ENVS 163 Plant disease ecology – Spring 2011
Environmental Studies, UC Santa Cruz

Professor: Gregory S. Gilbert, 439 ISB, ggilbert@ucsc.edu, 459-5002
Office Hours: W 10:45-12:15; 3:30-4:30

Required text and clickers (available at Bay Tree Bookstore):
2. i>clicker

Meeting time and place: MWF 9:30-10:40, 221 ISB

Course evaluation
30% 2 midterm exams
20% Final paper
15% 3 critical reviews
15% Online reading quizzes (13 quizzes*~9 question each: max 100 points)
10% 1 epidemiology homework (epidemiology)
10% Attendance, participation, in-class quizzes via i>clickers, office hours

General expectations
1. Come to class prepared, on time, with your i>clicker, and ready to participate actively.
2. Do the readings before class. Be able to answer the “Questions” and have a clear idea of the meaning of “Words to Know” at the end of each chapter of Essential Plant Pathology. Please use the CD than accompanies the book.
3. Ask questions. It is the best way to get me to slow down in lecture.
4. Go to office hours – get clarification, explore ideas, offer suggestions,
5. Follow up on what interests you, and use all available resources.
6. No cell phones or internet-connected computers allowed during class.
7. I have a zero tolerance policy for plagiarism and cheating. No credit will be given for an assignment where a breach of academic integrity is established. UCSC policy is available at (http://www.ucsc.edu/academics/academic_integrity/undergraduate_students/). All violations of academic integrity will be reported to the Provost. There is a handout on plagiarism in the Resources folder on the course eCommons site, with additional links for more information.
8. Work together (except on quizzes and exams). This is not a competition. I don’t curve grades (unless poor performance is clearly linked to my own incompetence). I strongly encourage you to form peer-review groups to help each other improve your written work.
9. Late assignments will be docked 1 point off your total course grade (of 100%) per calendar day late (to max 5 points), unless arrangements to turn it in late were made in advance. Assignments will not be accepted more than one week after they are due. There are no make-ups on quizzes, which must be completed by 9:25 a.m. on the day due. Make-ups on midterm exams are by oral exam only. Assignments must be posted to eCommons before class on the date due; those posted after 9:25 a.m. will be 1 day late.
10. i>clickers register who responded to in-class questions, and the proportion of possible in-class clicker responses made will be used as the primary measure of attendance and participation (4% of final grade). For in-class quizzes (at the end of many lectures on the material for that day), correct answers will count 2X an incorrect answer (4% of grade). An additional 2% is based on vocal participation in class and attendance at office hours. Using an i>clicker not registered to you, or allowing someone to use your i>clicker, will be considered cheating.
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These readings are available in Resources in the ENVS 163 eCommons site.

Required readings

Suggested readings – discussed in lecture examples
Critical Reviews of Primary Literature  
ENVS 163 – Plant Disease Ecology – Spring 2011

Being able to read the primary scientific literature is a professional skill that will allow you to stay on top of the latest information throughout your career, without having to simply take the work of interpreters at face value. Reading scientific papers efficiently, effectively, and critically is a learned skill – there are tricks to help, but it really just requires practice. By far, however, the best way to read scientific literature is with friends. Scholarly nerds (like professors and grad students) form journal clubs and reading groups not just because it is part of the educational and research process, but because (1) it make understanding the literature much easier, and (2) it is fun. Really. Fun! Get with it – everyone is doing it!

You, too, can be part of this national craze of reading scientific papers for fun and profit! In this class you will write three critical reviews of papers from the primary (peer-reviewed) literature on plant pathology.

**Critical Review 1**: Environment and Disease – Bradley et al. 2003
Each student must turn in an individual draft on eCommons before class on Friday 29 April.
Bring a hard-copy version of your draft to class, where we will have group discussions about the paper and your reviews. You then have until the start of class on Monday 2 May to post a final, revised version of your critical review to eCommons. This final version will be graded. Note that failure to turn in a significantly developed draft by class on 29 April will result in a 10% reduction of the grade on the final paper.

**Critical Review 2**: Physiology or Genetics of plant-pathogen interactions.  
Due on eCommons before class on Wednesday 11 May.  
You may choose any peer-reviewed, empirical paper (not a review paper, and not on the required reading list) related to the physiology or genetics of plant-pathogen interactions.  
You are strongly encouraged to write this review in groups of three students. Choose a paper, read it individually and sketch out a critique, then get together to talk about the paper. Craft a final consensus critical review, and turn in one final version for the entire group. All student’s names must appear on at the top, and the same version must be submitted for each of the students individually to eCommons. All students in a group will get the same score for the review. It is permitted to write the reviews singly or in pairs, but I strongly recommend groups of three.

**Critical Review 3**: Ecology or Evolution of plant-pathogen interactions – your choice of paper  
Due on eCommons before class on Friday 20 May.  
You may choose any peer-reviewed, empirical paper (not a review paper) related to the ecology or evolutionary biology of plant diseases.  
You are strongly encouraged to write this review in groups of three students, following the same guidelines as for Critical Review 2.
Critical Review Requirements

**Length:** The reviews should be **700-1000 words.**

**Document type:** A .doc, .docx, or .pdf files only. I do not accept files saved as native Open Office or Apple Pages, and will deduct 5% from any documents that need to be returned to students to change the format.

**Writing:** Clear, concise, unambiguous writing with correct spelling and good grammar.

**Structure:** Header, Summary, Critique (see details below and example)

**Original paper attachment:** A pdf of the paper being reviewed must also be submitted.

**EVALUATION**

**5 points: Header.** Please follow the header format shown in the example (student names, class and assignment, date, full citation of article reviewed).

**50 points: Summary of the article.** The first section (generally no more than half of your review) should be a concise summary of (a) the objective of the study, (b) what was done, and (c) what was found. Only include enough of the methods to know what kind of study was done (e.g., “… used fungicide application experiments in the field to…” “… through isolations of fungi from 30 species of symptomatic plant species, they examined …”, “… collected rust spore samples from wheat fields across North America and testing their race structure using …”). You should not include detailed methods like ” in a completely randomized block design in southern Mississippi, they added zero or 15 larvae to each of 20 replicate plots, 2x2-m each, on 4 April 2001 to ….” Provide what is needed to get the picture of what was done, but the focus should be on the objectives and the results.

**30 points: Critique.** Critique is not criticizing. It is a thoughtful evaluation. In the second section describe something positive about the scientific value of the study (note: “well written” does not count – look at the science), and describe why it is important. All papers have strong points, or they would not have been published. Sometime it is hard not to fall into the trap of just focusing on all the problems.

Then you should briefly discuss either (a) any important problems with the paper (e.g., “the author’s interpretation of the data may be flawed because they did not consider …”), or (b) a specific suggestion for where to go next with this line of study (note: “repeat this again in another year or species or place”, or “increase the sample size” is generally not enough unless you provide very specific reasons for why this might provide significantly different results. What is the next logical step to build on these findings?)

**10 points: Required length, document type, structure, and clarity of writing.**

**5 points: Post a pdf copy of the article being reviewed to eCommons assignment.**

Thus there is a total of 100 points per critical review.

**Reminder:** Create one final version of the critical review for the whole group, with all group members names in the header. Each student must submit the assignment separately on eCommons. All group members will receive the same score.

**Summary.** The focus of this study was to determine potential effects of vector behavior on disease transmission in the Silene-Ustilago system. Behavior included preferences for healthy vs. infected hosts, rates of spore deposition and changes in vector movement associated with plant spacing. In the study they 1) identified insect species that were the most abundant visitors to local populations of *Silene alba*, and 2) determined whether insect vectors discriminated between healthy and diseased flowers. Because vectors must visit both healthy and diseased flowers to spread infection, any biases with respect to host disease status may influence the rate at which disease spreads. Knowledge of dispersal mechanisms and the distance spores are dispersed is important to modeling disease spread. The number of spores deposited on healthy hosts is likely to influence how infection probabilities vary with distance from diseased plants and a "threshold" number of spores may be required to achieve infection. In natural populations, spore dispersal also depends on vector foraging patterns that may vary with plant spacing: densely spaced patches of plants should attract higher numbers of vectors whereas individual vectors may visit more flowers if plant in widely spaced patches. They found many insects visited the plants, but the most common were bees, syrphid flies, nocturnal moths and sphingid moths. Bees tended to prefer healthy flowers unless they had been previously exposed to diseased flowers. In the context of disease spread, vectors that discriminate had a lower probability of encountering disease, but were more likely to spread spores to healthy plants. Moths made more visits to plants with more flowers and there was no preference for healthy vs. infected plants in terms of the number of flowers visited per unit time. But when visitation rates were divided by the number of flowers, moths discriminated in favor of healthy flowers over infected flowers. Even in close plant spacing spore dispersal over long distances may occur. With bees, even after visits to the 15th consecutive flower, significant amount of spores were deposited. More spores were deposited per visit if the bee visited more than one infected flower before encounters with healthy flowers.

**Critique.** This study is a significant advance in our understanding of the spread of vector-borne plant pathogenic fungi, and has implications for managing such diseases in agricultural systems. The design of the study allowed them to clearly distinguish between …

This study suggest that xxxxx might also be an important regulator in the spread of vector-borne diseases. An important followup study would be to… OR Although there were many strong components to this study, we were concerned that interactions between pollinator species of different sizes might have been confounded by…
Some suggestions for the group critical review process

1. Select (as a group) a paper on the topic of the assignment.
2. Each person in the group reads the paper, takes notes on what the paper is about, what was done, what was found, and any questions, concerns, and confusion about the paper, and sketches out a critical review draft.
3. The entire group meets, preferably with some sort of shared consumables (cookies, coffee, solar-dried organic hemp granola with soy milk, etc.), for about a 2-h block (more if you are having a blast).
4. In the first 45-60 minutes of the group meeting, go through the paper, review what it was about, and try to collectively answer questions each person has about the paper. Make sure everyone gets it.
5. In the second hour, collectively construct a critical review of the paper based on your drafts and discussion.
6. Revise the draft, until all are agreed on a final version.
7. Each person submits the final version (with all group names on it) and a pdf of the original article on eCommons.

Suggestions for picking papers to review

You have a lot of freedom to pick which paper to review for the 2nd and 3rd critical reviews. Browse Web of Science or Google Scholar or flip through journals in the library (you know, stuff printed on paper) to find articles of interest, consult with your group, and decide collectively on which one to read. Avoid review papers or abstracts, because you will not be able to meet the needs of the assignment. Look for empirical, data-driven publications in peer-reviewed journals (e.g., experiments or quantitative observational studies). If you are so inclined, mathematical theory papers are ok. Papers that are required readings are NOT available for writing critical reviews. When in doubt, ask if it is appropriate.
Conveying complex scientific information clearly to a general audience is at once one of the most useful and most difficult tasks in environmental studies. The default final assignment in ENVS 163 is to write a synthetic, thoughtful, well-referenced biography of a pathogen or disease of your choice (note that I am open to a "topical option", detailed below, if this more closely suits your needs and interests). Your goal is to read carefully the primary (and appropriate secondary) literature on a pathogen or disease, dig broadly and deeply into it, and present a cogent, synthetic, integrated, readable, useful biography of it. Note that the Plant Disease Lessons available from the American Phytopathological Society at http://www.apsnet.org/education/LessonsPlantPath/ and on the disease classics CD with your Schumann and D'Arcy text under Plant Disease Lessons are examples of what I am asking you to do. For instance, check out the APSnet Feature Story on Bacterial Blight of Anthuriums (Alvarez et al. 2006), available on your EPP CD under Features/anthurium/default for a good example (but please do not use the numbered citation system they use there!).

**Standard Biographical Model.** Choose a well-studied pathogen or disease, and tell its story in such a way that it provides an organized and thorough overview of the life history, importance, and management of the disease, and a solid overview of the relevant research literature. The Biography will include (1) classification of the pathogen, (2) life cycle of the pathogen and/or disease cycle, in an original (i.e., drawn by you) illustration, (3) host and geographic range, and any important historical changes (e.g., introduced into North America from Europe in 1903, and then ...), (4) key ecological and epidemiological attributes of the pathogen, (5) how the pathogen interacts physiologically with host plants, (6) economic, ecological, scientific, and social importance, (7) potential and approaches to control, and (8) important scientific or management challenges faced.

The biography should rely primarily on peer-reviewed, primary scientific literature, although you may use secondary sources when appropriate. Please note, if there is a wiki page or annual review on your pathogen, this is just a place to start. Simply re-packaging what someone else has already compiled is – depending on the degree – laziness or plagiarism. And it is also always obvious.

(1) The collection of diseases in Plant Disease Lessons or elsewhere on the CD are NOT available for you to pick.

(2) Appendix 2 in your book (and the CD) list a large number of agronomically important diseases, but feel free to pick any other diseases for which there is adequate literature.

(3) Make sure that there is enough literature on all aspects of the pathogen or disease for you to be able to complete the assignment – examine the available literature, develop a detailed outline, and consult with the instructor before committing.

**Alternative Topical Model.** If you are more fascinated by a topic in plant pathology the crosses over among different pathogens, you may (with permission from Greg) choose a well-defined, important concept in plant disease ecology, and tell its story. For instance, you could write about the historical development of our understanding of the gene-for-gene concept in plant-pathogen
interactions, or the development of multi-cropping systems for disease control, or about policy for the quarantine of plant pathogens in international trade. At a minimum, you need to convey (1) a sense of the historical development of the concept, (2) a clear description of the mechanistic or theoretical basis, (3) key empirical work that tested or extended theory, (4) scientific importance, (5) applications to agriculture, ecology, evolutionary biology, or conservation biology, and (6) important challenges faced.

As for the biographical model, the paper should rely primarily on peer-reviewed, primary scientific literature, although you may use secondary sources when appropriate. As above, do not just re-package what someone else has already compiled.

**Graduate model (for ENVS 263 students):** A complete NSF DDIG-style research proposal on a plant disease topic.

**Requirements for Biographical and Topical models:**

1. Cite, and use substantially and correctly, at LEAST 5 peer-reviewed papers from the primary scientific literature. Beyond these five, you can use as many references as you like, including books, reviews, and non-reviewed sources. No more than two web sites or text-books may be cited.

2. The final paper should be **4,000 to 6,000 words**, including citations. Figures and tables (if desired) should be originals (that means drawn by you). You must follow the formats indicated below.

3. Post the final version to eCommons as a .doc, .docx, or .pdf version by 9:25 a.m. on the date due. I cannot open documents in native Apple Pages or Open Office formats; 5% off for any documents for which I must request a document type change.

**Evaluation (20% of final grade, scored as follows):**

- **60 pts.** Intellectual merit – each of the required elements addressed, depth of treatment, logic of arguments, sound development of ideas
- **20 pts.** Grammar, structure, and style. Is the paper clearly written in a style consistent with the audience? Are grammar, spelling, and word choice correct?
- **10 pts.** References: Minimum 5 peer-reviewed papers appropriately and significantly used, correctly cited in text and bibliography following style given below.
- **10 pts.** Outline well developed with 5 paper summaries by 6 May

**Due dates:**

**Paper outline due:** on eCommons by **Friday 6 May at 9:25 a.m.** with title, 1-paragraph summary of what you will cover, section outlines, and full citations for at least 5 papers THAT YOU HAVE REVIEWED that are appropriate for your paper.

**Final Paper due:** **Friday 27 June 2007** – on eCommons by 9:25 a.m
Required format for final paper: Please follow this overall structure including this format for citations. Please number all pages.

Title of paper

Your Name

ENVS163 Plant Disease Ecology

Date

Then follows the body of the text – use sections and subsections as appropriate to help with the flow of the paper.

In the text use citations as follows:

Single author (Janzen 1971)
Two authors (Burdon & Chilvers 1984)
Three or more authors (Bradley et al. 2002)
Multiple citations (Janzen 1971, Burdon & Chilvers 1984)

Literature Cited: (Use the format exactly as given below).

For journal articles:

For a book:

For a book chapter:

For a website:
Suggested exercise to help select a topic for the Final Paper
And maximize your effective use of Web of Science

Purposes:
(1) Develop skills for effectively using the Web of Science to find scientific literature,
(2) Finding and evaluating literature to be used for your final paper, and
(3) Proposing the topic for your final paper.

What to do:
1. Pick a particular pathogen, disease, or concept that you think might be a good topic for your final paper. For example:

   **A disease**
   Sudden Oak Death

   **A pathogen**
   Phytophthora ramorum

   **A concept**
   induced resistance

2. Go to the University Library web page at [http://library.ucsc.edu](http://library.ucsc.edu). Click on Article Databases in the Quicklinks on the left, then choose *Web of Science* from the top right.

3. Click on “General Search”, and type the name of your pathogen or disease or concept in the *Topic* box and click “Search”. Record the number of “results found” you got for your search terms. Read through the titles and abstracts of the articles (click on the title to see the abstract), check and make a record of those that seem interesting and useful. If the UC library has an electronic subscription to the journal, clicking on “UC-eLinks” will take you to the online text. Others are available only in the library. Note which ones are readily available to you.

5. From the results page, use the “Sort by” tool on the right to sort in order of times cited. This will show you which are the “classic” papers on the topic (although by default newer papers, even if exceptional, haven’t had the same opportunity to be cited).

6. Click on the title of a paper you are interested in. Click on the number after “Cited Reference”. This shows you all the articles that were cited in that paper, allowing you to follow back into history and find the papers that informed that work.

7. Now click on the number after “Times cited” for that citations. This shows you all the papers that have cited that publication – allowing you to follow the paper’s impact forward in time. For instance, today a search on “sudden oak death” produced 201 results. The top-cited article in that collection cited 30 previous publications and was in turn cited 218 times. Often you’ll find the most useful papers in following up who cited papers you are really interested in.

8. Peruse the references you find in while exploring the citations. Gather and examine at least five articles that you can access either electronically or in the Science & Engineering library.

9. Use this process to explore pathogens, diseases, or topics for your final paper. Be sure that there are adequate publications for you to be able to write a paper!