

# PhD Handbook

## 2015-2016

School of Applied Life Sciences  
Keck Graduate Institute



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# I. Contact Information

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## II. PhD Degree Program Overview

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The mission of KGI's PhD in Applied Life Sciences is to endow a select group of students with expertise in research areas relevant to applied biosciences, with the ability to use interdisciplinary tools and approaches to solve problems, and with the motivation to translate knowledge to beneficial applications to advance new horizons in the applied biosciences. The program is designed to educate technically competent, broadly trained, highly original scientists, and will prepare students for research and development positions in a variety of bioscience industrial or academic environments.

Prior to entering the PhD program, students must first complete the Masters' of Biosciences (MBS) degree at KGI; they will therefore be able to draw upon the unique interdisciplinary and applied educational foundation supplied by the MBS curriculum as they continue their studies. MBS students acquire a broad knowledge base in interdisciplinary life science (biomedicine, drug discovery and drug translation, systems biology, and bioengineering) and have the opportunity to focus their coursework in an area of interest to them for more in-depth knowledge. In addition, they gain industry experience through paid summer internships and industry-sponsored Team Masters Projects. They are exposed to a wide variety of issues such as regulatory hurdles encountered in bringing new products to market, intellectual property protection, and commercialization activities that include writing business plans and conducting market research. Throughout the MBS program, students are required to develop their abilities to work in teams and are given numerous opportunities to be team leaders. Students in the PhD program will gain competence in the methods of scientific inquiry by conducting and communicating original research for their theses. Through exposure to industry issues and applied problems, the students will become adept in the translation of discoveries in science and engineering into beneficial products and processes.

### Program Schedule and Format

Students complete the MBS program in two years; completion of the PhD portion of the program is anticipated to require an additional three years of full-time study, with the possibility for extension depending on the particular research project. Students will be encouraged to enter the PhD portion in June following graduation from the MBS program.

### Admission Standards

The students applying into the program should normally have:

- Minimum of 3.5 GPA in their MBS program;
- Possess good oral and written communication skills;
- Show the ability to comprehend complex issues, to identify unmet needs, to propose reasonable solutions and to defend their recommendations during the MBS program;
- Support of a KGI principle investigator;

- For students supported by a sponsorship company, a letter of support from the company advisor and an executed contract of financial support for three years will need to be in place.

## Learning Outcomes

A key learning outcome for the program is that PhD students develop mastery in an area of interdisciplinary science relevant to applied biosciences sufficient for conducting original research.

The PhD is conferred upon candidates who have demonstrated substantial ability to conduct relevant scientific research. Interdisciplinarity is an important feature of this learning outcome, as students are expected to demonstrate that they can “integrate the fundamentals of biomolecular technologies to solve problems in the applied life sciences.”

### PhD students must demonstrate that they can:

- Conduct important, original, and timely research;
- Apply rigorous methodologies to original, independent, experimental, theoretical and/or computational work in applied biosciences;
- Communicate effectively in academic as well as industry environments, to audiences composed of scientists, engineers and business professionals;
- Possess effective oral presentation skills and technical writing skills;
- Follow current trends within the applied life sciences, and can understand the technical content.

## III. Student Graduation Requirements

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### First Year

<b><u>Item</u></b>	<b><u>Due Date</u></b>
First Year Advising Committee Completed Form	Within first two (2) weeks of fall semester
Pass Research Ethics Online Course	Fall semester
Pre-Doctoral NSF Application	October
Teaching Assistant Evaluation Completed Form	End of each quarter in which you TA
Thesis Background Seminar Evaluation Completed Form	End of fall semester
Research Retreat	Fall semester
Thesis Prospectus	End of spring semester
First Year Progress Report Completed Form	End of spring semester

### Second Year

<b><u>Item</u></b>	<b><u>Due Date</u></b>
Teaching Assistant Evaluation Completed form	End of each quarter in which you TA
Literature Review Mastery Seminar	End of fall semester
Research Retreat	Fall semester
Thesis Progress Annual Thesis Committee Meeting Completed Form	End of spring semester

### Third Year

<b><u>Item</u></b>	<b><u>Due Date</u></b>
Written research proposal / business plan	No later than the end of Summer Quarter
Research Retreat	Fall semester
Publishable Manuscript	Prior to graduating

### Thesis Defense

<b><u>Item</u></b>	<b><u>Due Date</u></b>
Draft of Thesis	Due to Committee 30 days prior to defense
Oral exam schedule Completed form	Two (2) weeks prior to defense

## General Guidelines

- The PhD Committee must be established within the first six months of your first year as PhD student:
  - a. One member must be external to KGI;
  - b. Students will recommend members and initiate conversations, followed by approval of the advisor.
- All presentations except Research Retreat Poster Presentations will be graded as Pass/Fail
- Prior to all presentations involving your committee:
  - a. All presentations contents should be approved by the advisor ;
  - b. The committee must be provided with written materials two weeks prior to the presentation.

Students should meet with their committee approximately once a year (or every nine months). If the committee prefers to meet more frequently they may set their own terms for meetings.

## Thesis Background: Literature Review

During the first year of the program, the student is required to present a background overview and in-depth analysis of literature relevant to the thesis field of study. Topic and material must be approved by Committee Chair and Program Directors. Texts must be made up of at least 2-3 primary research reports/sources and may, in addition, incorporate a review article if available. An abstract and reference list should be provided for presentation.

This public presentation will be followed by a private examination by an ad-hoc committee of faculty/committee members will recommend an unconditional pass, a conditional pass (may require clarification or further study), or a fail. If a conditional pass is received a second opportunity to present will be given. Upon review of the second presentation and examination a pass or fail decision will be made.

## Thesis Prospectus: Qualifying Exam in First Year

During the first year, each student must present an outline of the background and methods of proposed original thesis research. The content must be approved by the members of the PhD Committee.

Two weeks prior to the public presentation a six page report outlining background & significance, the hypothesis & innovative contribution, methods & experiment design, preliminary results & analysis, timeline, future milestones, and bibliography (not included in page count) is due. This will be submitted to committee members for review.

Committee should be present during the presentation either in person or through remote access. If committee is not present, student must present prospectus to committee outside of presentation.

The schedule should be 45 minutes of presentation and 15 minutes of general Q&A. This public presentation will be followed by a private examination of the candidate by the thesis committee. The committee will recommend an unconditional pass, a conditional pass (may require clarification or further study), or a fail. Planned publication goals must also be set.

The thesis prospectus is not a seminar—it is an evaluation of the student’s ability to:

- Summarize the field of study, including past and current work from others;
- Generate a working hypothesis;
- Develop a plan that could be completed in 2-3 years;
- Understand the logic of experimental design;
- Develop a decision tree based on (all) possible results of experiments;
- Draw conclusions and adapt hypotheses depending on results.

In general, the student should prepare a spoken presentation sufficient to support a 45 minute presentation of the goals of the thesis, typically including preliminary data, models, etc. as appropriate which are relevant to at least the first goal, and should be prepared thereafter to discuss questions raised by the committee in professional scientific depth.

Students are strongly encouraged to speak directly with their advisor and committee if they have specific questions or concerns regarding the format, content and procedures for the oral examination.

## Literature Review Mastery

Comprehensive analysis of literature for topic related to thesis project but distinct from Thesis Background presentation—must be current and significant. Topic and material must be approved by Committee Chair and Program Directors. Texts must be made up of at least 2-3 primary research reports/sources and may, in addition, incorporate a review article if available. An abstract and reference list should be provided for presentation.

This public presentation will be followed by a private examination by an ad-hoc committee of faculty/committee members will recommend an unconditional pass, a conditional pass (may require clarification or further study), or a fail. If a conditional pass is received a second opportunity to present will be given. Upon review of the second presentation and examination a pass or fail decision will be made.

## Thesis Progress: Original Data Presentation

All students will be required to execute an original research project under the mentorship of a faculty advisor. The research advisor and the mentoring team will play a central role in monitoring student progress and preventing an unnecessarily long time to degree completion; they will also decide when the student has amassed a sufficient body of work to start writing the thesis. Because of the unpredictable nature of research, the mentoring team may recommend extension of PhD training beyond three years. Research will be conducted predominantly on site at KGI, but certain



portions of the work may be carried out at another institution within the framework of an ongoing collaboration. For PhD students sponsored by an external company, most or all of the research may be done off-site from KGI, with prior approval of the KGI advisor.

Each student must give a presentation of original thesis-related data. This presentation should provide updates on project progression. Two weeks prior to the public presentation an original research manuscript in preparation, submitted, or published OR a minimum six page report describing the progress toward thesis completion in a manuscript style format and bibliography (not included in page count) is due. This will be submitted to committee members for review.

This public presentation will be followed by a private examination of the candidate by the Thesis Committee.

## Research Proposal (RP) /Business Plan (BP)

At the end of the second PhD year, the student will be required to develop and defend an original research proposal or a Small Business Innovation Research (SBIR) - type applied research proposal with business plan, in a topic outside the specific area of the thesis, as a demonstration of originality and creativity. The research proposal might lead to or prepare students for postdoctoral fellowship applications, while the applied research proposal / business plan will introduce additional business concepts for students who wish to pursue industrial careers.

A written research proposal or business plan must be crafted and presented to the Program Directors. An abstract, the research proposal or business plan (with substantial technical component), and reference list should be provided for evaluation. The topic of the RP/BP must not have a substantial overlap with the thesis.

An ad-hoc committee of faculty/committee members, and at least one external expert will recommend an unconditional pass, a conditional pass (may require clarification or further study), or a fail. If a conditional pass is received a second opportunity to present will be given. Upon review of the second presentation and examination a pass or fail decision will be made. In the case of a fail, a second attempt on another topic may be approved by the Program Directors.

## Research Retreat: Poster Presentation

Each year PhD students will be required to participate in the KGI Research Retreat. Students in the first PhD year will be required to attend, while students in their second and third PhD years will present annual progress reports to be evaluated and approved by their mentoring teams. The research retreats will foster communication among students and faculty, aid the development of interdisciplinary ties and the creation of a strong research community. Annual research retreats will also help ensure student accountability for progress toward the degree. Student must display and present poster at annual Research Retreat. Poster should outline thesis status.

## Publishable Manuscript

In order to graduate, students must have one publishable manuscript or paper to which they have been the major contributor. Students are not required to have the manuscript already published in order to graduate; however, the paper must be ready for submission for publication.

## Thesis Defense and Thesis Submission: Presentation of Original Thesis Data and Conclusions

The conferral of the PhD is dependent upon successful completion of an oral exam and thesis submission, along with completion of all other requirements. The oral exam is a public seminar followed by a closed session with the student's Oral Examination Committee. At least one month before the oral exam, a substantial final draft of the thesis must be turned in to the student's Oral Examination Committee. At least two weeks before the oral exam, the student should check in with the committee and incorporate any changes by the time of the exam. The exam cannot be formally scheduled or publicly announced until the student receives approval from the committee. The student should, however, start scheduling a date and time with the committee earlier than that, to ensure that everyone is available on the projected date. The thesis presented at the defense is expected to be in the final form that will be submitted to the university barring any changes suggested by the student's committee at the defense. Committee members must be present (remote participation is available). The schedule is 45 minutes of presentation and 15 minutes of general Q&A. Followed by a private examination, sign offs and written thesis completion.

For PhD theses that are based primarily on patent submissions (as some industry - sponsored projects might be), the theses submission should not be delayed beyond a reasonable period for the purpose of patenting. The thesis advisors should provide adequate guidance for patent/disclosures in a timely manner such that thesis defense can progress with the program time line.

## Current topics in the applied life sciences

Students will be required to attend weekly colloquia on current topics in the applied life sciences during their PhD years. The colloquia are designed to encourage in-depth reading of primary literature related to the student's thesis research and to increase knowledge of topics of high general interest. Evaluation of students' formal presentations of literature topics, given in each semester of the first PhD year, will serve the function of the Qualifying Examination. Incorporated within the current topics series will be one or more seminars dedicated to the ethical conduct of research.

## KGI Seminars

The department's seminar series host outside speakers as well as KGI faculty presenting their own research. Both seminar series are considered an integral part of the PhD program and graduate students are expected to attend the seminars relevant to their area of specialization. Both seminar series are considered an integral part of the PhD program and graduate students are expected to attend the seminars relevant to their area of specialization.

## Ethics/Responsible Conduct of Research Course

All students are required to take an online Ethics training modules / quizzes. Training in Responsible Conduct of Research (RCR) is not just important and the right thing to do, but it is also a federal requirement for funded research. The national ethics center (Ethics Core) offers online training modules that cover required RCR content. This course is required and should be taken in the first year of the program.

<https://nationalethicscenter.org/cmditr-rcr-modules/how-to-use-these-rcr-modules>).

# IV. Expectations and Guidelines for Mentoring PhD Students

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## Role of Graduate Mentors in Student Success & Advocacy

Student success can be defined as comprehensive training (psychological, intellectual, and professional development). This includes a students' field of study and their professional arenas. Following points should be considered for students to be successfully prepared for graduation and employment.

KGI's PhD program in Applied Life Sciences is uniquely structured to encourage and enable the student to pursue professional employment opportunities upon graduation. A critical mechanism of the PhD program to facilitate student career development is to provide wherever possible a formal PhD Mentor as part of the Thesis Committee in addition to the Thesis Mentor. Ideally, the PhD Mentor should be someone closely associated with or having a direct knowledge of the life science industry.

Graduate Mentor including the Research Mentor as the PhD Mentor, should have an initial meeting to discuss your advising style. Establish who will schedule meetings and what should be prepared for meetings and who should prepare it. You may also address how your student's progress will be assessed.

- Strongly encourage students to focus and define their research topic as early as possible. Achieving this will help students stay on track. Establishment and proper development of the research topic and a measurable research plan will help you assess student progress.
- Throughout your student's PhD program keep their sense and level of focus in mind. It is the responsibility of the graduate mentor to prevent drifting from focus and/or isolation. Both of these outcomes can intensify stress, loneliness, *etc.*
- Above all, graduate mentors should create structure and clarify expectations. Make deadlines, timelines, and milestones as clear as possible. Regular meetings and committee steering and coordination can make the difference between student success and failure. Do not hesitate to ask for administrative assistance when it comes to meetings or materials.
- If you are the primary graduate mentor (advisor/committee chair), conflict management among committee members falls to you. Student success is KGI's priority. If a situation arises where two committee members are at an impasse of opinion, the primary graduate mentor must resolve it. If the primary graduate mentor does not feel equipped to make a decision in the case of a conflict they should seek the counsel of the Dean of Faculty to resolve the situation.
- If you are the PhD Mentor, it is desirable for you to maintain regular contact with the student's thesis mentor so as to understand the expectations of student performance levels.

## Implicit Requirements

Implicit requirements are unspoken and implied conditions for all PhD students, graduate mentors, and administrative personnel.

**Behavior** - should always be professional. Integrity and ethical behavior is expected under all circumstances.

- Individual honesty, reliability, and consistency add immense value to a working relationship;
- Self-motivation is a key mind-set in achieving success for all roles;
- Follow meeting etiquette;
- Be punctual;
- Dress appropriately;
- Organize materials, review the agenda, and prepare to contribute beforehand;
- Recognize and respectfully listen to every speaker;
- Do not interrupt;
- Allow time to ask questions;
- Polite interactions and communications are the most valued.

**Attitude** - confident, understanding, and acceptant attitudes are all prioritized in this program. Maintaining KGI's professional environment, polished image, appearance, conduct, and performance will better the morale of the general community.

**Teamwork** - always treat teammates with respect. Be prepared to take leadership roles. Compromise and conflict resolution are crucial skills in a team-based environment.

**Peer-mentoring** - peers at the student, graduate mentor, and administrative levels should support one another. Each constituency should feel open and comfortable with their peers. Peers should be trustworthy and available for others.

All members of the PhD community should monitor themselves and provide regular feedback to one another. Graduate mentors should pay special attention to new students during their first year.

## Explicit Requirements

Program requirements and milestones should be successfully accomplished on time. To reach this goal, proper preparation is required.

**Orientation sessions** - new PhD students will meet with the Program Directors and administrative personnel to discuss program requirements.

**Milestones and explanations** - written guidelines pertaining to milestones and explanations of requirements are posted on the PhD Program Sakai course page.

**Graduate seminar (research colloquium)** - PhD students should be prepared and on time. Mentors or administration should be prepared to introduce the student speaking and explain the type of talk the student will give. Graduate mentors or administrative personnel should keep track of time and be prepared to moderate the question and answer portion of the talk. Attendees should be encouraged to ask questions. Graduate mentors should not answer questions or speak for students unless a major clarification needs to be made on behalf of the student. As each student's performance reflects on their lab group, graduate mentor, and/or peers directly or indirectly it is essential that all contributing parties confer information and intent before each talk.

**Thesis management** - Graduate mentors and students should mutually establish a timeline. The review process and style of the graduate mentor and student should be made clear up front.

The ways graduate mentors (the thesis advisor and PhD mentor) can specifically promote student success are to:

- Provide prompt and constructive feedback;
- Be available for committee meetings, seminars preparations, and oral presentations;
- Conduct rigorous but fair final examination after thesis defense; and
- Provide appropriate guidelines for job searches in preparation for smooth transition after PhD defense.

## Program Quality Assurance

The PhD Program Committee will convene as needed to address qualifying exams, advancement to candidacy milestones, learning outcomes, fairness, accuracy, and other items. This committee consists of the PhD Program Directors, Director of Research, and Academic Coordinator. Other faculty and administrators may be consulted.

Students should be aware of the following field norms. It is the duty of the graduate mentor to advise on these norms

- Appropriate use of animal or human subjects;
- Appropriate citation of source material and prior research;
- Ethical submission and review of publications;
- Recognition and avoidance of conflicts of interest;
- Ethical use of research funds;
- Responsible generation, recording, and use of data.

## V. Administrative Information

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### Satisfactory Degree Progress

The KGI's requirements for satisfactory degree progress for graduate students are found in the [Student handbook](#) under Academic Policies & Procedures.

In addition, satisfactory and timely completion of each year's general and track specific requirements is mandatory. Students not making satisfactory degree progress are subject to departmental academic review and/or dismissal.

### Leave of Absence

If a break in continuous formal study is needed, graduate students must request a formal leave of absence from their advisor and the PhD Program Directors. The maximum period of leave granted is one year. The Leave of Absence petition is required. Graduate students on a leave of absence do not receive any financial support from the department. Students should consult with student services staff, if considering this option; staff will discuss administrative resources, impacts, etc.

If the student is not able to resume studies by the quarter originally approved by the Program Directors, a one-time extension may be requested. If he/she wishes to return after an approved leave of absence has expired, the student must apply for reinstatement. Renewed financial support from the department cannot be guaranteed in the event of an extended leave of absence. There are no guarantees that the Registrar's Office will approve a second year.

### Honor Code and Fundamental Standard

**The Honor Code**, the KGI's statement on academic integrity can be found in the [Student handbook](#). It articulates KGI's expectations of students and faculty in establishing and maintaining the highest standards in academic work. Principles inherent in this Code include:

- Students shall treat all members of the community with respect and without malicious intent to ensure that all students share equal opportunities.
- Students shall conduct themselves in a manner that upholds their reputation of honesty and integrity in order to promote an environment of trust.
- It is the obligation of the students to participate in making the honor system viable by reporting violations of potential academic and professional misconduct.

**The Fundamental Standard** has set the standard of conduct for KGI students. KGI students are expected to show both within and without the school such respect for order, morality, personal honor and the rights of others as is demanded of good citizens. Failure to do this will be sufficient cause for removal from KGI.

## Scientific or Research Misconduct

Scientific or research misconduct is defined as fabrication, falsification, plagiarism, or other practices that seriously deviate from those that are commonly accepted within the academic and scientific community for proposing, conducting, or reporting research, and does not include honest error or honest differences in interpretation or judgments of data. (Further information can be obtained from the [U.S. Office of Research Integrity, Department of Health and Human Services](#). Possible incidences of misconduct are to be reported immediately to the Deans of the respective schools who will initiate the appropriate procedures.

## Dismissal from the Program

Students not making satisfactory degree progress are subject to departmental academic review and or dismissal. In cases where a student is subject to dismissal, the department will follow the Guidelines for Dismissal of Graduate Students for Academic Reasons.

[For more information consult the student handbook.](#)



## VI. Financial Aid

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### General Policy

Students receive funding from a variety of sources (teaching assistantship, research assistantship, graduate fellowships, *etc.*) for a maximum of 3 years. Students in the PhD program are provided with a stipend/salary, tuition, and health insurance for four academic quarters each year.

### Teaching Assistantship

Teaching assistantship provides balance between teaching and research. KGI covers stipend, tuition, and associated fees. Due to the limited number of TA positions, the preference order for TAship allocation is directly proportional to the year of study of the PhD student, *i.e.* highest priority given to 1<sup>st</sup> year PhD students and lowest priority to the 3<sup>rd</sup> year students. If TAship is not awarded, the PhD student stipend is covered by research assistantship through the advisor or graduate fellowship.

Teaching responsibilities should be clearly understood before a student accepts a teaching position. Typical teaching responsibilities include the following:

- Assist in the preparation and grading of exams, problem sets, *etc.*;
- Hold regular office hours;
- Assist in preparation and distribution of course handouts;
- Attend lectures;
- Provide student course feedback to instructor;
- Initiate and plan discussion sections;
- For lab courses: set up experiments, check equipment and supervise clean-up.

### Research Assistantship

- Awarded through externally-funded project grant written by faculty advisor and covers stipend, tuition, and associated fees
- Awarded through thesis advisor in charge of writing grant, and is project-focused

### Graduate Fellowships

- Institutional training grant, *e.g.* [Integrative Graduate Education and Research Traineeship \(IGERT\)](#);
- Individual fellowship – awarded fellowship application written by you that covers stipend, tuition, and fees;

- All eligible first and second year PhD students are encouraged to apply for a [National Science Foundation \(NSF\) Graduate Research Fellowship Program](#). The application deadline is in late October;
- Please see the NSF website for deadlines: <https://www.fastlane.nsf.gov/grfp/Login.do>;
- All students are encouraged to apply for any/all fellowships for which they are eligible. Students are encouraged to consult their faculty advisors when preparing fellowship applications.

## Externally-Sponsored PhD Students

KGI accepts PhD students who are sponsored by external companies. The sponsored PhD fellowship terms are covered by properly executed contracts between KGI and the external companies. Please contact PhD Program Directors or your prospective advisor before applying to the program when considering a sponsored PhD program.

# VII. Laboratory Safety Training

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## Safety

Keck Graduate Institute is fully committed to maintaining safe conditions in all its teaching and research labs as well as in its classrooms, offices and support facilities. KGI's Safety Compliance Officer has expertise in these areas: biological safety, chemical safety, environmental affairs (including hazardous waste management), fire safety, occupational safety and health, risk management, shipping and receiving of hazardous material. Such Safety Compliance Officer is KGI's primary resource for information on state and federal safety and training requirements, and maintains training records organized so that it can be easily searched regulating bodies. For any questions related to the topics listed above please contact the Safety Compliance Officer (see Contact Information section of the manual). Additionally the Safety Compliance Officer is responsible for the distribution of safety information between the laboratories and the campus, and serves as a contact for initiatives (hazardous waste management, laboratory labeling, safety training, environmental and lab safety audits, etc.); ensures that training requirements for faculty, students and staff are met; and assist during regulatory agency interactions.

## Training

All incoming graduate students are required to complete safety training based upon the types of research that will be performed during the course of their PhD program. Specific training requirements are based on particular responsibilities and differ across various laboratories. Students should consult the advising faculty to specifically identify those required courses. Once identified the students must send an email to the Safety Compliance Officer (see Contact Information section of the manual) to register for courses, all courses are web-based and can be completed at your convenience.

All lab training must be completed prior to conducting any research in KGI laboratories. Advisors can and will require other training. Please note that any student who will be working with Bloodborne Pathogens will be required by state law to take an annual refresher training on the topic. Contact Safety Compliance Officer for the refresher training. All students conducting research in KGI labs are required to read the Chemical Hygiene Plan, the Biological Safety Manual and Afterhours Laboratory Access Policy and follow the procedures contained in the programs. All documents mentioned above can be found in every lab at KGI. Please ask the advisor or lab manager to locate those materials for you.

Each PhD advisor or lab manager is required to provide laboratory specific training to all students, including location of Personal Protective Equipment (PPE), eyewash and shower stations, SOP's detailing safety procedure to include but not limited to chemical spill response, fire extinguisher location, safe evacuation procedures from the lab, emergency contact information, waste management and finally each lab must maintain updated SDS sheets and direct the new students to the location. It is the student's responsibility to read, understand and follow the safety aspects of any chemical or biological sample they will be working with.

# VIII. Thesis Preparation and Submission

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## Note on Deadlines

The deadlines for scheduling the final oral examination, payment of fees and submission of your thesis are determined on a case-by-case basis by the PhD Thesis Committee of the student and the Director of PhD Programs. Completion dates cannot be waived or extended without severe extenuating circumstances and must be approved by the Directors of PhD Program or the Dean, in consultation with the thesis advisor. If you have questions regarding institutional requirements for the completion of your degree, please contact the Registrar.

## General

The PhD degree is conferred by the Keck Graduate Institute primarily in recognition of breadth of scholarship, depth of original research, and power to investigate problems independently and efficiently, rather than for the completion of definite courses of study through a stated period of residence. The work for the degree consists of original research and systematic studies that advance knowledge. In addition, the candidate must have acquired the power of clear and forceful self-expression in both oral and written English. Therefore, the candidate must describe their work in a thesis and defend it in an oral examination by the faculty. For more information consult the [student handbook](#).

An electronic copy of the final thesis and three paper copies must be presented to the Institute. The copy should be prepared in accordance with the instructions given here and the copy must be completed and accompanied by all illustrative material. Rewriting and changes may be necessary if the specifications are not met. The degree will not be officially awarded until the thesis is submitted in satisfactory form and approved by the Dean.

A thesis may be organized as a single paper or as a series of relatively independent chapters unified by a summary chapter. The chapters are often papers that have been or will be submitted to journals in the field or have already been published. Where the student is not the only or first author, the student must establish their major contribution, typically through an introductory chapter describing the “theme of the thesis.” In addition, there may be certain special requirements that will vary from option to option, particularly in the preparation and presentation of draft copies, format, bibliographical form, number of copies needed for the examining committee, and additional final copies beyond the electronic copy submitted to the ETD database. Candidates should consult the Directors of PhD Program concerning these additional requirements.

## Thesis Draft

You are advised to submit a final draft of your thesis to your PhD Thesis Committee for approval prior to the final preparation. All arrangements for scheduling the final oral examination should be made through the Director of PhD Program in consultation with your PhD advisor(s). Depending

on when your committee advises you to defend your thesis, the PhD Program Directors should be consulted regarding the feasibility of such a plan.

A general reference is *How to Write a Better Thesis* by David Evans, Paul Gruba and Justin Zobel (Springer, 2014. ISBN# 978-3-319-04285-5). However, it should be understood that this reference is only a general rule. Consult with your advisor to determine whether or not there are any special formats or procedures pertaining to your discipline.

The title page and signature page must conform to the models included in this document. An original (see format) and two copies of the thesis, with an additional abstract and title page, must be submitted to the Registrar. Along with your thesis you are required to submit the *Doctoral Thesis Agreement Form* from University Microfilms International, as well as the *Survey of Earned Doctorates* from the National Science Foundation. These forms are available in the Registrar's Office.

## Proofreading and Editing

All manuscripts should be proofread before being submitted to the Registrar's office in KGI. The consistency and accuracy of the spelling, punctuation, capitalization, abbreviations and word divisions are primarily the responsibility of the thesis writer, who should consult a dictionary and a manual of style for correct usage. Students are especially urged to use the "spell-check" feature of the computer software being used and to proofread the manuscript carefully, or to enlist the help of a friend or professional proofreader. The Institute proofreader will return to the student for correction and resubmission any thesis that has obviously not been carefully proofread. Students should also allow a minimum of two weeks for proofreading before the final examination is scheduled. Similarly, the thesis writer is fully responsible for editing the style and grammar of the manuscript. Any student who is unsure of their abilities should seek the help of a friend or professional editor. Up-to-date advice on software packages suitable for manuscript preparation can be obtained from the Information Management Services and Systems (IMSS) organization or from experienced students in the same field. Some academic options provide templates for preparing the manuscript but due to the variation in requirements between options, the Graduate Office does not provide such templates.

## Format and Paper

Theses (both original and copy) must be produced on white bond paper, 8 1/2 x 11 inches, of not less than 20 lb. weight. All paper in the thesis must be the same size and weight. Exceptions may be made in the case of over-sized charts or non-text materials which have been duplicated for inclusion. Pages should be printed on one side only. The print should be letter quality with dark black characters that are consistently clear and dense. Use of color font is not permitted except when these occur in figures. If you are including your previously published papers, then use the word version (or Latex version formatted as below), not the final printed copy from the publisher.

A *one and one-half inch margin* is required on the left-hand binding edge, and a margin of at least one inch is required at the top, right and bottom of each page. Any pages which exceed the standard

size must be assembled according to binding specifications. *Any and all materials included with the body of the thesis such as appendices, etc. must conform to the margin requirements.*

It is assumed that authors preparing a thesis will be doing so using word processing or other electronic means. All textual materials must be double-spaced. Footnotes and long quotations may be single-spaced. Footnotes should be avoided as much as possible, and all abbreviations must be collected and expanded on a separate page following the table of content pages. The page of the list of abbreviations must be included in the table of content.

Any standard type is acceptable and the same type must be used throughout the thesis.

Italics and/or bold face type may be used for emphasis, and non-English words or phrases should also be italicized. Type size should be 12 point or larger for Times New Roman font, or 10 points or larger for Arial, or its equivalent, as the document will be reduced in size on microfilm reproductions. Type which resembles written script, as well as ‘novelty’ typefaces are not acceptable. The print should be clean and even in quality and the print should be letter quality with consistently clear and dense black characters.

## Abstract

The abstract heading must conform to the model included in this document. The title of the thesis, your name, Keck Graduate Institute of Applied Life Sciences, and the *year the degree will be awarded* must appear on the first page of the abstract. The abstract must be double spaced and may not be more than 775 words (*text only*). It should explain in narrative form the nature and scope of the problem or topic, the method employed in developing the thesis, and a summary of the conclusions. Prepare your abstract carefully, as it will be published by University Microfilms International in *Thesis Abstracts*. Publication is automatic when your thesis is sent for microfilming.

## Order and Pagination

Theses typically have three main parts: preliminaries, text and references. All pages of your thesis, including any blank pages, must be counted in the numbering. The preliminary part of the thesis is numbered with *small Roman numerals* (*i, ii, iii, etc.*). The first page of the introduction or chapter one would start with *Arabic* number one (1, 2, 3, etc.). The first page of each chapter is to be numbered at the bottom center of the page, with all other pages numbered in the upper right hand corner. *Beginning with chapter one, page one, all pages of the thesis must be numbered, and there should be no breaks in the numbering sequence.*

Below is a summary of the proper sequence for counting and numbering:

Sequence	Page	Count?	Print Page Number?	Number Type
1	Title Page	Yes	No	N/A
2	Copyright Page (optional)	Yes	No	N/A
3	Signature Page	Yes	No	N/A
4	Abstract (double spaced)	Yes	No	N/A
5	Dedication (optional, double spaced)	Yes	No	N/A
6	Acknowledgments (optional, dbl space)	Yes	Yes	Small Roman
7	Preface (optional)	Yes	Yes	Small Roman
8	Table of contents (include appendices & bibliography)	Yes	Yes	Small Roman
9	List of Abbreviations	Yes	Yes	Small Roman
10	Table of Figures (or Plates) (opt)	Yes	Yes	Small Roman
11	Introduction (optional)	Yes	Yes	Arabic page 1
12	Chapter One	Yes	Yes	Arabic (pg.1 if no Intro)

## Appendices

Appendices are sometimes necessary for recording detail mathematical derivations, or additional methods, especially when the thesis is a compilation of published research papers where detail methods or mathematical derivations were not included due a variety of reasons. These relevant materials should be collected in a series of Appendices at the end of the final concluding chapter but before the Bibliography.

## Charts, Graphs, Tables, and Photographs

Please keep in mind:

- Illustrative material in black will reproduce satisfactorily, while colors will appear as slightly varying shades of gray. Labels or symbols rather than colors should identify lines on a graph;
- Shaded areas--such as countries on a map--will have better contrast if cross-hatching is used instead of color;
- Photographs should be professional-quality black and white or color. Most color photographs will reproduce acceptably on positive microfilm or microfiche as shades of gray but will lack clarity on xerographic copies made from the microfilm;
- Charts, graphs, and maps that are larger than the standard 8 1/2" x 11" page size may be used in your manuscripts but are best avoided.

## Bibliography

Include Bibliography in the Table of content and paginate. Use any of the standard formats of bibliography used in leading science journals for original research articles, such as Nature, Cell, PLOS Biology. All citations should be complete in terms of all authors names (do not use *et al.* in



the Bibliography, but you are free to do so in the text) and use standard journal abbreviations. You are encouraged to use standard bibliographic software, such as EndNote or ReferenceManager.

## Additional Data

Increasingly these days, large amounts of data are collected and analyzed for the conduct of research that leads to a PhD thesis. In cases that such data are used for the thesis, the final data must be organized in an appropriate format standard to the field, for example, the MIAME format for microarray data, and must be submitted in an electronic format on an acceptable data storage medium, such as CD, in two copies; one copy will be held by the Registrar's office and the second copy will be held by the Chair of the Thesis Committee (usually the advisor).

## Use of Published Material

Published articles of which the candidate is author or joint author may be included as part of the thesis, with due regard to copyright regulations (see next section). For the "original copy" of the manuscript, such printed pages must follow the same requirements, maintaining margins, type size (at least 8 point), and page number sequencing.

## Use of Copyrighted Material

As the author of the thesis manuscript, you will be asked to certify that any previously copyrighted material used in your work, beyond "fair use," is with written permission of the copyright owner, and that KGI will not be held responsible for any damages, which may arise from copyright violations. By signing the Copyright Agreement Form, you agree to the above terms.

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## Privacy of Thesis Material

Note that your thesis is a public document, and KGI is under legal obligation to make available all portions of the thesis, but not necessarily all original data that produced the thesis, to any outside entity, and will do so through microfilming of your entire thesis or photocopy or by transmission of the electronic archival copy. If you are concerned about the privacy of any information, you must first protect this information according to legally acceptable practices or you have the freedom to not include such information in the thesis.

Note, however, that it is up to the Thesis Committee to determine whether or not your thesis can be properly evaluated for intellectual criteria satisfying the PhD degree requirements, and if you opt not to include such data on ground of privacy you should discuss this with your PhD Advisory Committee on the prudence of such an action.

## Submission and Final Check

The original and one copy of the thesis are to be submitted to the Registrar's Office after your final oral examination. Pages should be clean on both sides with no slanted or missing pages. Do not submit bound copies; they will not be accepted. Once your thesis has been submitted to and accepted by the Registrar it may not be removed. Any corrections and/or additions to the thesis must have the approval of the Thesis Committee. Such corrections and/or additions are approved only in the most unusual circumstances; thus it is important that the submitted copies be checked for accuracy of content. The original and one copy will be deposited in Honnold Mudd Library after microfilming and binding. One copy will remain with the advisor, and the remaining copy will remain with the Director of PhD Programs.

# Sample Pages

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## The Preliminaries

The following pages provide samples of the preliminary pages of a thesis. Some pages have been abbreviated into text boxes and combined into one page. An actual thesis would not follow these practices. All printing is to be on one side of the page, and each item identified as being a separate page should be set up as such.

*The italicized sections are instructions or places where you would insert the pertinent information for your thesis.*

## The Title Page

A sample title page for a PhD student is shown on the next page. Please note that there is one circumstance where the wording on the title page would be different from that shown.

This will be the case of a joint doctorate program. In this case, the wording would be:  
A Thesis submitted to the Faculty of Keck Graduate Institute of Applied Life Sciences and (Name of Joint Institution) in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Applied Life Sciences.

Claremont and (*City of Joint Institution*)  
2015

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(*Name of Joint Institution Co-Chair*), Co-Chair

---

(*Name of KGI Co-Chair*), Co-Chair

---

(*Name of KGI Program Director*), PhD Program Director

This and the following pages provide samples formatting of the preliminary pages of a thesis.

(TITLE OF THESIS)

BY

(YOUR NAME)

A Thesis submitted to the Faculty of Keck Graduate Institute of Applied Life Sciences in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Applied Life Sciences

Claremont, California  
20xx<sup>1</sup>

Approved by:

(Signature of Thesis Chair)  
(Typed name of Thesis Chair)

---

<sup>1</sup>The date inserted here should be the calendar year in which the degree will be awarded, not the year in which the thesis is submitted - particularly for January degrees. You would not have a footnote associated with the year on your actual title page.

Copyright by (Your Name) 20xx  
All rights Reserved

We, the undersigned, certify that we have read this thesis of (your name) and approve it as adequate in scope and quality for the degree of Doctor of Philosophy.

Thesis Committee:

---

*(Typed name of Chair)*, Chair

---

*(Typed name)*, Member

---

*(Typed name)*, Member

---

*(Typed name)*, Visiting Examiner *(a visiting examiner is optional, upon approval of your Thesis Chair)*

---

*(Typed name)*, PhD Program Director

# Abstract of the Thesis

*(Title)*

By

*(Your Name)*

Keck Graduate Institute of Applied Life Sciences: 20xx

*(The abstract must be double spaced **and not more than 350 words**. It should explain in narrative form the nature and scope of the problem or topic, the method employed in developing the thesis, and the conclusions reached in summary form. This abstract will be published by University Microfilms International in Thesis Abstracts, so you should prepare it with care. Please note that Thesis Abstracts will truncate any abstract over 350 words, even if it is in the middle of a sentence.*

## Dedication

*A dedication is not required, although many people choose to honor someone of particular importance in their lives by dedicating their thesis to them. Theses are frequently dedicated to parents, spouses/life partners or mentors. The dedication should be brief.*

*no page number*

## Acknowledgments

*This page is also not required, but is frequently used. This is where you would acknowledge the assistance of those who were significant contributors to the process of writing your thesis: committee members, outside readers, someone who helped you formulate your prospectus, someone who helped with computer work or statistical analysis. Funding sources which supported your research would be acknowledged here as well. Please note that **page numbering** begins with this page, with small roman numerals as noted below*

*vi*

*Following the Acknowledgments, you may include a **Preface**. If included, it should be a separate page, with a small Roman numeral numbering.*

*vii*

*The next page should be the*

## TABLE OF CONTENTS

*Listing the page numbers of significant headings and subheadings of the thesis. If necessary, the Table of Contents would be followed by a Table of Figures and/or a Table of Plates.*

*Small Roman numeral page numbering continues through these sections.*

*viii*

## INTRODUCTION (OPTIONAL)

Or

## CHAPTER ONE

*Should begin page numbering for the body of the thesis, beginning with page 1 and continuing throughout the document. Numbering must be consistent, and all pages must be numbered, including figures, graphs, charts and plates. Numbering continues through to the end of the reference section.*

*1*

## Common Errors

- Reversed punctuation of quotations. Periods and commas always precede final quotation marks, even if the quotation consists of a single letter.
- For example: We shall call the shear stiffness "K."
- Incorrect punctuation of abbreviations. The Latin abbreviation for "and others" contains only one period "et al." The abbreviations "i.e." and "e.g." are punctuated with two periods and set off by commas from the sentences in which they appear.
- For example: Analysis of long and narrow buildings, e.g., the Jet Propulsion Laboratory, must take into account the shear stiffness, i.e., K in our equation.
- Names of authors spelled differently in the text and in the bibliography; reference numbers or dates in the text that do not agree with the bibliography.
- Unnumbered pages, especially those containing figures or captions to figures.
- Inconsistent hyphenation of compound words, such as "ray-tracing," "ray tracing," and "raytracing."
- Inconsistent capitalization of proper names used as adjectives, such as "Boolean" and "Hamiltonian."
- Inconsistent presentation of bibliographic information.

## After the Final Thesis Examination

**Library Clearance** - Contact the main circulation desk of the Library to make sure that all items have been returned before you leave campus.

**Exit Survey** - KGI PhD graduating students are expected to complete the student exit survey with the Program Directors or another faculty member specifically assigned by the Dean's office to conduct the exit interview.

**International Student Checkout** - All international students should notify the Student's Affairs Office of upcoming graduation dates. To apply for practical training, students should provide at least two to three months' notice prior to the beginning of employment. Forms and instruction for practical training can be obtained from the Student Services office.

**Thesis** - Submit to the Registrar an electronic copy of the final thesis, including all relevant databases in an acceptable media. The Library will generate an archival copy of the thesis from the electronic thesis, and both the electronic copy and the archival copy will be kept on permanent file available for reference or reproduction.



## Final Checklist for the PhD Degree

- An electronic copy of the thesis submitted to the registrar along with database if applicable;
- University Microfilms, Inc. Agreement Form along with permission letters for previously published articles. Attach one extra abstract and one title page. Submit to the Registrar's Office;
- The appropriate fees;
- Survey of Earned Doctorates form to the Registrar's Office;
- Two extra title pages to the Registrar's Office;
- Proofread copy of the thesis n with proofreader corrections to the Graduate Office;
- Proof that you have informed the Student Service's Office of your completion and have provided them with your forwarding address. Submit to the Registrar's Office;
- Forwarding Address Form include the address at which you can reached for the next three months to the Registrar's Office;
- Exit interview.