

Psychobiology Research (PSY 433)

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Overview

In the past, I have taught this course as part laboratory, part conference. In the conference component, we read articles demonstrating methods that we don't have access to at Reed. In the lab component, we learned procedures and conducted a group experiment.

This year, I have decided to convert the course entirely to a laboratory course. Two great difficulties confront us. One, the enrollment is too large for an effective laboratory course. Two, the time period (1 hour and 20 minutes) is too short to do anything ambitious. Therefore, we will split into two groups for most of the semester: a Monday group and a Wednesday group. Each group will meet once a week, but for three hours: 2:10-5:00. In addition, there will be responsibilities outside of the normal class time.

I strongly considered having no syllabus this year, but chickened out. Thus, we have something scheduled for each week of the semester. I also strongly considered reserving the final 4 or 5 weeks for independent or small group projects. These can be either incredibly instructive or a big waste of time, and which is often unpredictable in advance. As the semester progresses, I will be open to revising the syllabus to permit us to follow our own interests. **Check the website frequently for readings and lab exercises!**

COURSE WEBSITE: <http://academic.reed.edu/psychology/courses/stjohn/psy433/index.htm>

Evaluation

This will be a difficult course to evaluate, because frankly I expect the reason you are in this class is to learn some very cool procedures and to be in the lab a lot and to have fun. If that happens, I will be eminently satisfied.

1. Laboratory Compartment (25%)

Part of what I want to you get out of this course – because you will be immersed in it – is proper conduct in the laboratory. First, I expect you to show a great deal of respect, concern, and humanity towards our experimental subjects, often living mice and rats. This humanity should be based both on a humane ethic – recognizing the sacrifice these animals are making and that they are creatures that can feel stress, fear, and pain – and also based on a scientific ethic – recognizing that results in a study can be compromised if the experimental subjects are stressed, unhealthy, or mistreated. Second, I expect you to show a great deal of respect towards our research laboratory. Not only is much of the equipment expensive; it is also often delicate and sensitive. A microscope loses much of its utility if lenses are scratched. Microforceps have delicate tips that are easily damaged. Electrical instrumentation must be finely calibrated. While accidents can and will happen, if you are careful and respectful, they will be minimized.

I don't expect any of this to be a problem, nor do I expect that grades can or should coerce behavior in this regard, but it is undoubtedly an important part of Psychobiology Research and something I take seriously. Thus, 25% of your grade in this course falls under the rubric of Laboratory Compartment.

These aren't "free points" or "wiggle room points"; this 25% represents a very important evaluation of your performance in learning psychobiology research.

2. Background Paper (25%)

For the most part, we are not attempting to generate new data in this class or run complete, well-designed experiments. (In fact, I secretly wonder if any of them will work!) Thus, there will be no "lab report" assignment, no "journal article" type summary of your work. This is a shame, however, because undoubtedly an important part of psychobiology research is reading a literature, designing an experiment, analyzing it, and writing it up. In order to feel more connected to what you are doing in the lab, the Background paper will be a mini-review article of some topic we are researching – organization of the somatosensory medulla, somatotopic organization of motor cortex, hormonal control of drinking, hippocampal control of exploratory behavior, or the role of the salivary glands in licking behavior (there isn't much out there on this). Basically, select any one of these and see what the current state of the field is in this area. Write a 6-8 page double-spaced brief review, hopefully relying on 4-5 current empirical articles.

3. Technique Papers (2 at 25% each)

There is an enormous variety of research methods used in psychobiological investigation, and we can only do a small handful. The ones we are using – lesion, stimulation, electrophysiology, intracerebral drug delivery, microscopy, perfusion, and histology are classic and generally applied techniques. However, each of these techniques also have various modern refinements. For example, "caged glutamate" is a way of stimulating neurons using light. "2 photon laser microscopy" is a way to visualize neurons several layers deep in cortex in living animals. "192 IgG-saporin lesions" is a way to specifically lesion certain cholinergic neurons, sparing different cell types in the same brain region. For these assignments, choose a modern technique, describe how it works, what its advantages and limitations are, and review its application in at least two empirical articles. These papers should be roughly 6 pages in length. A good way to get started would be to look at Psychobiology or Neuroscience textbooks; some have chapters on methods and many have "boxes" or special features devoted to methods. Another excellent source would be the *Journal of Neuroscience Methods* and *Current Opinion In Neurobiology*. The latter journal is especially good – it is available in the Reed Library and for the past 3 or 4 years has published, once a year, an issue devoted to "New Technologies". These reviews do essentially what is asked of you in the Technique Paper. (Be careful of plagiarism here. It is fine to use a New Technologies review as a resource, but do not use the same examples in your paper.)

4. The Participation Caveat

Although I have listed the 4 components of your final mark as coequal, the main focus of the course is the laboratory work, not the writing. However, I have no interest in grading you on how nice your slides look or how well-placed your lesion is. But you will not receive a high mark in this course by doing excellent on the writing assignments and being passive in the lab. Our resources are limited; often 4 of you will be working together on a procedure, but I expect each of you to get hands on work and to be enthusiastic about it. If this doesn't happen, it will be reflected in the grade. Simply signing up for a course like this, though, I really don't anticipate this will be a problem for anyone!

Due Dates

The due dates for the writing assignments are:

Friday, February 17

Friday, March 24

Friday, April 21

Turn in the work to the box outside my office. I expect one paper from you on each of these dates, but you may choose which type of paper to turn in when. Just make sure I get one of each type by the end of the term!

Timeline

Organizational Meeting M 1/23 We will discuss the format of the course and laboratory conduct.

Animal Care W 1/25 We will discuss the ethics of experimentation on animals including the ethics of using animals for demonstration purposes only. We will also discuss the proper treatment of research animals, how they are housed and cared for and how to minimize their discomfort. We will learn how to handle rats and mice and how to inject them.

After the first week of classes, we will split into two groups: one group will meet for 3 hours on Monday; the other, 3 hours on Wednesday (2:10 – 5:00). Smaller groups and longer sessions will permit us to undertake more ambitious projects.

Electronics M 1/30 We will do several exercises to prepare us for electrophysiological recording, such as: understanding amplifiers and oscilloscopes, understanding micromanipulators, and injection of anesthesia.

Nerve Conduction M 2/6 We will perform an electrophysiological experiment on earthworms. BYOE! Actually, bring a jar full. **Everyone will meet on Monday, no Wednesday session.**

Electrophysiology M 2/13 We will perform an electrophysiological experiment on a living rat.

Lesions M 2/20 We will make stereotaxically-guided lesions in the hippocampus.

Behavior/Tissue Collection M 2/27 We will test the lesioned rats in a behavioral task and then collect the brain so that we can assess the extent and location of the lesion.

Histology M 3/6 We will cut, mount, and stain brain tissue from our hippocampus rats.

Stimulation/Mapping M 3/20 We will map the topography of motor cortex of rats using microstimulation.

Cannulation M 3/27 We will implant a cannula into the lateral ventricle for intracerebroventricular drug injection.

Drinking Tests M 4/3 We will behaviorally test the rats and then remove the brains to verify the positioning of the cannulae.

Desalivation M 4/10 We will extirpate the sublingual and submaxillary salivary glands of mice to examine the effects of this manipulation on lick rate.

Behavioral Testing M 4/17 We will behaviorally test mice for their lick rate to water.

Final Thoughts M 4/24 Everyone will meet together on Monday at 3:10 in Psychology 136. I will be out of town on Wednesday, so we will meet together to evaluate the course together. (You will also complete the typical course evaluations on this day.)