GENOMICS AND EVOLUTIONARY BIOLOGY OF PARASITES AND OTHER DEPENDENT SPECIES (3 CREDITS)

COURSE NUMBER: BIOL3241/BIOL5241
SPRING 2016

MEETINGS: T-Th 2:00PM to 3:20PM
ROOM: BIOSCI 342
INSTRUCTOR: Prof Ananias A. Escalante
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Phone: 215-204-3735
Office hours: By appointment

WELCOME TO THIS SEMINAR.

I have been teaching seminars like this for the past 15 years and I look forward to working with you. This syllabus provides essential and helpful information, please read it carefully. Notice that in a seminar like this, self-motivation and discipline are required.

CONTACTING THE INSTRUCTOR:

E-mail is the preferred method of contact. Students are welcome to make appointments or address administrative issues via e-mail. Please identify yourself as student in this class and write a concise message. E-mails will be answered within 24 hours during weekdays. Academic questions are better addressed in person during office hours. Walking-in during office hours is acceptable; however, students with appointments have priority.

SEMINAR DESCRIPTION:

All known multicellular organisms harbor diverse assemblages of dependent species, many of which are considered parasites or pathogens. Yet, in spite of a growing awareness of the importance of dependent species in biodiversity and medicine, many studies are limited to assessing the consequences to their hosts. The goal of this seminar is to discuss some of the biological processes leading to the diversity of dependent species and their functional/evolutionary relationships with their hosts. This general objective will be fulfilled by discussing research articles on the genomics and evolution of dependent species. Students are also expected to gain proficiency in writing scientific review papers.

REQUIREMENTS AND COURSE PHILOSOPHY:

Prerequisite Undergraduates:
BIOL 2112 or 2912 – Introduction to Biology with a grade of C or better
Biology 2227 - Principles of Ecology with a grade of C or better

Prerequisite Graduate Students: None.

STUDENT LEARNING OUTCOMES

Upon successful completion of this seminar:

- Students will have read primary literature and integrated concepts from ecology and evolution.
- Students will have gained proficiency in writing scientific papers.
- Students will have gained proficiency in self-directed learning.

This is a **seminar directed to graduate and upper division undergraduate students (juniors and seniors)**. Being curious and inquisitive is a requirement, all students are expected to read the assigned papers and participate actively in the discussion. Students (you) are expected to read/revise basic concepts as needed (e.g. characteristics of the HIV virus, genetic exchange in bacteria, the genetic code, etc.). Taking responsibility for your own education is called "self-directed learning" and it is an essential skill in the real world.

TEXTBOOK: There is no specific textbook. Required readings are listed at the end of the syllabus and they will be posted in blackboard but you can also find them electronically using the library (see Blackboard section below).

BLACKBOARD: Information pertaining to this seminar will be listed on Blackboard. It is your responsibility to check blackboard regularly for announcements, check changes in the syllabus (including changes in the required readings), etc. You should also revise your Temple e-mail account regularly for messages, assignments & potential schedule changes.

VALUABLE ONLINE RESOURCES: Web of Science (available via Temple library at http://library.temple.edu/).

GRADING POLICY (GRADE ALLOCATION):

Undergraduate Students
- Discussion and individual participation 40%.
- Paper 50%.
- Paper proposal 10%.

Graduate Students
- Discussion and individual participation 40%.
- Paper 60%.
- Paper proposal required

Please notice that the instructor doesn't "give" grades; you earn them. The final grades will be based on a 90-80-70-60 scale with "+" and "-". Grades will not be standardized; this means that it is possible that all could earn some form of an A. This seminar is an opportunity to enhance your ability to critically think and analyze papers. It is also expected that you practice how to search, synthesize, and communicate information.

DISCUSSION AND INDIVIDUAL PARTICIPATION ACCOUNTS FOR 40% OF THE TOTAL GRADE:

The seminar involves weekly meetings with one or two assigned readings. You are expected to come to each discussion and being an active participant. Notice that you don't have to memorize the readings, please bring your notes and any other material that allowed you to understand the article. You are welcome to discuss the assigned reading as part of a study group. All students are expected to contribute to the discussions; however, a discussion leader (DL) will be picked up at the beginning of each class (other arrangements could be made). The DL role may rotate during the discussion so, in a given day, there could be up to 2 or 3 DLs. The role of the DLs is to facility the discussion assuming that everyone has read the assigned paper. DLs are not responsible for answering everyone's questions. A good DL will lead to a discussion where everyone can answer questions and/or bring up important points. The DLs should start by making sure that everyone has a basic grasp of the key concepts needed to understand the paper. Thus, DLs are expected to ask questions about the paper to the other students, so I suggest that you write a list of questions while you read the paper so it is organized in a way that will facilitate a discussion. Students will be randomly chosen to answer such questions and they can use their notes.

All students should bring one written question to class that clearly relates to the article. **This question should be supported by a paragraph that provides background/context to the question. Thus, your question is expected to be detailed and thoughtful**. Handwritten questions are not acceptable. The instructor will collect all written questions at the beginning of the class and could use some of them during the discussion. The quality of your question will determine whether it is considered "participation". In particular, technical or descriptive

questions (those that you can search on your own) are welcomed; however, they are not considered by themselves participation. Let's define "participation" as: a) comments/questions showing that you have read a specific paper linking it to prior knowledge, b) a reasonable attempt to understand or highlight a problem, c) provide an alternative perspective about an issue, and d) recommend, introduce or present a research article to the class. The instructor will keep a record of your participation in class; this record will include your written questions. You are welcome to check your participation record during the semester and discuss with the instructor how to improve. Notice that students that participate below average cannot expect A as grade. If you believe that you are not performing well in the discussion, please contact the instructor.

A good effort invested in understanding a problem will be highly appreciated and considered participation even when the arguments were not entirely correct (even when technically wrong!). However, notice than being lost or giving a totally unrelated answer is not considered participation. Students are expected to do their best. **Everyone could have a bad day; there will be plenty of opportunities to participate and recover.** Please keep your readings up to date. You don't have to memorize them: take notes while reading, bring questions on tables and figures, and feel free to make comments.

ATTENDANCE: Attendance is required; however, up to two excused absences will not affect your grade. Students who wish or need to request more than two excused absences should talk with the instructor. Students with more than three unexcused absences will get an automatic "**D**" even if they turn their paper in.

PAPER: it is worth 60% (50 + 10 for undergraduates, see below) of your total course grade.

Paper proposal: There is a mandatory term paper proposal due on **week 6** for all students; it will account for 10% of the total grade for the undergraduate students. **The topic of your paper should be suitable for the journal Trends of Ecology and Evolution (TREE, visit the site at http://www.cell.com/trends/ecology-evolution/home).** The term paper proposal will not be graded for the graduate students but it is still required. The aim of this proposal is to show the structure of the paper you intend to write, **it is expected to be detailed and thoughtful**. The proposal must include a tentative title, a summary paragraph, and an outline. The summary paragraph should describe your general idea and could become part of your introduction in the final version. In particular, the summary should communicate the topic of the paper that you intend to write, explain the importance of the question/concept that you will address, the way in which you intend to address it, and the claims you expect to make. The summary paragraph in your paper proposal should be not shorter than 400 words. The outline of the paper should be as detailed as you can but it cannot exceed 3 pages, please use whatever format you like. Please indicate the content of the "box" and figure (if any) that you intend to incorporate (see information about the format below). You could also add a few references. E-mail submissions are required together with a hard-copy in class (or by 4:00 PM at SERC 653), see schedule. Do not leave papers in my mailbox. There are not make-up papers without a valid medical excuse. The grade of your final paper will have a 50% penalty if you fail to turn in a paper proposal.

The instructor will send you comments and suggestions. It is possible to discuss specific issues in person. **Please note that you can get full credit in your paper proposal even if the topic needs to be dramatically changed.**

Graduate students are expected to discuss evolutionary or ecological concepts in the context of dependent species, your effort to address such concepts **will account for 50% of the paper grade**. Descriptive papers focusing **solely** on epidemiology, public health, conservation, or simply describing a community or discussing a technology (even well written papers) **will not get a good grade**. E-mail submissions are required together with a hard-copy in class (see schedule). Do not leave papers in my mailbox. There are not make-up papers without a valid medical excuse.

Undergraduate students are expected to discuss the importance of the topic chosen and how it relates with their understanding of dependent species. Papers focusing **solely** on public health, conservation medicine, or epidemiology **will not get a good grade**. E-mail submissions are required together with a hard-copy in class

(see schedule). Do not leave papers in my mailbox. There are not make-up papers without a valid medical excuse.

Undergraduate Students: The term paper will be due on **week 13**; **it should be suitable and follow the format of Trends of Ecology and Evolution** (TREE, visit the site at http://www.cell.com/trends/ecology-evolution/home). You can have access online to the journal using the Temple Library link. The paper could focus on a fundamental concept or approach but also could describe a specific dependent species-host interaction. **PRIMARY REFERENCES (SCIENTIFIC ARTICLES IN PEER REVIEWED JOURNALS) SHOULD BE USED.** The final manuscript should be between 2500-3000 words in length excluding references (a minimum of 10 references), introductory paragraph, title, "boxes" (check journal format), figure legends, and personal identification**.** The paper could include a "box" but it is not a requirement (check journal).

Graduate Students: The term paper will be due on **week 13**; **it should be suitable and follow the format of Trends of Ecology and Evolution** (TREE, visit the site at http://www.cell.com/trends/ecology-evolution/home). You can have access online to the journal using the Temple Library link. The paper should focus on a fundamental concept or approach rather than a description of a specific dependent species-host interaction. **PRIMARY REFERENCES (SCIENTIFIC ARTICLES IN PEER REVIEWED JOURNALS) SHOULD BE USED.** The final manuscript should be between 3000-4000 words in length excluding references (a minimum of 20 references –primary literature), introductory paragraph, title, "boxes" (check journal format), figure legends, and personal identification**.** The paper is expected to have at least one "box" (check journal) and one figure (diagram).

Miscellaneous regarding the paper assignment: You don't have to write a cover letter; however, you are expected to take care of the format, it is part of your grade. The aim of following the journal required format is that you get some experience in preparing an article for publication. Brevity and Standard English are characteristics of a well-written scientific paper. Please avoid using unnecessary adjectives, flowery language, excessive redundancy, or any sort of poetic-storytelling prose. Colloquial use of terms will not be accepted. **Literal quotations from papers are not recommended because they are not consistent with the style used by this journal.** If you need to use quotations, please provide the source and clearly identify the quotation since those words will not be considered in for the paper total length. You can use up to 2 references discussed in class. **You cannot cite Wikipedia or websites**, only primary literature or reviews in peer review journals. You can discuss with others, however, two students cannot write a paper on the same exact topic and share more than 20% of the references cited.

LATE ASSIGNMENTS: It is anything that is turned in after a dateline without medical excuse or previous authorization from the instructor. **If** the instructor decides to grade it, 25% will be taken off the final grade if received up to a day late (24 hours). After a day and up to a week, your grade will be penalized up to 50% off. No late assignment will be accepted after a week.

EXTRA CREDIT POLICY: Extra credits are never given to satisfy individual needs. If the instructor decides to organize activities in which extra credits can be earned, all students will have the same opportunity.

RE-GRADING POLICY: If you consider that the instructor has made a mistake (different than adding points), you can request a re-grade. **Re-grades, however, are not partial**. Notice that you cannot request a re-grade that only encompasses part of the assignment, a single paragraph or a sentence out of context. A re-grade can go in any direction (your grade could go up, down or remain unchanged). Your original grade is nullified at the moment that you ask for a re-grade, thus, if you end having fewer points you cannot retract. Re-grading, however, is a dynamic process. It is highly recommended that you set an appointment with the instructor to discuss the content of your assignment. Being self-critical is important; your answers during the interview will be part of the re-grade process. Re-grades cannot be appealed with the instructor; there is a formal grade grievance process that you can follow. Re-grades should be requested the week after the grade is posted. You cannot ask for re-grades after 1 week.

"BORDERLINE" GRADES POLICY: The instructor doesn't "give" grades; you earn them. Students should not expect to be "bumped up" automatically to the next letter grade even if they need a fraction of a point. The

instructor will evaluate all the borderline cases before posting the final grades and then decide whether a student could receive that extra point or fraction considering the big picture (overall responsibility, pattern of improvement, etc.).

DISABILITY DISCLOSURE: Any student who has a need for accommodation based on the impact of a documented disability, including special accommodations for access to technology resources and electronic instructional materials required for the course, should contact the instructor privately to discuss the specific situation by the end of the second week of classes or as soon as practical. If you have not done so already, please contact Disability Resources and Services (DRS) at 215-204-1280 in 100 Ritter Annex to learn more about the resources available to you. The instructor will work with DRS to coordinate reasonable accommodations for all students with documented disabilities.

STUDENT/FACULTY ACADEMIC RIGHTS AND RESPONSIBILITIES: The University has a policy on Student and Faculty Academic Rights and Responsibilities (Policy #03.70.02) which can be accessed through the following link: http://policies.temple.edu/PDF/99.pdf

CLASSROOM RULES OF CONDUCT:

1. Please arrive to class on time and plan to stay for the entire discussion. Notice that late arrivals are disrespectful and distracting.
2. All cell phones must be turned off and hidden from view during class time. No texting is allowed. If you are expecting an important call, please notify the instructor before class. You should keep the phone on vibrate and answer the call outside the classroom.
3. Laptop and tablet computers are allowed for note taking and read your assigned papers only: i.e., other activities such as checking personal e-mail or browsing the Internet are prohibited.
4. This is a seminar so students are expected to talk to the class. Please avoid side conversations.

ACADEMIC DISHONESTY, INCLUDING INAPPROPRIATE COLLABORATION, WILL NOT BE TOLERATED. See below the Civility & Temple's Code of Conduct.

CIVILITY & TEMPLE'S CODE OF CONDUCT (COC): Violations of the CoC include, but are not limited to: academic dishonesty and impropriety, including plagiarism and academic cheating; interfering or attempting to interfere with or disrupting the conduct of classes or any other normal or regular activities of the University (see: http://policies.temple.edu/PDF/294.pdf).

LIST OF ASSIGNED READINGS *(could change in order to incorporate new topics)*.

Week	Readings
1.	Jan 17: Hoberg, E.P. et al. 2015. An integrated parasitology: revealing the elephant through tradition and invention. *Trends Parasitol*. 31:128-133. Jan 19: Barraclough TG. 2015. How do species interactions affect evolutionary dynamics across whole communities*? Ann Rev Ecol Evol Syst.* 46: 25-48.
2.	Jan 24: Colwell RK et al. 2012. Co-extinction and persistence of dependent species in a changing world. *Annu Rev Ecol Evol Syst* 43:183-203. Jan 26: Orr HA. 2009. Fitness and its role in evolutionary genetics. *Nat. Rev. Genetics* 10, 531-539.
3.	Jan 31: Salathé et al. 2008. The state of affairs in the kingdom of the Red Queen. *Trends Ecol Evol* 23:439-445. Feb 2: Decaestecker, E. et al. 2007. Host-parasite 'Red Queen' dynamics archived in pond sediment. *Nature* 450: 870-873.
4.	Feb 7: Alizon S., Michalakis Y. 2015. Adaptive virulence evolution: the good old fitness-based approach. *Trends Ecol Evol* 30:248-254. Feb 9: Blanquart, F. et al. 2016. A transmission-virulence evolutionary trade-off explains attenuation of HIV-1 in Uganda. *Elife* 5: e20492.
5.	Feb 14: Yang Z., Rannala. B. 2012. Molecular phylogenetics: principles and practice *Nat. Rev. Genetics* 13: 303-314. Feb 16: Switzer, WM. et al. 2005. Ancient co-speciation of simian foamy viruses and primates. *Nature* 434:376-380.
6.	Feb 21: West SA.et al. 2006. Social evolution theory for microorganisms. *Nat Rev Microbiol*. 4:597-607. Feb 23: Nadell, CD. 2016. Spatial structure, cooperation and competition in biofilms. *Nat. Rev. Microbiol.* 14: 589-600. **Paper proposal is due.**
7.	Feb 28: Bozick BA, Real LA. 2015. Integrating parasites and pathogens into the study of geographic range limits. *Q Rev Biol* 90: 361-380 Mar 2: Wilfert L, Jiggins FM. 2014. Flies on the move: an inherited virus mirrors *Drosophila melanogaster*'s elusive ecology and demography. *Mol. Ecol.* 23:2093-2104.
8.	Mar 7: Biek R. et al. 2015. Measurably evolving pathogens in the genomic era. *Trends Ecol Evol.* 30:306-313. Mar 9: Shah SD et al. 2010. Analysis of host-parasite incongruence in Papillomavirus evolution using importance sampling. *Mol Biol Evol.* 27: 1301-1314.
9.	Mar 21: Jacquot, M. et al. 2016. Multiple independent transmission cycles of a tick-borne pathogen within a local host community. *Scientific Reports* 6:31273.

Mar 23: Kikuchi T et al. 2011. Genomic insights into the origin of parasitism in the emerging plant pathogen *Bursaphelenchus xylophilus*. *Plos Pathogens* 7: e1002219.

10. Mar 28: Pybus O, Ramnaut A. 2009. Evolutionary analysis of the dynamics of viral infectious disease. *Nat. Rev. Genetics* 10, 540-550.

    Mar 30: Su YC. et al. 2015. Phylodynamics of H1N1/2009 influenza reveals the transition from host adaptation to immune-driven selection. *Nat Commun.* 6:7952.

11. Apr 4: Wilder AP. et al. 2015. Population genetic structure of a common host predicts the spread of white-nose syndrome, an emerging infectious disease in bats. *Mol Ecol.* 24: 5495–550.

    Apr 6: Maze-Guilmo, E. et al. 2016. Host dispersal as the driver of parasite genetic structure: a paradigm lost? Ecology Letters 19:336-347.

12. Apr 11: Altizer S et al. 2013. Climate change and infectious diseases: from evidence to a predictive framework. *Science* 341:514-519.

    Apr 13: Poulin, R. 2007. Are there general laws in parasite ecology? Parasitol. 134: 763-776.

13. Apr 18: Sachs JL. et al. 2011. Evolutionary transitions in bacterial symbiosis. *Proc Nat Acad Sci USA* 108: 10800-10807.

    Apr 20: Frickel J. 2016. Eco-evolutionary dynamics in a coevolving host-virus system *Ecol. Letters* 19:450-459.

[FINAL PAPER IS DUE APRIL 25]