The PhD Program in Genetics, Genomics & Cancer Biology (GGCB) is an interdepartmental program that focuses on training in the rapidly expanding field of molecular genetics, functional genomics and cancer biology. The program of study leading to a PhD degree is designed to provide graduate students with comprehensive training and research experience to pursue careers as independent scientific investigators in academic, government, or industrial settings.

**Program Director:**
Lucia Languino, PhD  
phone: 3-3442  
Lucia.Languino@jefferson.edu

**GGCB Graduate Studies Committee:**
Sophie Astrof, PhD; Bruno Calabretta, MD, PhD;; Jim Jaynes, PhD; Lucia Languino, PhD (chair); Alex Mazo, PhD; Mý Mahoney, PhD; Steven McKenzie, MD, PhD; Glenn Radice, PhD; Linda Siracusa, PhD; and Andrew South, PhD.

**Training Programs Office:** 910 BLSB  
fax: 215-503-0622

Joanne Balitzky  
phone: 3-6687  
Joanne.Balitzky@jefferson.edu

Kathleen Kieser  
phone: 3-4636  
Kathleen.Kieser@jefferson.edu

**General PhD Requirements:** The PhD degree earned through the GGCB PhD Program requires the student to complete all degree requirements of both the Program and the Jefferson College of Biomedical Sciences (JCBS). JCBS requirements are described at [http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html](http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html)

**Credit Requirements:** A minimum of 180 credits beyond the bachelor’s degree is required. 54 of these credits must be from a combination of required and elective coursework, including seminar/journal club. At least 18 of these 54 credits must be from outside the major Program (not GE courses). The remaining credits are dissertation research credits. Full time enrollment in the Fall Semester is 20 credits, Spring I and II combined is 30 credits, and Summer Semester is 10 credits.

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<th>Fall</th>
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| **Year 1** | GC 550  
10 credits | Advanced Human Genetics  
GE 637  3 credits | Genetics of Model Organisms  
GE 612  3 credits  
(Offered every other year) | Research  
GE 930 |
| | Biochemistry-Genetics Information Transfer  
BI 525  3 credits | Elective  
2-3 credits |                       |                       |
| | Current Literature I  
GE 710  1 credit | Current Literature II  
GE 720  1 credit | Current Literature III  
GE 730  1 credit |                       |
| | Seminar I  
GE 715  1 credit | Seminar II  
GE 725  1 credit | Seminar III  
BI 735  1 credit |                       |
| | Lab Rotation 1  
GE 511  3 credits | Lab Rotation 2  
GE 521  3 credits | Lab Rotation 3  
GE 531  3 credits |                       |
| | Ethics  
GE 640  1 credit | Applied Statistics in Neuroscience  
NS 740  2 credits |                       |                       |
| | Research  
GE 910 | Research  
GE 920 |                       |                       |
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<td>Regulation of Cell Cycle and Apoptosis</td>
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<td>Elective 2-3 credits</td>
<td>Genetics of Model Organisms GE 612 3 credits (Offered every other year)</td>
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<td>GE 636 3 credits</td>
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<td>Elective 2-3 credits</td>
<td>Pathobiology of Cancer GE 651 2 credits</td>
<td>Elective 2-3 credits</td>
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<td>Planning &amp; Writing a Research Grant GC 730 1 credit</td>
<td>Molecular Basis of Cancer GE 652 2 credits</td>
<td>Genomics &amp; Bioinformatics GC 645 3 credits</td>
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<td>Research GE 910</td>
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<td><strong>Year 3</strong></td>
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<td>Research GE 930</td>
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**Transfer of Credits:** A student may be able to receive transfer credits up to a maximum of 18 credits for graduate level courses taken at another institution per the policy described at [http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html](http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html). Check with your Program Director or the Training Programs Office for more details regarding credit transfers.

**Guidelines for Good Standing:**
1. Maintain B average in coursework
2. Performance in core courses – GC 550, GE 612 and GE 637
   a. Lower than a B- in any core course triggers a meeting with the Genetics Graduate Studies Committee to discuss corrective measures
3. Lower than a B- in two of the three core courses may result in dismissal from the Program

**Presentation of Scientific Information**

Current Topics in GGCB: Graduate students present at least twice per year on topics unrelated to their dissertation thesis research during required courses – GE 710, 720, 730. Students in 6th year and beyond are not required to register for this course sequence but are encouraged to attend without credit.

Joint Seminar Series in Biochemistry and Cancer Biology: GGCB students must register for GE 715, 725, 735 each semester and will receive 1 credit each semester for participation. Starting in their third year, each student will present his/her progress once a year in the "Research in Progress" component of the Joint Seminar Series in Biochemistry and Cancer Biology and in which pre- and postdoctoral trainees need to participate. Students in 6th year and beyond are not required to register for this course sequence but are encouraged to attend without credit.
Laboratory Research Rotations: During the first year of study graduate students are required to rotate through at least three different laboratories, each rotation lasting one semester. The purpose of laboratory rotations is threefold: 1) to expose the student to various experimental approaches to laboratory research problems dealing with different aspects of biomedical research, 2) to help the student select a dissertation research advisor, and 3) to assist the faculty in evaluating the student's strengths and areas needing further attention. The student arranges his/her research rotations in consultation with the Program Director on the basis of the student's own interests and the willingness of a faculty member to serve as rotation mentor. The student is expected to spend all available working hours when not attending classes engaged in research-related activities during each of these rotations. At the end of each rotation, the student is required to submit a written report summarizing the rationale of the experiments, the methodologies, results, and a brief discussion. The faculty member in whose laboratory the rotation has occurred then makes a written evaluation of the student's performance for each rotation. With approval of the Program's Graduate Studies Committee, students with substantial research experience and/or a Master's degree, may be allowed to take fewer than the three required rotations, depending upon the individual circumstances.

Evaluation at End of First Year: The Graduate Studies Committee will evaluate the performance of students in the Program at the end of the Spring semester. The criteria for evaluation will be the student's course grades, lab rotation evaluations, and participation and presentations in Journal Club. Students deficient in any of these areas will be brought before the committee to discuss the problem and possible ways to remedy the situation. Students with overall poor performance and judged unable to rectify the situation will be asked to leave the Program at this time.

Thesis Advisor and Research Advisory Committee: The Program Director will be the student's advisor during the first year and will meet with the student to establish the student's academic program and ascertain the nature of the student's research interests. Subsequent meetings will occur at the end of the first and second semesters to review academic progress and the development of research interests.

Permanent thesis advisor, selected on the basis of the student's academic accomplishments and research interests in consultation with the Program Director after the completion of three laboratory rotations. The final decision of mentor must be approved by the GGCB PhD Program Director.

Research Committee, formed in consultation with the thesis advisor, shall consist of the permanent thesis advisor, at least two other members of the GGCB Program (one of whom must be a member of the Graduate Studies Committee), and at least one other faculty member, in order to provide objectivity in evaluation of the student's progress. Adding individuals to the committee that bring specific expertise as the research evolves is encouraged. One of the GGCB faculty other than the thesis advisor will serve as the committee chairperson. It is expected that members of the Thesis Research Committee will be available to help and counsel the student concerning the thesis research throughout its duration. The student is responsible for sending the membership of the Thesis Advisory Committee to the Training Programs Office as soon as it is formed or if its membership changes. The Research Advisory or Thesis Committee should be formed after successful completion of the basic knowledge and concepts section of your comprehensive examination (CE Part 1, see below) and the first meeting held before October 31 of the third year of study. The Program Director is an ex-officio member of all student Advisory Committees and as such, should be notified in advance of the date and time of every meeting. Each student must have at least two Committee meetings per academic year. It is the responsibility of the student to arrange Committee meetings and procure forms for recording minutes. Meeting forms are available at http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html or from the Training Programs Office; there is one form for the committee chairperson and a form for each individual member. All forms should be returned to the Training Programs Office for inclusion in the student's file and distribution to the JCBS Dean. Either the student or thesis advisor may call committee meetings at any time.

If a student desires to change a permanent thesis advisor, or a thesis advisor desires to be relieved of responsibility to a student, the matter shall be brought to the Program Director and subsequently, before the Graduate Studies Committee for consideration.
**Individual Development Plans (IDPs)**

The GGCB Program and Jefferson College of Biomedical Sciences (JCBS) require an annual IDP for all predoctoral students. These IDPs should be reviewed and discussed with your program director, your thesis advisor, and your committee on an annual basis, or more frequently as warranted. This will ensure open bi-directional communication between trainees and faculty mentors to mutually assess short-term and long-term professional goals and achievements. The purpose is to ensure that periodic review and assessment of a student’s current stage of professional development, and future plans, address both the general competencies and proficiencies established by the College and the GGCB program, as well as each trainee’s individual professional development needs and goals. The IDP for first year students involves two sections, including Part A: Self-assessment of Skills, Motivations and Part B: Establishment of Plans and Goals for the Coming Year. The IDP for students in thesis labs involves three sections, including Part A: Self-assessment of Skills, Motivation and Career Planning; Part B: Assessment of Achievements and Goals; and Part C: Skills to Improve.

**Guidelines for the GGCB PhD Comprehensive Examination**

After completion of all course work at the end of the second year (June, July or August), each graduate student is required to pass a Comprehensive Examination (CE). The CE has two parts:

1. an oral test of basic knowledge and concepts in the fields of General, Mouse, Human and Cancer Genetics derived from coursework in GC550, GE612, GE637, GE636, GE651 and GE652, which will last approximately two hours, and
2. an oral and written exam, based on the preparation and defense of a research proposal in Genetics, Genomics and Cancer Biology, preferably in, but not limited to, an area of investigation of the student’s dissertation and/or advisor’s research program. Special attention should be paid to incorporating materials from NS740 and GC645.

Defense of the research proposal should be completed before December 31 of the third year of study. The examining committee will be composed of three members of the GGCB PhD Program faculty who will be assigned each year plus the thesis advisor. It is the student’s responsibility to arrange the date and time for the defense of the proposal with the members of the examining committee. Once a date is selected the student must notify the Training Office in sufficient time to reserve a room and AV and notify JCBS. This notification produces the official record of the CE which must be completed at the examination/defense and returned to the Training Program office. Please note that the CE is not officially completed and recorded in JCBS until this step is completed.

The written proposal must strictly abide by the rules for submission of an NIH NRSA F30/31, including the 6-page (plus one specific aims page) limit. The student is expected to clearly explain the questions to be addressed, their importance to the scientific field, the hypotheses to be tested, and the rationale behind these hypotheses. The experimental plan should delineate proper controls and potential outcomes, including ones that refute the tested hypotheses. The research scope should be appropriate for a graduate student to complete in 3-4 years of study.

In order for the examination committee to evaluate the student’s writing ability, the student must prepare a grant proposal with minimal input from faculty and other research staff. The thesis advisor is permitted to help with the development of specific aims, but is forbidden to have any input on the written document. The examinee can seek guidance on grant organization and conceptual development from student colleagues and postdoctoral fellows. However, this assistance cannot extend to fine editing of any written material. At the time of submission, the examinee will be asked to provide a list of who contributed to the thesis proposal and in what capacity.

Students who have submitted an F31 to the NIH may use that grant as their written proposal. **The completed proposal must be submitted to all CE Members at least two weeks prior to the examination date.**
Readiness to Write the Thesis: Before the student begins writing, the research advisor, research advisory committee, and candidate must reach a consensus on the content of the thesis and the format – either traditional or manuscript. JCBS is notified by use of Chairperson’s report (see above). At this time the student and committee will also designate the format of the thesis.

Thesis Defense: All PhD candidates must successfully present a public seminar and defend the Thesis prior to graduation. The JCBS Dean may attend the defense. In the oral defense, the candidate must demonstrate competence in his or her specific area of research as well as successfully defend the thesis research. By the time of the thesis defense, the research work performed by the student should generally have reached a stage of completion such that at least one paper, representing work to which the student has been a primary contributor (though not necessarily sole first author), has been published or accepted for publication in a peer-reviewed journal. If the candidate wishes to graduate in the upcoming Spring Commencement, the thesis defense must be passed and the final approved copy of the thesis must be turned into the Dean’s office no later than April 1 of that year.

Final Examination (Defense) Committee: Is chaired by the Program Director (or his/her designate) and is composed of members of the Research Advisory Committee. An external member is optional but recommended. The JCBS Dean or his designate is an ex-officio member of all Defense Committees.

The student MUST give the penultimate version of the thesis to his/her committee members at least 6 WEEKS prior to the defense date. At this point, the committee will read and revise the thesis within 2 weeks. After review by the committee, the thesis will be given back to the student; he/she will revise the thesis within 2 weeks. After this revision, it is presented to the Defense Committee and the Dean’s Office.

Scheduling the Seminar and Defense: At least two months before the planned date, the student is responsible for scheduling the date and time of the defense. Contact the Training Programs Office to reserve a room and AV equipment for the public seminar.

Letter from the Program Director: At least one month before the planned Defense, contact the Training Programs Office to generate letter from the Program Director to the JCBS Dean. The following information is necessary for this letter:

1. date, time, location of Public Seminar and Thesis Defense
2. thesis title
3. your name as it should appear on the diploma
4. members of the Final Examination Committee; addresses for any outside the University
5. the date on which the student stipend payment will stop (this information is for JGSBS Financial Office use only; it will not appear on other defense documents)
The PhD Thesis Manual contains the JCBS requirements for the successful completion of the PhD degree from the time you matriculate until you complete your degree. These are minimal requirements that are supplemented and expanded by GGCB Program specific requirements and instructions.

**Highlights from the PhD Thesis Manual which are important to your progress:**

- **page 6: Formation of the Research Committee**
  - JCBS minimum - research advisor and 2 graduate faculty; formed in consultation with advisor and Program Director
  - chairman of committee – a member other than thesis advisor
    - **GGCB** – permanent thesis advisor, at least two other members of the GGCB Program (one of whom must be a member of the Graduate Studies Committee), and at least one other faculty member, in order to provide objectivity in evaluation of the student's progress. The Program Director is an ex-officio member of all student Research Committees and as such, should be notified in advance of the date and time of each meeting.

- **page 6-7: Monitoring Progress**
  - 2 committee meetings per year, each year of research activity
  - Use forms for reporting results: report from each committee member plus chairperson's report – both available at http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html
    - **GGCB** – return all forms to Training Programs Office, 910 BLSB for required distribution
  - Semi-Annual Report to JCBS from student

- **page 7: Thesis Proposal**
  - may be part of Comprehensive Exam

- **page 8: Comprehensive Examination**
  - **GGCB** – requires at least one meeting of Research Committee prior to the Comprehensive Exam; see GGCB Handbook for details

- **page 9: Readiness to Write**
  - Determined by Research Committee; JCBS notified by use of Chairperson’s report (see above)
  - Designate format of thesis: Traditional or Manuscript

- **page 10-12: Final Examination Committee and Defense of Thesis**
  - Candidate must present an open seminar of thesis work followed by a private defense before his/her Examining Committee
  - “By the time of the thesis defense, the research work performed by the student should generally have reached a stage of completion such that at least one paper, representing work to which the student has been a primary contributor (though not necessarily sole first author), has been published or accepted for publication in a peer-reviewed journal.”
  - Committee Membership: Research Committee; Program Director
    - **GGCB** - an external member, from outside the University, is optional but recommended. Under certain circumstance, a second faculty member from another department may serve in place of the external member or the external review of the thesis can be handled without the actual presence of the reviewer.
  - Arrange defense date with Program Director and committee at least two months prior to planned defense
    - **GGCB** – notify Training Program Office of date and time in order to arrange room and AV equipment for open seminar
  - One month prior to defense request letter from Program Director to JCBS denoting readiness to defend
    - **GGCB** – contact Training Programs Office to request this letter; 3-6687 or Joanne.Balitzky@jefferson.edu

- **page 13: Format of Thesis – Model 1, Traditional**

- **page 22: Format of Thesis – Model 2, Manuscript**
Application for Degree/Certificate: Is available on Blackboard to all registered students. Candidates for degree must complete this form and return to University Office of the Registrar. Deadline is usually December 31 of year prior to desired commencement.
PhD Degree Completion Checklist: http://www.jefferson.edu/university/biomedical-sciences/student-resources/policies-guidelines.html