MCB Second Year Review Guidelines

July 2021

The purpose of this review is to evaluate your progress towards establishing the foundational knowledge in your research area needed to develop an impactful set of research questions that will make up your thesis proposal. You should be continuously adding to your knowledge base through coursework, lab meetings, discussions with your PI, independent readings, journal club, and attending scientific seminars and conferences. If you engage in these activities upon joining a lab, you will become familiar with the important questions in your field and methods with which to tackle them. **Therefore, this exercise is not intended to be an exam for which you are expected to study or cram.** Rather, the majority of the knowledge needed for this review should be the cumulation of your scientific activities to date and thus represents an initial foundation to build upon as you progress in your training.

After the Second Year Review, a student should demonstrate:

- Solid foundational background on the state of the field as it relates to the student's research focus (assessed by the *Second Year Review Document*).
- A well-defined overall objective of their project (assessed by the *Second Year Review Document*).
- Progress in lab work towards defining their specific aims (assessed by *Productivity and Project Advancement Presentation*).
- Effective communication of scientific ideas and impact (assessed by *Second Year Review Document* and *Productivity and Project Advancement Presentation*).

Please note that it is possible that your Committee may recommend revision of the Second Year Review Document, additional coursework, or other training as part of the outcome of the Review.
The Second Year Review is organized in the following four parts:

1. Second Year Review Document:

Create a document (3-page maximum, 11 pt font, single spaced, 0.5 in margins all around) containing the two sections described below. Include a title that summarizes the topic and questions of your project. You may include 1-2 relevant figures. It is highly encouraged that you seek input by your PI before submitting the document package. Although your PI can provide input regarding the general content and organization, they cannot do extensive editing, rewriting or copyediting. Write your document in the form of an essay and organize it under the two section headers:

A. Outstanding questions and impact and B. Significance.

A. Outstanding questions and impact: 1- 1.5 pages

Hypothesis-driven research is fueled by understanding the key questions pertaining to your project and field. Identifying these questions and thinking through them will guide your overall project direction, influence your experimental design, and ensure your results have the highest impact possible.

Questions and prompts to consider as you write your document:

1. **Research topic and statement of importance:** briefly describe the topic or field being examined. Why is this an important area of research? (see note 1)

2. **Outstanding questions in your field:** Describe important and currently outstanding questions in your field that interest you. Support your argument by discussing 2-3 key primary research papers that led to these questions. (see note 2)

3. **Identification of knowledge gap(s):** Identify the specific gap(s) in knowledge that needs to be filled in order to answer these questions, i.e. what type of information needs to be collected? (see note 3)

4. **Objectives / approaches**: Briefly describe 2-3 objectives and associated approaches (experimental and/or analytical) that you would use to fill the established knowledge gap(s). (see note 4)

5. **Impact statement:** Now that you have educated the reader, briefly describe: 1) the impact that the completion of your work will have in the context of the specific question(s) articulated above and 2) the impact that your studies will have on your field or scientific community, and, if applicable, on human health or the greater community? (see note 5)

Use primary literature as the main resources to support your answers, but reviews may be cited where appropriate.

Bibliography and format:

a. In-text citations should be written in the *Cell* style and not numbered, e.g., "Smith et al., 2015; Smith and Jones, 2015." See below.
b. Include a pub-med hyperlink for each in-text citation.
c. Use a reference manager (*e.g.* Zotero, Endnote, etc.) to format your bibliography at the end of your paper. Note that the bibliography does not count towards the page limit of this document.
d. References are not included in the page limit.

- Article in a journal: Sondheimer, N., and Lindquist, S. (2000). Rnq1: an epigenetic modifier of protein function in yeast. Mol. Cell 5, 163–172.
- Article in a book: King, S.M. (2003). Dynein motors: Structure, mechanochemistry and regulation. In Molecular Motors, M. Schliwa, ed. (Wiley-VCH Verlag GmbH), pp. 45–78.
- An entire book: Cowan, W.M., Jessell, T.M., and Zipursky, S.L. (1997). Molecular and Cellular Approaches to Neural Development (Oxford University Press).

B. Significance: 0.5 - 1 page

Communication of science and its impact on different communities is critical for creating an informed public as well as motivating interest in your work. This should include 2-3 sentences that describe the relevance/significance of your project to each of the following audiences:

1. Scientific peers that are not in your field.
2. A general, lay audience (i.e. a member of the public with no scientific training).

2. Professional Development Report

In a separate document form the one above, list the following:

1. Any conferences or symposia that you attended since arriving, and/or ones that you would like to attend within the next year.
2. Any presentations and format (oral or poster and specifying if local, national, or international) that you have given since your arrival and those that you plan to do within the next year.
3. Your plan of study form to remind the committee of the classes you plan to take. This is a great opportunity to discuss a revised plan and get it signed by your committee if applicable. https://registrar.uconn.edu/wp-content/uploads/sites/1604/2019/02/Plan-of-Study-Doctor-Philosophy.pdf

3. Productivity and Project Advancement Presentation

To demonstrate your research progress at the Second Year Review meeting, you will present a short talk outlining the background, importance, and overarching goals of your research project, recent experimental results and their interpretation, and design of upcoming/planned experiments. This presentation should be no longer than 20 minutes and the slides of your presentation must be shared with the committee in advance (see timeline below).

Timeline and due dates

Component	Date due to committee	Format
1. Second Year Review Document	Two weeks prior to meeting	PDF
2. Professional Development Report	Two weeks prior to meeting	PDF
3. Productivity and Project Advancement Slides Presentation	Two days prior to meeting	PDF
4. Plan of Study	Two days prior to meeting	PDF

5. 1st Year Committee Meeting Slides Presentation	Two days prior to meeting	PDF
6. Individual Development Plan	Two days prior to meeting	PDF

4. Individual Development Plan

Please include the Individual Development Plan you created in MCB6001.

Prompt notes for section A:

These notes are provided to illustrate the type of content you could write for a hypothetical project that investigates the genetic basis for a heritable disease.

Previous attempts to understand the genetic basis for disease X have focused on exon arrays for genotyping in coding regions only. The results from these studies do not adequately explain all of the genetic variation associated with the disease, and your preliminary results suggest that there are mutations in non-coding regions that likely contribute to the disease. Therefore, your proposal is centered around the use of complete genome sequencing or high-density SNP arrays to identify disease-associated loci in both coding and non-coding regions of the genome. You will then use multiple functional genomic datasets to investigate the specific gene regulatory mechanisms that are altered in the diseased state. The numbered notes below correspond to each prompt.

1. **Research topic and statement of importance:**
   Think in broad terms. For instance, if you plan to investigate the genetic basis for a heritable disease, you could lead with a basic description of the disease, its frequency in the population, and why an understanding of the underlying genetics is important.

2. **Outstanding questions in your field:**
   In following the above example, one could state that although the disease shows clear patterns of inheritance, only a small percentage of disease occurrences are adequately explained by previous studies that focus on coding regions. A brief discussion of the shortcomings of previous studies is warranted.

3. **Identification of knowledge gap(s):**
   Here, the specific knowledge gap refers to the information or data that is needed to answer the question proposed above. Again, following the heritable disease example, one could state that we do not have sufficient knowledge of the genetic variation of individuals from families with the disease. Therefore, to fill this knowledge gap you would propose to identify candidate susceptibility loci in both coding and non-coding regions of the genome through collection of genomics data.

4. **Objectives / approaches**

   This is the section where you explain *how* your project will advance your field and why it is innovative. You can state specific approaches that will be employed and their advantages. In the example of a heritable disease, you could propose to collect whole genome sequencing data or high-density SNP genotypes covering the whole genome from individuals in families with or without a history of the disease.

   In this case, your approach is novel because in addition to mutations in coding regions, you plan to include candidate loci that are in non-coding regions in your studies. The innovation to emphasize is the use of new or available functional genomic data (ChIP-seq, RNA-seq, etc) from affected and healthy individuals. These data will allow you to generate testable hypotheses for how the non-coding regions function in healthy and diseased individuals.

5. **Impact statement:**

   The impact statement can be targeted to both scientists and a general audience. For instance, you could state that the candidate loci identified in your proposal will be foundational to future studies of the role of non-coding mutations to heritable diseases, and can identify potential therapeutic targets for mitigation of the disease.