



Original Research Proposal

Guidelines

2015

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Goal and Faculty Expectations about the ORP

The primary goal of the ORP is to have the first-year students understand what goes into designing a research project. How to formulate a question that is worth answering but sufficiently well defined to be manageable, how to recognize alternative hypotheses, and how to design and interpret experiments that can distinguish between them.

In other words, we expect students to show that they are able to formulate an experimental plan that plausibly could answer a reasonably interesting question. The plan does not have to have a high probability of success suitable for an NIH R01 style grant proposal, and the question doesn't have to be paradigm shifting. However, students should be pressed on projects that are completely pointless and experiments that don't address a question. They should be able to discuss more than one possible outcome of their planned experiments, and they should be able to propose follow-up experiments to distinguish with some or all of the possible explanations for a given experimental outcome.

In addition, the faculty reaffirmed a few years ago as a group that the ORP is not a comprehensive exam. This means that the ORP is not about how much material the students have retained from courses taken here or elsewhere. GPC takes student performance in coursework into account along with the ORP and there are other times and places for tests of general knowledge of biochemistry.

Note that it is entirely appropriate to ask students about things that ARE related to their projects, and if a student proposes a change in a cellular activity that could be due to anything from allosteric control of enzyme activity to programmed DNA rearrangements, then the student has opened him or herself to questions related to those topics.

NOT OK:

Student #1: It is known that addition of PEP to PFK changes the binding affinity of F6P to the enzyme. My ORP will be about finding residues that are involved in allosteric channels. Faculty member: Tell me everything you know about how glucose affects gene expression in *E. coli*.

Student #2: My ORP will examine chromatin remodeling at the promoter for the acid phosphatase gene in *S. cerevisiae*. Faculty member: Describe the mechanism of acid phosphatases, what is the nature of the active site?

OK

Student #1: It is known that addition of PEP to PFK changes the binding affinity of F6P to the enzyme. My ORP will be about finding residues that are involved in allosteric channels. Faculty member: I see from your proposal that this involves testing the properties of mutant enzymes. How will you decide which residues to change, and how will you make these mutations?

Student #2: My ORP will examine chromatin remodeling at the promoter for the acid phosphatase gene in *S. cerevisiae*. Faculty member: What kinds of mechanisms are involved in chromatin remodeling?

Overlap with Bio/Bio faculty research or student's previous research

The ORP is intended to be an original research proposal. Thus your ORP topic must not be identical to the research of any member of the Department of Biochemistry and Biophysics, although a related topic may be satisfactory.

Also, Your ORP topic must not include any research in which you have previously participated.

Faculty mentor-mentee relationships

Students are encouraged to meet with their faculty mentor during the fall semester to begin talking about possible general directions for their ORP and about choosing a key paper. It should be noted that ORP topics will not be approved unless they are connected to one or two specific papers from the literature. If a student starts with a good topic/paper then the ORP process generally goes much more smoothly.

It should also be stressed that the ORP mentors are not the only source of information for the students. The mentor's goal is to steer mentees to sources in the literature or to other scientists who may work in an area the mentee finds interesting. An ORP mentor's role is to advise students by pointing out obvious flaws in reasoning, asking about controls and alternative approaches, and asking what will happen if the experiment comes out with a different outcome than what the student is expecting. However, it is the student's responsibility to identify and contact faculty members or other scientists who can best help them with the specific scientific area that they are most interested in.

In the event that the mentors or the mentees have interactions that are negative or unproductive, or if there are chronic difficulties in arranging meetings either party can request a reassignment by contacting Rafael or the Head of the GPC. The GPC will make re-assignments. Both parties should know that the change in assignment is not intended to be an indictment of the person nor the training process, but a way to help find a better match. **The last day for reassignment is Wednesday, January 21, 2015.**

Specific responsibilities of mentees

The mentee should:

1. Set up and keep appointments with mentor
2. Come up with ideas for the ORP, locate and read the necessary background materials, and propose the approaches to be used.
3. Identify other resources that could improve the ORP and initiate discussions with those who could help with the science.
4. Determine whether input from others, including the mentor and the mentee's PI, once assigned, will improve the ORP and then integrate the ideas into the ORP.
5. Submit all drafts on time.

Specific responsibilities of faculty mentors

The mentor should:

1. Be responsive to the mentee's needs for scientific input, provided that they are reasonable and will not affect the integrity of the ORP process.
2. Be reactive with regard to the ideas concerning the ORP. That is, comment on the mentee's ideas, but refrain from proposing unrelated directions and/or force radical changes in the direction of the proposed research.
3. Be proactive if the student is floundering or unable to complete assignments. Do suggest ways for the student to pace the ORP process or seek other resources, including other scientists, books, reviews, etc.
4. Approve documents related to the ORP (see below) that the students need to submit.
5. Avoid rewriting anything for the student...no matter how tempting it might be!

Summary of key dates

Dec. 10	ORP Kickoff, 1:30 – 3 p.m., room N127
Dec. 11	ORP Tools Workshop, 9:30 a.m. to noon, room N127
Jan. 5	Mentees need to define an area of interest for the ORP workshop
Jan 5, 7, 9	Intersession ORP workshop, room N127
Jan 16	Submit signed plagiarism form to Debbie Gau by 4 p.m.
Jan 20	Submit <u>two</u> possible topics to Rafael by 11 a.m. For each, supply the key literature reference, a very brief description of the question and general approach to be pursued
Jan 21	Last day to request reassignment of mentor or mentee
Mar. 17	A one-page “Specific Aims Summary Page” for the ORP to Rafael by 11 a.m.
Apr. 13	Draft copy of the ORP, approved by the mentor, due by 11 a.m. to Rafael
May 7	4 copies of your final ORP proposal by 4 p.m. to Rafael
May 11-12	ORP exams
May 21	Students that will be retaking the ORP should submit 5 copies of their revised ORP proposal by 3:00 p.m. to Rafael
May 26	ORP retake

Intersession ORP Workshop

Note: Attendance by all first year students at all sessions is mandatory.

Session 1: Monday, January 5 2-5 PM Room N127

All first year students will give a 2-3 minute presentation of their idea for an ORP topic and get initial feedback from the instructors and from their peers. As outlined in the tools workshop, students should begin this presentation with four or five concise sentences that summarize the specific question that they plan to address.

Session 2: Wednesday, January 7 2-5 PM Room N127

Discussion of ethics, plagiarism and the consequences thereof

Senior graduate students will describe their ORP experience, share with the new students what types of questions were asked during their actual exam, and provide suggestions of what to do and what not to do when preparing for the ORP.

Session 3: Friday, January 9 9-11 AM 1-3 PM Room N127

All first year students will give a presentation of up to 5 minutes (with up to two PowerPoint slides) of a proposed ORP topic. This can either be the same or a different topic than presented on **January 5**. The subject choice and outline are nonbinding, but are intended to help the student focus on a specific topic and to get a better idea of whether it would be suitable for development into a successful ORP.

Other deadlines

March 17: Students will submit a one-page summary of their ORP (signed by ORP mentor) to Rafael Almanzar by 11 a.m. that contains the topic area, hypothesis, aims and a brief description of proposed approaches. This is equivalent to a letter of intent. Mentors should have input and initial a hard copy draft to be submitted.

April 13: The complete draft of the ORP should be submitted to the mentor for comments plus an electronic copy should be cc'ed to Rafael by 11 a.m. The faculty mentor should sign the draft. If the signature is missing, the proposal will be accepted, but Rafael will check with the mentor to determine whether he/she had a chance to review the draft. The students should note that the electronic copy will be scanned for plagiarism. Faculty mentors should provide input to the student by **April 10**. The student can also submit a draft to his/her permanent lab PI and request input. Note that it is the student's responsibility to get necessary feedback for their ORP.

NOTE: The only faculty members allowed to read the **ORP proposal** are the mentor and the student's permanent lab advisor (when officially assigned).

NOTE ALSO: Only fellow graduate students can review the student's **oral presentation**. Faculty (including the mentor and PI) and postdocs are **NOT** allowed to attend practice talks.

May 7: 4 copies of the final ORP proposal plus the key paper is due before 11 a.m. in Rafael's office. The proposal should also be submitted electronically. The key paper must accompany the ORP and should also be submitted electronically as a PDF file. Rafael will use a document-checking program to determine that your ORP does not contain text duplicated from existing literature.

May 11-12: ORP Exams

May 21: Revised ORP proposals (if requested by committee) due in Rafael's office before 11 a.m.

May 26: ORP Retake

How “Biochemical” does the ORP have to be?

Questions have arisen about to what degree the ORP has to focus on “Biochemistry/Molecular Biology” as opposed to “Genetics” or “Cell Biology”. In many ways this is a semantic argument since these fields greatly overlap. However, the students are working toward Ph.D.s in biochemistry and biophysics and the ORP is intended to be an exercise for them to plan a project that is focused on specific molecules and which is mechanistic in scope.

Students should avoid descriptive projects such as simply isolating mutants and looking at a cellular phenotype. Instead, they should propose hypothesis-driven projects that will further the understanding of some aspect of biochemistry. A useful guide is to not simply ask WHICH molecules participate in a process, but to ask HOW does a participant achieve X. If at all possible, the students should strive for a quantitative answer.

HOWEVER, part of being a good biochemist is to appreciate the range of approaches that are available and to use the methods that are most appropriate to address the particular hypothesis being tested. The primary focus should be biochemical, but depending on the particular questions it may be appropriate, and perhaps even necessary, to use genetic tools or cell biology. No matter which approaches are used, the students should fully understand their pros and cons.

Consider a project deals with intracellular trafficking from the nucleus to the mitochondria. The main focus on the proposal should be to improve understanding of the molecular interactions that mediate and control the trafficking, perhaps using pull down experiments, molecular interaction studies with purified proteins, or advanced spectroscopic techniques. However, having determined a putative molecular mechanism and made critical mutations, it might then be appropriate to determine the actual location the protein within a live cell to confirm the physiological relevance of the *in vitro* results. Whether any sort of *in vivo* analysis would be appropriate for your ORP would depend on the nature of your project.

Another examples of inappropriate ORP proposal would be proposing a structure determination with no hypothesis-driven experiments, or proposing technology development.

Material Resources

Do not worry about budget.

You can use any materials or instruments that exist.

You cannot use materials or instruments that do not exist.

e.g. If you need an antibody that no one else has reported, you must be able to outline how you would make it.

You must describe appropriate methods to produce the amount of material required for your measurements. Be prepared to justify your choice of methods.

e.g. If you propose a method that requires large amounts of a protein that is very difficult to obtain, be prepared to explain why you are not using alternate methods.

Written Proposal Guidelines:

Students should be able to formulate the question that their project addresses and be able to explain why that question is worth answering. They should then outline experimental approaches that would generate enough experimental data for one or two publications in good journals. In particular, the students must be able to take their project beyond a single experiment. Thus, the proposed studies should include at least one level of follow-up experiments (i.e. future directions) that would be different depending on the outcome of the initial aims. The number of follow-up experiments will depend on the content of the initial experiments.

The written statement describing your ORP should be similar in organization to an NIH grant and must be built around a hypothesis-driven question. The written proposal **must** consist of the sections listed below in the order indicated and with the titles indicated. Note that there are page limits for each section of the written proposal. **Use your best judgment about what to include in your written statement and what points to leave for the oral defense.** Use diagrams and figures as part of your proposal to help make important points. Figures and diagrams do not count toward the page limits and may be placed at the end of the document.

Page 1: Specific Aims Summary Page (single spaced, 0.5 inch margins, at least 11 point Arial font)

I. Abstract (1 paragraph). This section should cover issues relevant to the proposed study such as: what is the biological question to be answered and its importance; a description of the unknowns of the biological system; a brief description of the methodology to be used to address your question; a conclusion about the expected outcomes of the study and how it will answer the proposed question. Avoid summaries of past accomplishments and the use of the first person. The abstract should be self-contained and understandable without reference to any other section, figure, etc. The plot of your story is in the introductory paragraph, where you say why the reviewer should care about [e.g. colon cancer as a fatal disease] and about your efforts to [e.g. detect it more accurately]. The specific problem that you'll be addressing, in this hypothetical case, is that [e.g. current molecular approaches for measuring colon cancer progression are relatively insensitive]. The solution is [e.g. new protein technology based on the enzymatic roles of some proteins secreted by colon cancer cells]. All of that can be said in the first paragraph of your first page.

II. Introduction to hypotheses/goals of experiments (1 paragraph). This section should introduce the basis for the hypothesis and what should be learned from the study. Whether you have a general, overarching hypothesis that covers the entire proposal or a specific one for each aim is a question of personal style and of what best fits the science you are proposing. But there should be a hypothesis somewhere in your application. Vague statements such as "We hypothesize that tumor tissues and normal tissues from the same organ will have different patterns of gene expression" are virtually useless. Be more specific, perhaps saying, "We hypothesize that tumor tissue will display a gene expression profile showing elevated inflammatory responses." Again, a small example from the NIH guide, which might be helpful.

III. Summary of Aims (1 paragraph). Use succinct statements or outline about the goals and basic methodology of each aim or sub aim.

Pages 2 - End (double spaced, 0.75 inch margins, at least 11 point Arial font. Page lengths indicated are suggestions. **The total length of this section must not exceed 10 pages.**)

IV. Proposal Uniqueness/Creativity (1 paragraph). Succinctly state why your proposal is unique/creative/innovative and how/where you addressed this within the proposal. The goal of this component is to spur creativity in proposing experiments. Creativity may include, but not be limited to, the following questions: Are aspects of existing systems brought together to open a new area of study? Are novel or cutting edge techniques proposed? Under all circumstances, appropriate methodology should be proposed, regardless of novelty. However, proposals taking chances and identifying novel possible solutions and/or methodology for answering interesting questions will be rewarded.

V. Research Strategy

Background and Significance (2-3 pages). Briefly sketch the background for the proposal. State the importance of the proposed work and relate it to what is currently known. Appropriate citations are required.

Specific Aims (2-3 pages per aim, depending on size of aims, number of sub aims, etc.)

- A. Aim 1:** Based on the subheadings below discuss the rationale for the experimental plan, the procedures/methods to be used to accomplish the specific aims, potential difficulties and limitations of the proposed methodologies, possible outcomes and interpretation, and alternate possibilities/strategies.
1. **Experimental Rationale**
 2. **Experimental Design**
 3. **Experimental Results and Interpretation**
 4. **Future Directions and Alternative Strategies**

Use same formatting for additional aims

VI. Summary and Conclusion (1-2 paragraphs concluding the document)

Additional Sections

Figures with explanatory legends should be included where appropriate.

VII. Literature Cited/References: Provide the complete citation for all literature sources used. Each literature citation must include the title, names of all authors, book or journal, volume number, page numbers, and year of publication, single spaced. **Use of EndNote is strongly suggested for ease of organizing the references. Use reference formatting style from a journal.**

Key Paper: As mentioned above, ORP topics will not be approved unless they are connected to one or two specific papers from the literature. A copy of the key paper must be attached to the written proposal and will be provided to each member of the ORP committee along with the proposal before the oral exam. Obviously, the student is expected to be able to critique the key paper.

NOTE: The only faculty members allowed to read a student's ORP proposal before the exam are the mentor and the student's permanent lab advisor (when officially assigned).

Use the cover sheet format for the draft and final copies of your ORP paper, example on last page.

Ethics and Plagiarism Statement

I understand that professional ethics are taken very seriously in the Department of Biochemistry and Biophysics at Texas A&M University.

I have received instruction about professional ethics during the OGS orientation for new graduate students in September during Dr. Park's presentation on "Expectations and Evaluation of New Graduate Students", and during the January ORP Workshop.

Specifically, I have been informed that falsification of data is sufficient grounds for dismissal from the graduate program and it has been emphasized to me that the ORP is supposed to be an original research proposal. I further understand that the rough draft and final version of my proposal will most likely be screened electronically for evidence of plagiarism.

It has been pointed out to me that information on professional ethics, and specifically on plagiarism, is available on the TAMU web site and that a tutorial is available to help me understand what constitutes plagiarism and how to avoid it.

<http://aggiehonor.tamu.edu>

<http://library.tamu.edu/>

Under class resources, click on tutorials, then Academic Integrity, then Academic Integrity & Plagiarism to see the presentation

<http://www.indiana.edu/~istd/>

I understand that, if I have questions, it is my responsibility to ask for clarification from my ORP mentor, my permanent laboratory advisor, a member of the graduate program committee, or the Aggie Honor Office.

I understand that if I am found guilty of plagiarism, possible consequences can include a poor grade on the 1 credit BICH 685 with my ORP mentor, having only one (rather than two) chance to pass the ORP exam, or possible expulsion from the graduate program.

I further understand that the rough and final drafts of my ORP proposal will not be accepted nor will I be allowed to take the ORP exam until a signed copy of this document is given to the Biochemistry and Biophysics Graduate Program Office.

I hereby certify that I have taken the opportunity to review the material on plagiarism and other forms of academic dishonesty on the web sites listed above and that I understand and agree to abide by the Aggie Honor Code.

Student Name

Student Signature

Date

Submit signed form to Debbie Gau by 4 p.m. on January 16, 2015

Oral Defense Guidelines for Students

For the Oral Defense, students should plan a presentation of about 20 minutes describing the relevant parts of your proposal. Presentations will be limited to 12-15 PowerPoint slides. The three faculty members evaluating your proposal will have had the opportunity to read your Written Proposal and the key paper that you have selected. During and at the conclusion of your 20 minute presentation, faculty members will question you on aspects of the proposal they feel are important. At least one of the faculty members will be a member of the GPC.

It is important that you demonstrate understanding of the methods you propose to use as well as your particular experimental system. In particular, students should be able to grasp the limitations of their methodology, if not in the original proposal, then in the discussion at the exam. Students who realize during the exam that a line of experiments will not work - AND can cogently explain why - are often allowed to pass without reformulating a new project that would have a higher probability of success. Whether the overall performance is sufficient to pass is, of course, at the discretion of the committee.

Backup slides for other methods will not be allowed. Students must use the board to explain backup methods. This is based on our sense that too much time is spent on making the slides and not enough time on understanding the content.

Decisions as to the acceptability of your ORP and the overall evaluation of your progress during your first year in the graduate program will be made within one week of the Oral defense. You will be notified in writing of the results of this evaluation.

NOTE: Only fellow graduate students can review the student's oral presentation. Faculty (including the mentor and PI) and postdocs are not allowed to do so.

Example of OPR evaluation sheet

2015 Evaluation of Original Research Proposal

Student:**Date:****Time:****Room:****Faculty Member:****Comments for GPC:**

Sub-categories	A	B	C	D	F
Originality/Creativity.					
Understanding of background.					
Ability to formulate a good question.					
Appropriateness and understanding of methods.					
Communicates effectively.					
Ability to understand limitations of the proposal and to think on their feet.					

COMMENTS:

OVERALL EVALUATION:

(with "C" being a marginal pass)

A B C D F

Do you believe a retake is necessary?**Yes****No****What degree of change is needed?****None****Minor****Major****New Topic****Do you believe a rewrite is necessary?****Yes****No**
☐ Rewrite specific section(s): _____

☐ Complete rewrite

****ORP Cover page to be used for the draft and final:***

***Full Name
UIN
Date***

Title of ORP

PI's Name