Cell Biology, Stem Cells and Development Program

GRADUATE SCHOOL

UNIVERSITY OF COLORADO
DENVER | ANSCHUTZ MEDICAL CAMPUS

STUDENT HANDBOOK

Updated August 2016

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University of Colorado School of Medicine
Graduate Program in Cell Biology, Stem Cells and Development (CSD)

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I. Mission

The primary goal of the **Cell Biology, Stem Cells and Development** (CSD) Program 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 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 and Developmental Biology.

II. Graduate School Administration

The Graduate Program in Cell Biology, Stem Cells and Development (**CSD**) is part of the Graduate School of the University of Colorado, which is an equal opportunity institution. The graduate programs at the Anschutz Medical Campus are part of the Graduate School.

The University of Colorado Denver Graduate School Campus publishes the Graduate Student Handbook, which includes general information and rules concerning graduate students, as well as specific information on Honor Code and Grievance Procedures. This information applies to students in all programs (http://www.ucdenver.edu/academics/colleges/Graduate-School/current/Pages/resources.aspx). The purpose of this handbook is to relay additional information specific to the CSD program.

A. Student Support. At present, students accepted in the Ph.D. program are provided full tuition, health insurance, and a stipend of $28,500 per year for living expenses (for the academic year 2015-16). 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.**

B. 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.

III. Program Components

1ST YEAR STUDENTS

COURSEWORK, LABORATORY ROTATIONS, AND PRELIMINARY EXAMINATION

Fall Semester - Required Registration

Biomedical Sciences Course Core **IDPT 7806-07-08-09** 10 units

Course Director: Drs. M. Churchill, R. Davis, R. Evans, A. Bradford, K. Artinger,
This section of the course covers structural, cellular and molecular biology.

Ethics in Research **PHCL 7605** 1 unit

Course Director: Dr. Jim Sikela
Course is designed to introduce issues around ethics of research, publication, and reviewing of manuscripts and grants.

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

Cells, Development, and Cancer 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**. Seminar schedules will be distributed by the Program Administrator each fall semester and are also available on the program's website.

Spring Semester - Required Registration

Stem Cells and Development **CSDV 7605** 4 units

Course Director: Dr. Bruce Appel
Course will cover topics in the development of the organism, such as cell birth, migration, differentiation, and death, in a variety of developmental systems. Part of the course is devoted to the discussion of original literature in the field.

1 Elective **(see p. 20 for a list of courses)** variable

Course Director: Varies per semester
Course will focus on specific topics each semester.

Research in CSDV (Lab Rotation) **CSDV 7650 (003)** 1 unit
(for 3rd lab rotation)

Coordinated by the GAC Chair, Dr. Tom Evans.
Students will perform research in the laboratory of one of the members of the program. The rotation will be followed by an oral presentation.

Cells, Development, and Cancer 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**. Seminar schedules will be distributed by the Program Administrator each fall semester and are also available on the program's website.

Summer Semester

Research in CSDV **CSDV 7650** 3 units

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

A. 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. Students should discuss their interests with several potential faculty mentors, several weeks or more before the start of the rotation.

ROTATION SCHEDULE FOR 2015-2016:

Fall 1st Rotation: August 31, 2015 - November 20, 2015

Fall 2nd Rotation: November 23, 2014 - February 26, 2015

Spring 3rd Rotation: February 29, 2015 – May 20, 2015

B. 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. Official dates for rotations are set by the Graduate School. Medical Scientist Training Program (MSTP) students must complete two rotations (during the summers of the first and second year of Medical School).

C. 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 his/her 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.

D. Rotation Seminar. At the end of the 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 15 minutes in length (12 minute talk + 3 minutes for questions). The student must rehearse the seminar with his or her 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 - explain briefly 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!

E. 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 15th** 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.

F. 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 his/her 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 s/he (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 each member of the committee no later than 1 week before the date of the oral examination. This deadline is firm. The proposal is to follow the NIH pre-doctoral fellowship format and can be no longer than 6 pages (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. 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. Students will be graded on a Pass or Fail basis, as decided by a majority of the committee. The final grading will incorporate a combined evaluation of the written proposal as well as of the oral examination. Both aspects of the examination will be weighted equally.

9. In the event of a failed exam, the situation will be referred to the Graduate Advising Committee (GAC) for CSD for a remediation and exam retake plan to be completed by the end of the summer semester.

2nd Year Students

COURSEWORK, PRE-THESIS RESEARCH AND THE COMPREHENSIVE EXAMINATION

Fall and Spring Semesters – Required Registration

Research in CSDV **CSDV-7650 (OV1 and OV3)** 1-5 unit*
Course Director: Dr. Bruce Appel
Laboratory research with CSD Training Program faculty.

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

1 Elective or Advanced Topics Course **(see p. 21 for list of courses)** variable+
Course Director: Varies per semester
Course will focus on specific topics each semester.
Can be taken in either the fall or the spring (after the first year, one elective or advance topic class is required per academic year.

+ *the fall and the spring semesters must <u>each</u> total 5units*

All students are required to complete a course in statistics by the end of the fourth year. The recommended course is BIOS 6606, generally offered each fall semester. Students who have already completed a similar course may request an exemption from the Program Director.

NOTE: Each <u>fall semester</u>, all students must complete the forms for insurance plan selection. Contact the Student Insurance Coordinator, 303-315-0800 with questions. These forms must be completed whether or not you plan to participate in a Student Health Insurance Plan.

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

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 should be scheduled with the program administrator at least one month in advance, although the presentation can be scheduled at any time during the year, i.e., earlier is better. 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.

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 Student Handbook on Comprehensive Examination policies and deadlines, and pick up a packet of instructions and forms from the Graduate School well ahead of the planned examination so all required paperwork can be completed on time. Completed paperwork must be submitted to the Graduate School no later than two weeks prior to the examination date (http://www.ucdenver.edu/academics/colleges/Graduate-School/current/Pages/comprehensive-exam.aspx). **Note:** A student must be registered at the time he/she takes the Comprehensive Examination.

Students must take the Graduate School Comprehensive Examination for admission to candidacy for the CSD Ph.D. by the **end of the summer of their second year but before January 1st 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 majority of the members, including the chair, must be from the core 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 GAC with the names of the 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 Student Handbook. 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 the graduate student handbook, the comprehensive examination "will test your mastery of a broad field of knowledge, not merely the formal course work completed." The student should consult with his or her committee members prior to the exam as to the subject areas each member expects the student to have mastered.

1. Written proposal (NRSA format)

Listed below are **guidelines** for the proposal:

Title	
Short Introduction and Specific Aims	1.0 page
Research Strategy	6.0 pages
Rationale	
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.

2. The Exam

The candidate for the PhD should prepare a talk of 30 minutes on his/her thesis proposal and preliminary results. 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 and the Comprehensive Examination Committee will be requested to leave. There will be two types of questions from the committee:

1. Questions on the written and oral proposal: ~ 1hr.
2. General knowledge questions primarily from the course work of the candidate: ~ 1hr.

After the questions the candidate will be asked to leave, and the committee will discuss the results of the different exam components and reach a recommendation. The committee chair will bring the recommendations of the committee back to the candidate and fill out the appropriate forms of the Graduate School.

3. Possible Results

Pass (no conditions)
Conditional Pass (conditions must be detailed)
Continuation of examination (comments must be included)
Fail (the student must leave the graduate program)

4. Application to the Graduate School for Admission to Candidacy

Applications must be completed no later than three weeks before the exam. Forms are available from the Graduate School and must be approved by the Program Director and returned to the Graduate School Office. 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 prior to the exam date.

NOTE: After passing the comprehensive exam, all PhD students are required to register for a minimum of five (5) hours of Doctoral Thesis CSDV 8990 (instead of CSDV 7650) 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.

3rd Year and Advanced Students

Fall and Spring Semesters – Required Registration

1 Elective or Advanced Topics Course **(see p. 21 for list of courses)** variable

Course Director: Varies per semester
Course will focus on specific topics each semester.
Can be taken in either the fall or the spring *(after the first year, one elective or advance topic class is required per academic year)*

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

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.

+ *the fall and the spring semesters must each total 5units*

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

NOTE: Comprehensive exam (see p. 11) must be taken by December of Year 03.

NOTE: Each Fall semester, all students must complete the forms for insurance plan selection. Contact the Student Insurance Coordinator, 303-315-0800 with questions. These forms must be completed whether or not you plan to participate in a Student Health Insurance Plan.

A. 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. Thesis Research
Within one month of the completion of rotations, each student must reach a mutual agreement with a faculty sponsor who will serve as their thesis advisor. The choice of thesis advisor must be formally approved by the Graduate Advisory Committee. The student and faculty member together plan a thesis project. Doctoral level work requires a close collaboration with a faculty mentor. It is the responsibility of the student to establish and maintain that relationship. Continuation in the PhD program depends upon the student identifying a mutually agreeable thesis laboratory. The thesis research is the

responsibility of each student, who must be able to conceive, carry out and write up (as the thesis) a significant body of work in a logical manner. All faculty are available for discussion and consultation. All students are encouraged to apply for fellowship support from outside agencies, e.g. NIH, NSF, Howard Hughes Medical Institute, March of Dimes, etc.

C. Thesis Committee Meetings

It is recommended that the students meet with their committees every six months. The candidate should provide the program with a 20-30 minute talk should be give 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. Students are required to meet at least once each year. The following documentation is required and copies must be submitted to the Program Administrator for inclusion into the student's file:

- date of meeting
- student's written report to the thesis committee
- the committee's responses/recommendations
- list of attendees for each meeting
- signatures of student and committee chairman

D. 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 Chairman of the Thesis Committee will meet with the GAC to discuss the student's progress and will submit a brief written summary of the outcome of each meeting with the student.

Upon completion of a body of original research that constitutes a significant contribution of new knowledge to the field of cell and developmental 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

The rules of the University of Colorado Graduate School concerning a PhD thesis are as follows: **"**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, he/she 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 his/her progress. The Chair must be a member of the Program. It cannot be emphasized enough, however, that each student is responsible for his/her own progress.

4. Guidelines for Supervision of Thesis Work

1. Since 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 Committee. Students must submit a written update on their progress to the Committee at least one week before the Committee meeting. The Chair of the Committee should provide the student and the Program Director with a written summary of the student's progress and recommendations of the thesis Committee. The meetings should be documented (date of meeting, items discussed, committee recommendations, list of attendees, signatures of the student and committee chairman) and a copy provided to the Program Administrator for inclusion into the student's file. The Thesis Committee can recommend more frequent meetings when they feel more careful monitoring is warranted.

3. When the student and his/her 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. The Staff Assistant of the Graduate School holds seminars twice a year on the proper formatting of the 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 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 his/her 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 in the Graduate School office at least three weeks

in advance. The examination must be taken at least three weeks prior to the date on which the degree is to be conferred. Degrees are conferred in May and December. The student must be registered for a minimum of 5 credits 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.

4. The thesis defense is the final examination of the thesis and related topics. It includes an oral presentation of the salient points of the research, its conclusions and its integration with the rest of the field. The oral presentation 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.

5. 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.

6. 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.

7. The student is responsible for providing a bound copy of the thesis to the Thesis Advisor, the members of the Thesis Committee, the Program and the Graduate School.

IV. Graduate School standards

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 for the PhD (research hours cannot be accumulated until the semester before the Comprehensive Exam is passed). All work undertaken as a graduate student must be in compliance with the academic Code of Honor (see Appendix A of UCD-AMC Graduate Student Handbook).

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's record will be reviewed by the GAC. At this point the student may be asked to retake part of the exam, the entire exam, or 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 his/her next two semesters in order to be removed from Academic Probation. The Graduate School requires that after a student is put on academic probation, he/she 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. Change in Thesis Lab. If a student leaves a thesis lab for any reason, (but is still considered by the CSD GAC to be in good academic standing) the student has 1 current semester (but no more than 90 days) to relocate to another thesis lab and determine a new thesis advisor if necessary. It is the student's responsibility to locate another thesis lab and/or advisor. Within those 90 days, the student must rotate for a minimum of 6 weeks in a potential new advisor's lab, so that the final decision to join

the new lab can be made within the 1 semester/90 day window.

F. Time Limit of PhD Studies. Students have six years from the time they enter Graduate School to complete all requirements for the degree. Continuation after six years requires the approval of the student's Thesis Committee and the CSD Steering Committee. It will also be necessary to pass a second comprehensive examination, similar in content to the first, before a thesis defense can be scheduled.

G. Leave of absence. It is the policy of the CSD program to grant leave of absences only under extreme circumstances. A formal letter must be submitted to the GAC and program director explaining the reasons a leave of absence is necessary. Before the leave is taken it must be approved by the GAC and the Graduate School. After a student joins a thesis lab, the PI must also approve the leave of absence. As per the rules of the Graduate School, only 15 days of paid leave is guaranteed, after that time period it is under the discretion of the program and the PI.

V. Obligations and Record Keeping

A. Attendance. All graduate students are **required** to attend the weekly Cells, Development and Cancer (CDC) 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.

The students also organize a bi-monthly journal club, and all CSD students are **required** to participate.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 US citizens 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 paper work for establishing Colorado Residency must be filed with the Registrar prior to second year registration.

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 his/her 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 (2^{nd} 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 telephone, 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. In addition, the student member of the advising committee also serves on the Steering Committee of the graduate program.

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 (three) 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.

Steering Committee: This committee consists of the chairs of each of the 6 graduate program committees plus additional members as deemed appropriate by the director of the program.

Committee of Students: Consists of the student members of the 5 Graduate Program Committees (Advising, Recruitment, Curriculum, Membership and Retreat) and is chaired by the 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.

UCD-AMC
Graduate Program in Cell Biology, Stem Cells and Development

I. Advance Topics in Cell Biology, Stem Cells and Development, and electives offered by other departments and/or programs.

Students must take at least four Advanced Topics (CSDV 7670, content varies year to year) or electives, beginning in year two.

A. Advance Topics in Cell Biology Stem Cells and Development (CSDV 7670)

Each CSDV course is 1-2 credits and comprises 15-30 hrs of meeting time within a semester. In general, one CSDV 7670 course will be offered per year. Students are encouraged to submit ideas for CSDV Advanced Topics Courses of special interest to them to the Curriculum Committee. Students who are in the program for longer than five years are required to take one additional Advanced Topic per year until graduation. This requirement has been in effect since the 1991-92 academic year.

B. 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. However, below we list several frequently offered electives for advanced graduate students.

IDPT 7646	Tissue Biology and Disease Mechanism	J. Hooper
IMMU 7630	Overview of Immunology	J. Cohen
MOLB 7800	Advanced Topics in Molecular Biology	J. Kieft
NRSC 7615	Developmental Neurobiology	A. Ribera/K. Artinger
PHCL 7606	Receptors and Cell Signaling	M. Dell'Acqua
CANB 7600	Cancer Biology	S. Nordeen

C. 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.

Current students as of September 2016

STUDENT	START YEAR	THESIS ADVISOR	PRELIMS	COMPS	THESIS COMMITTEE CHAIR
Jason Dinella	2010	Koch	6/11	12/12	Koster
David Castillo	2010 (BSP)	Barlow	6/11	9/12	Finger
Brian Bayless	2010 (BSP)	Pearson	6/11	11/12	Doctor
Ryan Scannura	2011 (BSP)	Clouthier	7/12	11/13	Williams
Andrew Weems	2011	McMurray	7/12	12/13	Evans
Jason Williams	2011 (BSP)	Artinger	6/12	11/13	Pearson
Colby Fees	2012	Moore	6/13	11/14	Prekeris
Senthilnath Lakshmana Chetty	2012	Koster	6/13	12/14	Lu
Alex Liggett	2012	DeGregori	6/13	11/14	McMurray
Swati Mishra	2012	Siegenthaler	6/13	12/14	Appel
Veronica Fregoso	2013	Law	6/14		
Santiago Fregoso	2013	Franco	6/14		
Jennifer Jones	2013	Dempsey	6/14		
Stephanie Bonney	2013	Siegenthaler	6/14		
Caitlin Winkler	2014	Franco	6/14	3/15	
Tanya Brown	2014 (BSP)	Macklin	6/14		
Sofia Pezoa	2014	Niswander	6/15		
Colleen Bartman	2014	Eckle	6/15		
Jayne Aiken	2014 (BSP)	Moore	6/15		
Ismail Sola	2014 (BSP)	Vibhakar	6/15		
Eric Peterman	2014 (BSP)	Prekeris	6/15		
Anthony Junker	2015	Pearson	6/16		
Katrina Cable	2015	Johnson	6/16		
Mark Gutierrez	2015	Franco	6/16		
Heather Clancy	2015 (HMGP)	Niswander	6/16		
Mellissa Delcont	2015 (MSTP)	Appel	4/14		
Brenna Clay	2016				
Kayt Hawley	2016				
Michael Kaufman	2016				
Samantha Ottman	2016				
Taylor Rutherford	2016				
Adam Soh	2016				
Alexandra Theis	2016				

CSD FACULTY ROSTER AUGUST 2016

Faculty	Primary Dept	CSD Students
Bruce Appel	Pediatrics	Melissa Delcont
Kristin Artinger	Craniofacial Biology	Williams
Linda Barlow	Cell & Developmental Biology	
Emily Bates	Pediatrics	
Brad Bendiak	Cell & Developmental Biology	
Steve Britt	Cell & Developmental Biology	
Joseph Brzezinski	Ophthalmology	
John Caldwell	Cell & Developmental Biology	
David Clouthier	Craniofacial Biology	Scannura
Richard Davis	Biochemistry	
James DeGregori	Biochemistry	Liggett
Peter Dempsey	Pediatrics	Jones
Stijn DeLanghe	Immunology/Peds	
Tobias Eckle	Anesthesiology	Bartman
Tom Evans	Cell & Developmental Biology	
Tom Finger	Cell & Developmental Biology	
Santos Franco	Pediatrics	Fregoso S., Winkler, Gutierrez
Joan Hooper	Cell & Developmental Biology	
Aaron N. Johnson	Biology	Cable
Karen King	Orthopedics	
Peter Koch	Dermatology	Dinella
Maranke Koster	Dermatology	Lakshmana Chetty
Amanda Law	Psychiatry	Fregoso V.
Shi-long Lu	Otolaryngology	
Traci Lyons	Oncology	
Wendy Macklin	Cell & Developmental Biology	Brown
Jim McManaman	Obstetrics and Gynecology/Medicine	
Michael McMurray	Cell & Developmental Biology	Weems
Jeffrey Moore	Cell & Developmental Biology	Fees, Aiken
Lee Niswander	Pediatrics	Pezoa, Clancy
Karin Payne	Orthopedics	
Chad Pearson	Cell & Developmental Biology	Bayless, Junker
Rytis Prekeris	Cell & Developmental Biology	Peterman
Yosef Refaeli	Dermatology	
Tania Reis	Endocrinology, Metabolism, Diabetes	
Diego Restrepo	Cell & Developmental Biology	
Jane Reusch	Endocrinology/Medicine	
Mary Reyland	Craniofacial Biology	
Sue Reynolds	Immunology/Peds	
Dennis Roop	Dermatology	
Julie Siegenthaler	Pediatrics	Mishra, Bonney
Kunhua Song	Cardiology	
Chandra Tucker	Pharmacology	
Xiao-jing Wang	Pathology	
Trevor Williams	Craniofacial Biology	
Rajeev Vibhakar	Pediatrics	Sola

46 active faculty members

2016-17 Committee Membership Roster

Bruce Appel, Director

Recruitment Committee
Jeffrey Moore, Chair
Emily Bates
Santos Franco
Colleen Bartman
Santiago Fregoso

Graduate Advisory Committee
Tom Evans, Chair
Joan Hooper
Joe Brzezinski
Tanya Brown

Curriculum Committee
Lee Niswander, Chair
Rytis Prekeris
Amanda Law
Veronica Fregoso
Mellissa Delcont

Membership Committee
David Clouthier, Chair
Joan Hooper
Linda Barlow
Karen King
Sofia Perez

CSD 2017 Retreat Committee
Julie Siegenthaler, Chair
Tobias Eckle
Jennifer Jones
Eric Peterman

CDC Seminar Series Representatives
Michael McMurray – Cell & Developmental Biology
David Clouthier – Craniofacial Biology
Julie Siegenthaler– Pediatrics
Bob Sclafani – Cancer Center
Colby Fees – CSDV 7000
Jayne Aiken – CSDV 7000

Steering Committee
Bruce Appel
Lee Niswander
David Clouthier
Wendy Macklin
Dennis Roop
Jeff Moore