Experimental Ecology and Evolution in the Field, Winter/Spring 2013 (EVE 180, 4+4 units, T/TH 9:00 to 11:50, Storer 1343)

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Course Objective

This course teaches the process of science through direct experience with field ecology research. During this course, we will design and execute an ambitious group research project from start to finish. This will include formulating an original research question, developing an experimental design, collecting data, statistical analysis, and communicating the results in the form of a scientific paper.

Course Description

This class is unusual for several reasons. First, this is a field-based ecology class – we do much of our science outside. Second, this is a small class for highly motivated students; the class is two quarters long and tons of work. Third, this class works together to do a real research project.

Textbook

There is no required textbook for this course. We will have a few selected readings early on, and we will be conducting extensive research in the primary literature.

Teaching Philosophy

1. *This class is about learning through doing.* We will focus on doing good research, and trust that valuable lessons will emerge from the process.

2. *This class is student-led.* We will provide a framework and our best advice along the way, but we expect you to take the lead in developing the core ideas and organizing the effort that will drive this project forward.

3. *This class is collaborative*. We will be working as a team in order to tackle objectives that none of us would be able to achieve by ourselves. By working together, we can do research on an amazing scale. Also, it is more fun.

Class Schedule

This is a normative schedule, and we will probably start to deviate from it pretty quickly. But to stay on track, we should probably try to stay pretty close to this.

week	topics
1/8	Introductions, an overview of the research process; photograph names; signup MCs and Bloggers; scouting out potential field sites
1/15	Considering potential study organisms; learning natural history in the 21st century; sampling local field guides; identify areas of expertise; identifying seasonally available organisms
1/22	Investigating potential research concepts; using the library and the primary literature; using bibliographic software; what makes a question interesting?
1/29	Research methods and tools of the trade; introduction to experimental design; tour of research labs and facilities
2/5	Project proposals due; peer review of proposals; identify a short list of projects; addressing possible logistical hurdles (e.g., permits and permissions)
2/12	Proposal presentations and discussion; preliminary experimental design; final voting on project proposals; library research and field scouting ;pilot studies
2/19	Experimental design
2/26	Experimental design; start the experiment
3/5	Data collection
3/12	Data collection
3/19	Data collection; (Finals week)
3/26	Data collection; (Spring break)
4/2	Data collection
4/9	Data collection
4/16	Data collection; write methods section
4/23	Data collection; methods section due; introduction to statistics in R; peer review of methods
4/30	Statistical analysis; write results section
5/7	Statistical analysis; results section due; peer review of results
5/14	Write introduction and discussion
5/21	Draft papers due; peer review of draft papers
5/28	Revise draft papers
6/4	Final papers due

Choosing a Project

The hardest part of this class (and science in general) is choosing a project. Choosing a project will require us to combine a moment of inspiration with the diligent effort required to craft a testable question. We'll need the technical skills to design solid methods, and sufficient imagination to foresee all the potential pitfalls along the way. It's the hardest part of science, and we're going to try to do it together in the first few weeks of this course.

In ecology, developing a new project usually means finding a way to combine the following four key ingredients: 1) an interesting conceptual question, 2) a practical field site, 3) an appropriate study organism (or set of study organisms), and 4) a feasible set of methods. Projects can begin from any of these ingredients, but all successful projects will eventually require all four of these elements, plus some hard work and a bit of luck.

We'll begin this class by focusing on each of these elements individually, and trying to look for the inspiration necessary to link them together. There will be a few trips to scout out field sites, and we'll also spend some time in the lab to learn some foundational skills. By the fifth week, we will each write up a short (<500 word) project proposal which outlines a possible project, including a clear description of the four key ingredients. Based on these proposals, there will be a peer review process to narrow down a short list of two or three candidate projects. Next, we'll divide into groups to research these proposals in greater detail. Each group will do a short presentation on their potential project, and we will spend some time discussing the details. Somewhere around the sixth week, we should be prepared to do a final vote to choose the class project.

The Blog

This class starts out with a few planned classes, but it will become improvisational pretty soon. Our agenda will change depending on the ideas and plans that emerge from the class, and we'll be grappling with the unpredictable whims of Mother Nature as well.

To stay on top of what's going on, each meeting will have an MC and a Blogger. The role of the MC is to keep the meeting on task, and make sure that we stay on target to accomplish what we need to do. The role of the Blogger is to keep a detailed account of our recent activities. These entries should include a recap of everything that has happened since our last class, including detailed field notes with photos and text. We will treat this blog as our shared project notebook, to help us remember who did what when and where. In order for this to be useful, the Blogger should post these notes to our blog as soon as possible after the end of each class. Here is our blog:

http://ecology180.wordpress.com/

In addition to keeping a record of the day's events, the Blogger should end each entry with a detailed agenda for the next meeting. Give this agenda some careful thought, considering what is feasible and where we are relative to the normative schedule. The Blogger has a particular incentive to develop a realistic and detailed agenda: during our next meeting, the Blogger from the previous meeting becomes the new MC. We'll sign up for MC and Blogger slots during our first meeting.

The Notebook

Almost every scientist I know has a notebook: a place to jot down notes, to-do lists, ideas, observations or whatever else comes to mind. The key to making a notebook useful is to use it regularly; I use mine almost every day. Each entry should include a date, but other than that, the sky is the limit. You can use yours to keep track of your new project ideas, or to keep your own personal notes in the field, or to write out concept maps, or to draw pictures. Sometimes, it's just useful to work with ideas on paper. If you see something cool, or you have a stroke of inspiration, or you spot a potential problem in the field – write it in your book, so we can all benefit. In a pinch, you can even use it to record data, although we'll usually aim to record data on datasheets. Your entries don't need to be long or carefully crafted – think of this book as a scratchpad where you are free to work out intellectual kinks. The crux is that you

should keep your notebook with you at all times – you never know when inspiration will strike. For this course, we'll provide the books and check in on them at the end of the winter quarter.

Expectations

1. *Be thoughtful.* Part of being a good colleague is being as accurate, deliberate, reliable, helpful and as cheerful as the circumstances permit. When things go wrong (as they always do), you should play an active role in seeking a solution.

2. *Be present.* In a collaborative project, we are all relying on each other. Your active participation in the research process helps everyone. If you are not able to attend a meeting for any reason, please make arrangements to have someone cover for you.

3. *Be prepared.* A big part of research is being organized and being prepared for what's coming. This could include being informed for discussion, being well-dressed for fieldwork, or being prepared to ride your bike on field days.

4. *Volunteer.* The demands of research are often unpredictable, and it is very likely that our project will require us all to do some work outside of our regularly scheduled meetings. This is par for the course in science; please volunteer cheerfully!

Evaluations

This is not your typical run-of-the mill course, and the students that take this course are not run-of-the mill students. We will be thrilled if every student earns an A in this class.

Grading for this course is a bit more fluid than for a normal course. For starters, the final grades for this course are deferred until the end of the Spring quarter. This grade will be based on your contributions to all stages of the research project, including the discussions, presentations, mini-assignments, lab work, field work, and written assignments that emerge in the course of this project. The expected break-down of evaluations is: winter participation (200 pts), spring participation (200 pts), blogging and MC'ing (100 pts), the notebook (100 pts), proposals and peer review (100 pts), presentations and peer review (100 pts), methods and peer review (100 pts), results and peer review (100 pts), draft paper and peer review (100 pts), final paper (100 pts). In addition, we may include some additional ad-hoc mini-assignments along the way. Although we will be working together to collect a single dataset for this project, each student will write up the project individually. In addition, many stages of this project will include an evaluated peer review component. Thoughtful and constructive peer review is an essential part of the scientific process.

A Note about the Course Material and Service Fee (CMSF)

This course will have a Course Material and Service Fee of $56 each quarter to cover the costs associated with the lab/course. Students who are unable to afford the fee may seek a waiver from the department. The waiver form is available at the front desk in the EVE office, 2320 Storer Hall. Completed forms must be returned to the EVE office before the 20th day of instruction. Only in extreme

cases of financial hardship, as of yet unaddressed through financial aid, can the fee be waived. Documentation is required. Further instructions are listed on the waiver form. You are encouraged to seek financial aid assistance from the Financial Aid Office. Information is available on the EVE department website *www.eve.ucdavis.edu* with full detail on the costs associated with each course/fee and an appropriate departmental contact should there be additional questions under the "CMSF Info" tab.

Keys

As we move forward in this project, there will probably come a time when you need to work late in the lab, or get some supplies out over the weekend. To do that, you'll need keys to the classroom. You can get building and classroom keys from Sally Sandoval (smsandoval@ucdavis.edu). There is a refundable $10 deposit for each key. Please make sure the classroom stays locked when no one is there.

Course Resources, Email and Links

This course will require us to use a wide range of resources. In some cases, we may suggest resources that become part of your toolbox. In other cases, you may be asked to draw upon your own unique skills and background to get you through. Don't be shy about asking for help. Also, if you discover any particularly useful resources, please let me know! The following course resources will be posted or linked on the course website (and more may be added):

1. USDA Insect Collection and Preparation Handbook (pdf)
2. Insect label template (docx)
3. Zotero and Mendeley
4. Purdue University's Online Writing Lab (OWL)
5. UC Davis Student Academic Success Center
6. UC Davis Student Disability Center
7. Health Education & Promotion Wellness: Napping & Sleeping Resources
8. Web of Science
9. Google Scholar
10. Tuft University's VUE
11. eFabre

If you want to email the entire course, you can email *fieldecology2013@smartsite.ucdavis.edu*.

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