

Comprehensive Exam Study Guide

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Comprehensive Exam

Description and Logistics

Welcome to my study guide that I used to prepare for my comprehensive exams. This is a compilation of resources that I used while studying for my comprehensive exams. Each tab and chapter in this R-book are organized by the committee member this was used for.

Disclaimer: Some pages of notes are more comprehensive and descriptive than others. This study guide is meant to be a foundation to bounce off of the topics I learned more about for this exam set. And of course is in no way a completely thorough literature review on this topic - for every paper cited or mentioned, I'm sure there are 3-4 more great papers on that topic.

University of Rhode Island specifics

Comprehensive exams at the University of Rhode Island are taken ~completion of 3rd year - 4th year and result in moving from Level II to Level III graduate student as well as moving from Ph.D. Student to Ph.D Candidate. Each committee member gives a day-long written exam (usually 3) and ~2-4 weeks later there is a 2 hour oral comprehensive exam with all committee members (addition of an outside department chair = 4 members).

“The graduate manual has not been updated with the changes quite yet. You are not required to go through our office to schedule your comprehensive exams. You will schedule with your committee and then your major professor will submit the results.” - URI Graduate School (Spring 2021)

No forms are necessary for scheduling the exam, just schedule both portions with your committee. I would advise scheduling your oral exam ahead of time and if you need to change it you can later.

Exam Content by Committee Member

Dr. Hollie Putnam's Exam

- signal transduction pathways; feedback loops, specific examples
- alternative interpretations for why methylation might not be the only player
- epigenetics/methylation details and history of the field
- interaction between genetics for evolutionary outcomes

semi-open book; HP chooses the resources available; 12 hour time limit.
will email in the morning with questions and need to return them by certain time.

DNA Methylation
Epigenetic Modifications
Biology of Coral Bleaching
Feedback Loops
Genotype x Environment
Signal Transduction
Thermal History and Variability

Practice writing questions: [here](#).

Dr. Scott McWilliam's Exam

Flexible Phenotype Chapters 4, 5, and 9
Biochemical Adaptation Chapters 1 and 2
Fox et al: Beyond buying time: the role of plasticity in phenotypic adaptation to rapid environmental change.
Snell-Rood et al: Mechanisms of plastic rescue.

Open-book; 1 day time limit (24 hours)

Biochemical Adaptation
Flexible Phenotype
Plastic Rescue
Plasticity and Phenotypic Adaptation

Dr. Roxanne Beinart's Exam

Focus on the topics covered in Microbial Interactions: OCG594 this semester with a focus on the background readings from each week. I suggested mutualism with multicellular organisms and cooperation/communication topics in particular. The bulk of notes for this exam are in the Mutualism markdown below.

Open book; 12 hour time limit.

Basics of Symbiotic Interactions
Mutualism
Coral Holobiont
Cross Feeding

Exam Reflection and Suggestions: What I Wish I Knew

My advice to a future me if I were to go back in time and do this all over again
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Use citations to build a case, not solely as needed

While I was writing my exams, I made the mistake of citing as needed - as in I cited when I used a reference to explain concepts and answers rather than using the literature and citations to build a case and story. References and literature is the base of the answer that you construct. See below Comprehensive Exam Tips for more details on this.

Notes and study guide structure

I would suggest to structure notes based on the type of exam rather than the content:

For a 12-hour open exam: I would keep a heavy focus on the bigger picture of how concepts connect to each other instead of in-depth notes on the small details of pathways and examples. I would use my notes as bookmarks for examples (i.e. come back to this paper for an example of this) that I could reference for more detail during the exam if needed.

For a closed exam: I would need to know the citations and exactly what information I would cite from them prior to the exam since I would not be able to reference or read the paper again. I would also practice writing out the questions and answers. For example, I expected to have to explain a signal transduction pathway from environmental signal to change in methylation pattern. For this I needed to understand (not just memorize) how the signal pathways in corals worked. I wrote the following bullet points:

Signal transduction:

- Receptor (2)
- 2nd messenger (2)
- Example in corals (4 steps)
- Alternative to temperature (1)

“Receptor (2)” prompted me to explain to myself how the cell is able to receive a signal and the 2 denotes that in my notes I had 2 examples of this or 2 mechanisms. I use these bullet points to guide explaining this out loud (usually to myself but a kind friend will do too). If I can teach it without referencing my notes, then I know I understand it well. During the exam if I have forgotten a specific, then it’s easier for me to remember when I know the numbers I had associated with each bullet point - this (in a similar way to colored notecards for some people) guides my brain to associated information together.

I struggled for so long in high school and college to keep up with material when notecards and different forms of study guides didn’t work that well for me. I

found that teaching does - using bullet points like the above and then ‘teaching’ it back to myself is the most effective studying method for me.

Creating this study guide was the most helpful resource for me - a concentrated document where all my citations and references lived for easy access during open book exams.

Exam Week

Absolutely put a day in between exams - I had two back to back and did not leave myself enough time to re-group and prepare for the next one.

Get other people’s exams

It is fair game to ask for peer’s exam questions and answers. I didn’t realize how open this may be prior to my exams - it helps to see how others structured their answers and what literature they relied on. I am more than happy to share all three-four written exams I took - both the best and worst answers I wrote (email emma_strand@uri.edu).

Burn-out

I completely burnt myself out during this studying process and by the end, didn’t enjoy the process - which is such a bummer because several people reflect positively on their time during comps because you get to spend so much more time just learning. My notes for the third exam I took were not nearly as detailed as the first two sets and by the time the third written exam came around it took a huge amount of brain power to get through the exam.

General Comprehensive Exam Tips

Role of the Comprehensive Exam

“The comprehensive examination is a critical part of a PhD program. You should not view it simply as a bureaucratic hurdle to pass over on your way to the dissertation. Instead, before embarking on narrowly focused dissertation work, the comprehensive examination establishes that you have the broad familiarity and expertise with the field that is the mark of a doctoral education. It is the checkpoint that confirms that you are ready to pass from being a student to a scholar. The process of preparing for the comprehensive exam should help you organize and reflect on the variety of things you have learned over the past few years. While to this point, each of your seminars has been a distinct learning experience, you now have the opportunity to think about how your interdisciplinary work in international studies fits together. Preparation for the comprehensive exam should help you become better able to integrate and utilize the knowledge you have gained in your graduate study. It is also critically important for embarking on the dissertation. The best dissertations are effectively connected to the central questions and literature of the field. Unless

you have developed an integrated overview of the field you will not have the necessary foundation for dissertation work. This written exam process allows the committee insight into your capacity for integration, synthesis, and expression of your knowledge around particular research topics/questions. It then enables us to more effectively guide you and challenge you in the rest of the dissertation process.”

Tips for Writing an Effective Comprehensive Exam

From Old Dominion University webpage.

1. Make sure you answer the questions explicitly and clearly.

The most common comprehensive exam mistake is to not explicitly and clearly answer the question. Read the question very carefully and make sure that you offer an explicit answer to the question. Do not rely on the readers to draw out implicit answers.

2. Make appropriate reference to the literature and relevant scholarly debates.

You should demonstrate familiarity and facility with a range of the literature. You should be able to appropriately reference the scholars whose arguments are relevant to a particular issue.

3. Make appropriate use of theory and of empirical and historical knowledge.

If appropriately done, it is particularly effective to use theory to inform answers on history questions and history to inform answers on theory questions.

4. Write full answers that are structured with an introduction and conclusion.

As in all writing, structure and organization are important to effective communication. Just because it is a time-limited exam is no excuse for jumbled, incoherent writing. Take the time to think through and outline your argument and its structure before you write. As in all writing, signposting, headings, and clear explicit language can help communicate your ideas. Provide a clear introduction and conclusion that can help you summarize your central point and will reassure the readers that you have, in fact, explicitly answered the question.

5. Make an argument

As a scholar prepared to embark on independent thesis work, it is important that you demonstrate an ability to effectively articulate your own views. The comprehensive exam is not just about knowing the literature. It is also about demonstrating that you can think about international issues critically and come to your own conclusions. Avoid wishy-washy answers that simply describe some of the ideas extant in the field and then conclude that they are all correct. Take a stand and defend it with appropriate theoretical, analytical, and empirical material.

6. Make choices

You will notice that most of the questions are a lot bigger than can be fully answered in the two-hours you will have on average during the written exam. You have to make choices on how you will answer so that you can display your breadth and depth of knowledge while satisfying the committee that you have effectively addressed the question. It usually helps if you can be explicit about how you are managing the question. It is rarely a good strategy to try to present a broad and superficial survey of too many things.

Chapter 1

DNA Methylation

A compilation of resources on understanding why the addition of that little methyl group matters.

What is DNA methylation?

From compgenomr:

10.1 What is DNA methylation?

Cytosine methylation (5-methylcytosine, 5mC) is one of the main covalent base modifications in eukaryotic genomes, generally observed on CpG dinucleotides. Methylation can also rarely occur in a non-CpG context, but this was mainly observed in human embryonic stem and neuronal cells (Lister, Pelizzola, Downen, et al. 2009; Lister, Mukamel, Nery, et al. 2013). DNA methylation is a part of the epigenetic regulation mechanism of gene expression. It is cell-type-specific DNA modification. It is reversible but mostly remains stable through cell division. There are roughly 28 million CpGs in the human genome, 60–80% are generally methylated. Less than 10% of CpGs occur in CG-dense regions that are termed CpG islands in the human genome (Smith and Meissner 2013). It has been demonstrated that DNA methylation is also not uniformly distributed over the genome, but rather is associated with CpG density. In vertebrate genomes, cytosine bases are usually unmethylated in CpG-rich regions such as CpG islands and tend to be methylated in CpG-deficient regions. Vertebrate genomes are largely CpG deficient except at CpG islands. **Conversely, invertebrates such as *Drosophila melanogaster* and *Caenorhabditis elegans* do not exhibit cytosine methylation and consequently do not have CpG rich and poor regions but rather a steady CpG frequency over their genomes (Deaton and Bird 2011).**