CSDV 7605, CSDV 7606 or CSDV 7670 (depending on student interest and faculty availability). Each session will include a practice presentation and post-session critique.

Practical mentoring experience in Cell Biology, Stem Cells and Development
CSDV7676 1 unit
Course Director: Jeff Moore
This course trains PhD students in effective mentoring skills for a research lab setting. Students will receive training in a wide variety of topics including project design, communication, conflict resolution, creating equitable and inclusive mentoring relationships, and more. This course is intended for students who are further along in their training and seeking to build professional skills that will enable them to be successful in the next stage of their career. As such, it is offered for students in year 2 or beyond of their training. GDDR Training Grant trainees are required to take CSDV7676 once, as part of their roles as mentors in the Developing Scholars Program.

Electives offered by other departments/programs.
A few electives are highlighted here, but courses change yearly. The best resource for course offerings will be found on the registrar's website when you register for each upcoming semester. Below we list several frequently offered electives for advanced graduate students. STA=subject to space availability.

IMMU7630 (FALL) Overview of Immunology
Instructor(s): J. Cohen

MOLB7800 (SPRING) Advanced Topics in Molecular Biology (STA)
Instructor(s): M. McMurray/O. Rissland

MOLB7900 (SPRING) Practical Computational Biology for Biologists (Python)
Instructor(s): S. Ramachandran/M. Taliaferro

MOLB7950 (SPRING) Practical Computational Biology for Biologists (R)
Instructor(s): S. Jagannathan/N. Mukherjee

NRSC7615 (SPRING) Developmental Neurobiology
Instructor(s): E. Bates/ S. Franco

PHCL7606 (SPRING) Receptors and Cell Signaling
Instructor(s): M. Dell'Acqua/ M.Caino

PHCL or MOLB7801 (SPRING) Rigor and Reproducibility in Biomedical Research
Instructor(s): M. Breuss

CANB7600 (SPRING) Cancer Biology
Instructor(s): S. Nordeen

Independent Studies in Cell and Developmental Biology (CSDV 7850)
Independent Study is to accommodate students who wish to (1) take a Professional School Course for credit and (2) gain a defined expertise with a faculty mentor other than their thesis advisor. Consent of the faculty member offering the Independent Study and the Program Director are required.

VII. CURRENT STUDENTS AS OF AUGUST 2022

STUDENT	START YEAR	THESIS ADVISOR
Adam Soh	2016	Pearson
Adam Almeida	2017	Macklin
Nicole Moss	2017	Sussel
Madison Rogers	2017	Fantauzzo
Ali Shilleh	2017	Russ
Zeke Thomas	2017	Moore
Elliott Brooks	2018	Sussel
John DeSisto	2018	Green
Hannah Jones	2018	Siegenthaler
David Villani	2018 (transfer)	Zuscik
Yunus Ozekin	2019 (BSP)	Bates
Kaitlin Alemany	2019	Moore
Amy Briggs	2019	DeGregori
Hannah Moran	2019	Mosimann
Kyle Northington	2019	Bates
Omar Ochoa Olmos	2019	Brzezinski
Samantha Payne Landgrave	2019	Zuscik
Christina Piarowski	2019	Barlow
Ian Purvis	2019	Brzezinski
Maria Hansen	2020	Sussel
Trevor Isner	2020	Barlow
Bryan Johnson	2020	DeGregori
Abigail Mumme-Monheit	2020	Nichols
Sylvia Nunez	2020	Sagerstrom
Christopher Schaaf	2020	Sussel
Wolfgang Schleicher	2020	Pietras
Shane Williams	2020	Dempsey
Yuzhu Cheng	2021	Reis
Erik Collet	2021	Pearson
Devon Conradson	2021	Vagnozzi
Mikaela Follmer	2021	Bates
Sophia Kim	2021	Siegenthaler
Addison Rains	2021	Artinger
Harrison Wells	2021	Mosimann
Kelsey Abrams	2022	Rotating
Jeremy Brown	2022	Rotating
Michael Lippincott	2022	Rotating
Jeremy Martin	2022	Rotating
Susannah Schloss	2022	Rotating

Kaleigh Schuler	2022	Rotating
Amanda Stenzel	2022	Rotating

VIII. CSD FACULTY ROSTER AUGUST 2022

Faculty	Primary Dept	CSD Students
Bruce Appel	Pediatrics	
Kristin Artinger	Craniofacial Biology	Rains
Linda Barlow	Cell & Developmental Biology	Piarowski, Isner
Emily Bates	Pediatrics	Ozekin, Northington, Follmer
Richard Benninger	Bioengineering	
Kristen Boyle	Pediatrics	
Martin Breuss	Pediatrics	
Jim Bridges	Medicine, NJH	
Joseph Brzezinski	Ophthalmology	Ochoa Olmos, Purvis
John Caldwell	Cell & Developmental Biology	
David Clouthier	Craniofacial Biology	
James DeGregori	Biochemistry & Molecular Genetics	Briggs, Johnson
Peter Dempsey	Pediatrics	
Tobias Eckle	Anesthesiology	
Tom Evans	Cell & Developmental Biology	
Katie Fantauzzo	Craniofacial Biology	Rogers
Tom Finger	Cell & Developmental Biology	
Santos Franco	Pediatrics	
Adam Green	Pediatrics	DeSisto
Joan Hooper	Cell & Developmental Biology	
Ethan Hughes	Cell & Developmental Biology	
Sujatha Jagannathan	Biochemistry & Molecular Genetics	
Igor Kogut	Dermatology	
Edward Lau	Medicine	
Amanda Law	Psychiatry	
Shi-long Lu	Otolaryngology	
Traci Lyons	Oncology	
Wendy Macklin	Cell & Developmental Biology	Almeida
Susan Majka	Medicine, NJH	
Jim McManaman	Obstetrics and Gynecology/Medicine	
Michael McMurray	Cell & Developmental Biology	
Jeffrey Moore	Cell & Developmental Biology	Thomas, Alemany
Christian Mosimann	Pediatrics	Moran, Wells
Jessica Nelson	Cell & Developmental Biology	
Jamie Nichols	Craniofacial Biology	Mumme-Monheit
Karin Payne	Orthopedics	
Chad Pearson	Cell & Developmental Biology	Soh, Collet
Eric Pietras	Hematology/Medicine	Schleicher
Rytis Prekeris	Cell & Developmental Biology	
Tania Reis	Endocrinology, Metabolism, Diabetes	Cheng
Diego Restrepo	Cell & Developmental Biology	

Mary Reyland	Craniofacial Biology	
Olivia Rissland	Biochemistry & Molecular Genetics	
Dennis Roop	Dermatology	
Holger Russ	Barbara Davis Center	Shilleh
Charles Sagerstrom	Pediatrics	
Stephen Santoro	Pediatrics	
David Schwartz	Medicine	
Julie Siegenthaler	Pediatrics	Jones, Kim
Kunhua Song	Cardiology	
Emily Su	Obstetrics and Gynecology/Medicine	
Kelly Sullivan	Pediatrics	
Lori Sussel	Barbara Davis Center	Brooks, Hansen, Moss, Schaaf
Matthew Taliaferro	Biochemistry & Molecular Genetics	
Arianne Theiss	Medicine	
Ronald Vagnozzi	Medicine, Cardiology	Conradson
Rajeev Vibhakar	Pediatrics	
Eszter Vladar	Pulmonary Sciences	
Xiao-Jing Wang	Pathology	
Trevor Williams	Craniofacial Biology	
Michael Yeager	Bioengineering	
Michael Zuscik	Orthopedics	Villani, Landgrave

62 active faculty members

IX. CSD 2022-2023 Committee Membership Roster

Jeff Moore, Director

Recruitment Committee
Katherine Fantauzzo, Chair
Kelly Sullivan
Jessica Nelson
Kyle Northington, Student Rep
Sylvia Nunez, Student Rep

Graduate Advisory Committee (GAC)
Joe Brzezinski, Chair
Jim Bridges
Charles Sagerstrom
Ethan Hughes
Sujatha Jagannathan
Hannah Moran, Student Rep
Katie Alemany, Student Rep

Curriculum Committee
Julie Siegenthaler, Chair
Rytis Prekeris
Olivia Rissland
Chad Pearson
Hannah Jones, Student Rep
Tina Piarowski, Student Rep

Membership Committee
David Clouthier, Chair
Peter Dempsey
Eszter Vladar
Joan Hooper
Matt Taliaferro
Ian Purvis, Student Rep
Sophia Kim, Student Rep

Journal Club
Yunus Ozekin
Trevor Isner

Advanced Writing Workshop

CSD Voices
Samy Landgrave
Hannah Moran

CSD 2022 Retreat Committee
Sue Majka, Chair
Katie Alemany, Student Rep
Wolf Schleicher, Student Rep

CSD Seminar Series
Linda Barlow, Chair
Katherine Fantauzzo
Chad Pearson
Peter Dempsey

Diversity, Equity and Inclusion (DEI) Coordinator
Santos Franco
Omar Ochoa, Student Rep

Steering Committee
Joe Brzezinski
Santos Franco
David Clouthier
Julie Siegenthaler
Linda Barlow
Katie Fantauzzo
Sue Majka
Jeff Moore

Student Executive Committee
Hannah Moran, Chair
Hannah Jones
Tina Piarowski
Katie Alemany
Ian Purvis
Kyle Northington
Omar Ochoa
Samy Landgrave
Yunus Ozekin
Trevor Isner
Sylvia Nunez
Addison Rains
Wolf Schleicher
Sophia Kim

Appendix 1: Preliminary exam rubric

	KNOWLEDGE AND SCHOLARSHIP Identifies background and existing information.	**score:**
4	• Strong evidence of synthesis of concepts covered in coursework. • Terms, concepts, principles and methods are correct and described in depth. • Clearly identifies research problem in the field, based on prior knowledge. • Critiques prior work on the problem. • Demonstrates command of literature relevant to proposal. • Information presented is appropriately cited.	**comments:**
3	• Evidence of synthesis of concepts covered in coursework. • Terms, concepts, principles and methods are mostly correct and described with sufficient depth. • Identifies research problem in the field, based on prior knowledge. • Some critique of prior work on the problem. • Demonstrates familiarity with the literature relevant to proposal. • Most information presented is appropriately cited.	
2	• Some evidence of synthesis of concepts covered in coursework. • Terms, concepts, principles and methods are mostly correct but lacking important details. • Description of prior knowledge is adequate. • Describes, but does not critique prior work on the problem. • Demonstrates familiarity with the literature relevant to the proposal, but some relevant literature is neglected. • Information presented is cited, but could be improved.	
1	• Little to no evidence of synthesis of concepts covered in coursework. • Descriptions of terms, concepts, principles and methods are insufficient and/or incorrect. • Insufficient description of prior knowledge. • Insufficient description of prior work on the problem. • Insufficient incorporation of literature relevant to the proposal. • Information presented is rarely cited.	
	SCIENTIFIC REASONING AND EXPERIMENTAL DESIGN Describes hypothesis and experiments designed to test it.	**score:**
4	• Hypothesis is clearly stated, along with compelling rationale • Compelling rationale for experimental approach is provided. • Experiments are clearly described and appropriate. • Clearly describes controls and how they impact interpretation of the results. • Alternative experimental approaches are clearly described. • Clearly describes how results impact the hypothesis. • Identifies weaknesses in interpretation. • Alternative results are described, and impact on the hypothesis is considered.	**comments:**

3	• Hypothesis is stated and rationale is provided. • Rationale for experimental approach is provided. • Description of experiments is mostly clear and appropriate. • Controls and their interpretation are described. • Alternative experimental approaches are described. • Describes how results impact the hypothesis. • Alternative results are described and connected to the hypothesis.	
2	• Hypothesis is stated, but rationale is weak and could be improved. • Rationale for experimental approach is provided, but is unclear. • Description of experiments lacks some important details. • Controls are described, but description of interpretation is weak. • Alternative experimental approaches are described, but not developed. • Description of how the results impact the hypothesis lacks depth. • Alternative results are described, but not clearly connected to the hypothesis.	
1	• Hypothesis is unclear and rationale is weak. • Insufficient rationale for experimental approach. • Description of experiments is unclear or inappropriate. • Controls are poorly described. • Alternative experimental approaches are insufficiently described. • Insufficient description of how the results impact the hypothesis. • Alternative results are insufficiently described.	
	WRITTEN COMMUNICATION Communicates knowledge and reasoning through writing and graphics.	**score:**
4	• Writing is exceptionally clear and effective. • Graphics are well-organized. • Terms, concepts, principles and methods are used correctly.	**comments:**
3	• Writing is mostly clear and effective. • Most aspects of graphics are well-organized. • Most terms, concepts, principles and methods are used correctly.	
2	• Some aspects of writing are clear and effective. • Some aspects graphics are well-organized. • Some terms, concepts, principles and methods are used correctly.	
1	• Writing is unclear and ineffective. • Graphics are disorganized. • Terms, concepts, principles and methods are lacking and/or incorrect.	
	ORAL COMMUNICATION Communicates scientific knowledge and reasoning through speech and visual displays.	**score:**
4	• Oral communication is exceptionally clear and effective. • Graphics are well-organized. • Response to questions consistently incorporates appropriate evidence. • Response to questions is reflective.	**comments:**

3	• Most of oral communication is clear and effective. • Most graphics are well-organized. • Response to questions often incorporates appropriate evidence. • Response to questions with occasional prompting or “leading” required.	
2	• Some aspects of the oral communication are clear and effective. • Some aspects of the graphics are well-organized. • Response to questions incorrectly, even after prompting or “leading”.	
1	• Oral communication is unclear and ineffective. • Graphics are disorganized. • Fails to respond to questions.	

Appendix 2: GDDR T32 Trainee Selection and Reappointment

Each year, GDDR Training Faculty will nominate outstanding students working on projects relevant to the Genetics of Development, Disease and Regeneration. Only CSD Program students who have passed their Preliminary Exam, are entering their second or third year, and are working in the labs of GDDR Training Faculty will be eligible for support. Training Faculty and their mentees will submit the student's biosketch, a one-page description of the student's research and career goals, and a letter of recommendation. The Trainee Selection and Oversight Committee will review nominations and identify the most competitive applicants for interviews (typically 2X the number of available trainee slots). Each trainee will be supported for a maximum of 2 years, contingent on progress as determined by the Trainee Selection and Oversight Committee. While supported by the training grant, trainees are expected to submit abstracts and present their work at national or international conferences and participate in all GDDR functions, including the Virtual Roundtable, Developing Scholars Program, and Summer Symposium.

Applicant Eligibility

1. CSD Program student
2. Sponsored by a member of the GDDR Training Faculty
3. Successful completion of the Preliminary Examination
    a. 1st year students may apply for the training grant before they take the Preliminary Exam but must pass the Exam before appointment
4. Entering 2nd or 3rd year of training
5. Meets NIH T32 eligibility criteria

Application Materials and Application Process

1. Application materials will be submitted to Caitlin Moloney, CSD Program Administrator
2. Mentors and mentees will jointly prepare and submit application materials
3. Application materials will include:
    a. Applicant biosketch (**for part D. Scholastic Performance, please list only graduate courses).
    b. One-page description of applicant research project, objectives, and career goals. This can be written in the form of a Specific Aims page, with the aims consisting of research, training and career goals.
    c. Letter of recommendation from faculty sponsor

Selection Process

1. All members of the Trainee Selection and Oversight Committee will review all applications
2. Committee members meet to select applicants for interviews
3. The full committee will meet with each applicant for interviews lasting approximately 15 minutes. Committee members will ask questions of applicants using a script developed prior to the interviews to ensure that each applicant is asked the same questions.
    a. Committee members who are in conflict with an applicant will be excused from interviewing and scoring that applicant
4. Applicants will be scored using a 1-9 NIH scoring scale on the following criteria:
    a. Prior academic performance in graduate courses
    b. Prior research accomplishment
    c. Clarity of research objectives

d. Clarity of career objectives
e. Strength of fitness with the training objectives of the GDDR T32

Application and Appointment Timeline

1. Applications solicited and received in May
2. Candidate interviews in June
3. Preliminary Exam by the 3rd week of June
4. Trainee appointments to the training grant following the Preliminary Exam
5. Trainee appointments begin July 1

Appointment Strategy

The GDDR T32 will support 6 students annually. Each trainee is eligible for up to two years of support. To ensure continuity of junior and senior trainees, in the second year of the T32 a maximum of three of the original six trainees will be reappointed for a second year of support, thereby permitting appointment of three new trainees.

Trainee Oversight and Selection Committee

This committee will consist of the Director of the GDDR T32 Program and members of the Training Faculty chosen to represent the breadth of Program research interests and to include individuals from diverse backgrounds and different career stages.

Appendix 3: Comprehensive Exam Rubric

PURPOSE OF THE SCORING RUBRIC:

This scoring rubric is intended to help standardize the comprehensive exam process. Its purpose is to improve transparency, calibrate expectations, and to ensure that CSD students are treated equitably. Comprehensive exams are customized for each student, making the exam process inherently subjective and difficult to standardize. Nonetheless, this scoring rubric provides a framework for evaluating the student in the most objective fashion possible given the complexities of the exam. It is meant to have some flexibility.

SCORING RUBRIC:

This rubric contains examples of exam performance and should not be viewed as a strict checklist.

	KNOWLEDGE AND SCHOLARSHIP Identifies background, existing information, and reasoning.	**score:**
4	• Strong evidence of synthesis of concepts to support the thesis topic. • Terms, concepts, principles and methods are correct and described in depth. • Clearly identifies research problem in the field, based on prior knowledge. • Critiques prior work on the problem. • Demonstrates command of literature relevant to the thesis topic. • Information presented is appropriately cited. • Demonstrates independence in reasoning and understanding of the topic.	**comments:**
3	• Evidence of synthesis of concepts to support the thesis topic. • Terms, concepts, principles and methods are mostly correct and described with sufficient depth. • Identifies research problem in the field, based on prior knowledge. • Some critique of prior work on the problem. • Demonstrates familiarity with the literature relevant to the thesis topic. • Most information presented is appropriately cited. • Shows some independence in reasoning and understanding of the topic.	
2	• Some evidence of synthesis of concepts to support the thesis topic. • Terms, concepts, principles and methods are mostly correct but lacking important details. • Description of prior knowledge is minimal. • Describes, but does not critique prior work on the problem. • Demonstrates familiarity with the literature relevant to the thesis topic, but some relevant literature or preliminary data are neglected. • Information presented is cited, but could be improved. • Shows little independence in reasoning and understanding of the topic.	
1	• Little to no evidence of synthesis of concepts to support the thesis topic. • Descriptions of terms, concepts, principles and methods are insufficient and/or incorrect. • Insufficient description of prior knowledge. • Insufficient description of prior work on the problem. • Insufficient incorporation of literature relevant to the thesis topic. • Information presented is rarely cited/attributed. • Lacks independence in reasoning and understanding of the topic.	
	SCIENTIFIC REASONING AND EXPERIMENTAL DESIGN Written or oral description of hypotheses and experiments designed to test it.	**score:**

4	• Hypothesis is clearly stated, along with compelling rationale • Compelling rationale for experimental approach is provided. • Experiments are clearly described, powered, and appropriate. • Clearly describes controls and how they impact interpretation of the results. • Alternative experimental approaches are clearly described. • Clearly describes how experiments and results test the hypothesis. • Identifies weaknesses in interpretation. • Alternative results are described, and impact on the hypothesis is considered. • Statistics, rigor, reproducibility and sex as a biological variable are deeply considered and suitable to the thesis project.	**comments:**
3	• Hypothesis is stated and rationale is provided. • Rationale for experimental approach is provided. • Description of experiments is mostly clear, powered, and appropriate. • Controls and their interpretation are described. • Alternative experimental approaches are described. • Describes how experiments and results test the hypothesis. • Alternative results are described and connected to the hypothesis. • Statistics, rigor, reproducibility and sex as a biological variable are sufficiently addressed and suitable to the thesis project.	
2	• Hypothesis is stated, but rationale is weak and could be improved. • Rationale for experimental approach is provided, but is unclear or weak. • Description of experiments lacks some important details or is underpowered. • Controls are described, but description of interpretation is weak. • Alternative experimental approaches are described, but not developed. • Description of how experiments and results test the hypothesis lacks depth. • Alternative results are described, but not clearly connected to the hypothesis. • Statistics, rigor, reproducibility and sex as a biological variable are incompletely addressed.	
1	• Hypothesis is unclear and rationale is weak. • Insufficient rationale for experimental approach. • Description of experiments is unclear or inappropriate. • Controls are poorly described. • Alternative experimental approaches are insufficiently described. • Insufficient description of how experiments and results test the hypothesis. • Alternative results are insufficiently described. • Statistics, rigor, reproducibility and sex as a biological variable are not addressed.	
	WRITTEN COMMUNICATION Communicates knowledge and reasoning through writing and graphics.	**score:**
4	• Writing is clear and effective. • Graphics are well-organized and effective. • Terms, concepts, principles and methods are used correctly. • Writing takes full advantage of the student's preliminary data, experience, and/or the supporting literature. • Citations are organized, appropriate, and of sufficient depth.	**comments:**
3	• Writing is mostly clear and effective. • Most aspects of graphics are well-organized and effective. • Most terms, concepts, principles and methods are used correctly. • Writing partially takes advantage of the student's preliminary data, experience, and/or the supporting literature. • Citations are organized, but sometimes inappropriate or of limited depth.	

2	• Some aspects of writing are clear and effective. • Some aspects of graphics are effective or the graphics are incomplete. • Some terms, concepts, principles and methods are used correctly. • Writing poorly reflects the student's preliminary data, their experience, and/or the supporting literature. • Citations are poorly organized, inappropriate, or of insufficient depth.	
1	• Writing is unclear and ineffective. • Graphics are disorganized or lacking. • Terms, concepts, principles and methods are lacking and/or incorrect. • Writing does not utilize the student's preliminary data, their experience, and/or the literature. • Citations are unorganized, used inappropriately, or lacking.	
	ORAL COMMUNICATION Communicates scientific knowledge and reasoning through speech and visual displays.	**score:**
4	• Oral communication is exceptionally clear and effective. • Graphics are well-organized and effective. • The public seminar is highly effective, engaging, and on-time. • Response to questions (public and with the committee) consistently incorporates appropriate evidence and reasoning. • Response to questions is reflective and shows independent thinking.	**comments:**
3	• Most of oral communication is clear and effective. • Most graphics are well-organized and effective. • The public seminar is effective, but could be improved for clarity, engagement, or time. • Response to questions (public and with the committee) often incorporates appropriate evidence and reasoning. • Response to questions is correct after substantial prompting or "leading".	
2	• Some aspects of the oral communication are clear and effective. • Some aspects of the graphics are effective or the graphics are incomplete. • The public seminar is somewhat effective, lacks logical flow, or is inappropriately brief or long. • Response to questions frequently incorrect, even after substantial prompting or "leading".	
1	• Oral communication is unclear and ineffective. • The public seminar is ineffective. • Graphics are disorganized or lacking. • Routinely fails to answer questions correctly or coherently.	

Appendix 4. Template for Thesis Committee Meeting Progress Report

Written progress reports can be useful tools for structuring your committee meetings. It is recommended that you send your committee members a brief progress report ~1 week before your committee meeting. The goals of the progress report are to update your committee on your progress and accomplishments, identify any needs or concerns, and identify goals for the future. Below is a suggested format for your progress report.

Student Name:

Year started graduate school:

Year of comps:

Meeting date:

Last meeting date:

Committee members:

Thesis mentor:

Title of project:

Summary of progress since last meeting:

Thesis project:

Supporting projects/collaborations/pending publications:

Manuscripts:

Meetings, abstracts and form of presentation (poster/talk):

Fellowships/ Grants:

Other experience, accomplishments:

Potential timeline for the upcoming year and graduation:

Appendix 5. Office of Research Education Policy -

Program faculty member who leaves the institution and associated students.

The Office of Research Education (ORE) and the School of Medicine (SOM) PhD programs work to ensure that all ORE PhD students have optimal PhD training conditions. Major challenges occur, however, when a student's PhD mentor leaves the institution, and the student has not completed the PhD requirements. Depending on the student's stage in her/his/their research and the program, the challenges will vary. ORE's policy regarding students whose mentors leave the institution is defined below. The guidelines below are to be considered as the minimal requirements and that individual PhD program may have additional ones. All PhD program faculty need to acknowledge and agree to this policy before accepting a student for PhD training.

1. Program Faculty member's responsibilities: We understand that there are stages in negotiation of a position at another institution that require confidentiality. However, once a Program faculty member begins to negotiate an option to leave CU-AMC (i.e., PI is negotiating an offer from a non-AMC institution), ORE policy requires the PI to immediately inform the student, the ORE Associate Dean, relevant Program Director(s) (PD), and, depending on the student's stage in the program, the student's PhD committee. This requirement has the best interests of the student in mind and also allows for appropriate thoughtful consideration and discussion of what is the best course for the student.

2. Student considerations

a) 1st year/rotating students: If a program faculty member is actively seeking a position at a non-AMC institution or is likely to leave the institution within a ~ year (i.e. has an offer or is negotiating an offer from a non-AMC institution), ORE policy does not allow the faculty member to mentor a rotation student while negotiations are on-going or if the faculty has received an offer. Also, the PD and student(s) need to know ASAP so that students rotate with training faculty who are CU-AMC faculty.

b) Students who have chosen a PI who is leaving the institution as mentor:

i) Students who have chosen a PhD mentor but not yet completed the comprehensive examination (pre-comp student). Until the program faculty member leaves the institution and the student's training path has been determined, the faculty member will remain responsible for the student's tuition, stipend and fees. ORE's strong recommendation is that a pre-comp student who has been in her/his/their mentor's lab for < 1 year (not including rotation time) will select a new mentor. The student might first consider other training faculty with whom rotations were done during their first year. If none of these are possible options, an additional rotation might be considered. While it is not required that the student do another rotation before joining a new thesis lab, this can be arranged by the PD if needed.

Alternatively, a pre-comps student may choose to move with the mentor. In this case, ORE policy is that the student withdraw from the ORE PhD program and enroll in a program at the new institution. However, the major goal is the best interest of the

students which may require flexibility, e.g., if student has been with mentor well over a year, has a comps committee set up and about to do comps - as one example. This decision should be reached by discussion with the student and the comps committee/graduate advisory committee of the program and with final approval by the Program Director.

ii) Post-comp students. Until the program faculty member leaves the institution and until the student's training path has been determined, the faculty member will remain responsible for the student's tuition, stipend and fees. Depending on the stage of the student's research and training, the best course for the student might differ. If the student remains with the PI, the PI and student will develop a detailed training plan that specifies (1) whether the student will continue her/his/their research at the faculty member's new institution or remain at CU-AMC; (2) the frequency (at least weekly) of regular meetings between the faculty member and student; (3) financial and technical support for the student's research (e.g., ordering supplies, continuation of any PRA or other lab member assistance); (3) steps taken to ensure minimal impact on the student's training and time to degree; and (4) a detailed plan to resolve any problems that might develop is needed.

For students who remain at CU-AMC after the mentor departs to a new institution: The student, student's mentor, the student's thesis committee chair, and the PD will write and sign a memorandum of understanding (MOU) that specifies the laboratory & desk space and technical and financial support that will be available to the student as well as a CU-AMC on-site co-mentor. The co-mentor will serve as a scientific advisor and advocate for the student to ensure that the mentoring plan is followed and program requirements are met. The required MOU is discussed further below in #3.

iii) Students who opt to or are forced to change mentors (e.g., mentor insists student move but student is unable to do so). The PD will make a good faith effort to facilitate the student's ability to find another mentor. The choice of a new mentor may also lead to changes in thesis committee membership. Accordingly, decisions about new mentors or additional rotations will be left to the discretion of the PD.

In some cases, it may not be possible to establish a new mentor/mentee relationship. Failing to identify a new thesis laboratory if unable to continue with the leaving PI may result in dismissal from the ORE PhD program. In addition, lack of academic progress may be cause for dismissal from a program. ORE strongly recommends that PDs place specific time-lines on the decision-making by students. This includes both the decision about whether the student will leave with the PI or select a new lab.

3. Financial responsibilities. Faculty who leave UC-AMC and continue as the mentor for a student in an ORE PhD program will remain responsible for the student's tuition, stipend and all fees until completion of the PhD. On the other hand, if a program faculty member leaves the institution but will not continue as a student's primary mentor, he/she/they will remain responsible for the student's tuition, stipend and fees until a new training plan has been approved by the student, PI, student's PhD committee (if one has already been formed) and

the Director(s) of the PhD program. A formal MOU will be put in place that is agreed to and signed by the departing mentor, the PD(s), and the thesis advisory committee chair. The MOU will detail the financial arrangements for the trainee's stipend, necessary supplies and equipment, and defined space*.

** Agreements regarding space may require the signature of the Dean of the relevant school.*
*** If deemed necessary for the best interest of the trainee, ORE expects the mentee's departing PI to underwrite the short rotation.*

4. Mediating problems that might arise: If the PI leaves the institution and the student continues on the same project, then an individual (typically the thesis committee chair) will be designated to mediate problems that arise. If the student elects to pick a different individual from their thesis committee, they will do so in consultation with the PD and her/his/their thesis committee chair. Thus, the student will have an assigned co- mentor whom he/she/they and the PhD program trust and expect to raise any concerns as soon as they arise and advocate for the student's best interests. As always, any situations that emerge and raise issues for the student about equity, retaliation, discrimination, and/or harassment need to be addressed and reported as required (e.g., Office of Equity).

Approved March 14, 2022

Appendix 6: ORE Policy on External employment for Graduate Students

Background

Graduate students admitted to ORE Programs receive an annual stipend of $34,000, health insurance coverage and full tuition. They are considered full time students and, per NIH policy, expected to devote a minimum of 40 hours to their PhD training.

Students may wish to take on additional paid employment for financial reasons or to gain experience in teaching, industry or explore other career opportunities. This may be complementary and beneficial to their training and professional development in University of Colorado graduate programs.

In the past students have taken on additional external employment, in some cases becoming self-funded and essentially full-time employees of another company or institution, while simultaneously attempting to complete their PhD training at the University of Colorado. This has been detrimental to academic progress and the student-mentor relationship.

There are currently no guidelines or policies regarding Graduate students engaging in external employment.

Policy

Graduate students, in good academic standing, may, with appropriate approval, work a maximum of 10 hours per week in external employment.

Such employment must be approved in advance, in writing by the Students Program Director for first year students, and by Program Director and Thesis advisor for those students who have entered a laboratory or who transfer or are directly admitted to a laboratory.

The Office of Research Education and the Students advisory/ thesis committee must also be informed of any students approved for external employment.

External employment must not conflict with any required elements of a student's PhD training. Examples include but are not limited to: laboratory research, classes, assessments, seminars, journal clubs, lab meetings, retreats and other required program or ORE activities.

Students must remain in good academic standing in order to continue their external employment.

Approvals must be reviewed and reported by the student's Program and Advisory committee every 6 months. Students will attest that they have not exceeded approved external employment hours.

Students receiving extramural support for their PhD from training grants or other sources are subject to the requirements and policies of those funding entities and may not be eligible for external employment.

Failure to disclose external employment, falsely reporting or willfully exceeding approved hours will be grounds for disciplinary action and possible dismissal from the PhD program.

Definitions

External employment- any paid (or compensated in kind) work or work product outside of a student's PhD training program and the Office of Research Education.

Good academic standing-maintaining a minimum of a B grade in all classes, rotations and thesis work. Passing Preliminary and comprehensive exams. Meeting other Program requirements, as described in Program Handbooks. Demonstrating satisfactory and timely progress toward the PhD, as determined by the Students Advisory/Thesis Committee.

Resolution of problems

Students may appeal denial or rescinding of approval for external employment on the basis that policies were not followed or applied fairly. Appeals will be reviewed by the Associate Dean for Research Education and their decision will be final.