**Syllabus, BISC 583, Spring 2019**

**Evolution & Adaptation of Marine Organisms**

***Draft version, 12/10/18***

Course overview

BISC 583 is a 4-unit course covering fundamentals of evolutionary patterns and processes in the marine environment, with emphasis on rates of adaptation to a changing ocean. It is primarily intended for first-year students in the Marine Biology and Biological Oceanography (MBBO) Graduate Program. Prerequisites are admission to the MBBO program or permission from the instructors.

Course objectives

This is a core course for first year students in the MBBO program. Students will gain background in the essentials of evolution and adaptation in marine microbes and metazoans, including quantitative approaches. In addition, they will gain experience in critiquing the current literature through discussions and written presentations.

Faculty

Suzanne Edmands, [sedmands@usc.edu](mailto:sedmands@usc.edu), AHF 130, 213-740-5548

Andrew Gracey, gracey@usc.edu, AHF 316, 213-740-2288

Eric Webb, [eawebb@usc.edu](mailto:dheidelb@usc.edu), AHF 209C, 213-740-7954

Format

The course will meet in AHF 259 from 11am - 12:20 pm on Mondays and Fridays, with class meetings generally alternating between faculty lectures and student-led discussions of primary literature. Course content will be posted on Blackboard (https://blackboard.usc.edu/).

Textbooks

Hall & Hallgrimsson, 2014 (H&H). Strickberger's Evolution, 5th ed. Jones & Bartlett. ISBN 978-1-4496-9192-9. Paperback international edition (ASIN B01A8JHG0Y) is also acceptable.

Grading

Letter grades will be based on three midterms (20% each), one final (10%), student-led discussions (15%) and written assignments (15%).

*Student-led discussions:* Students will alternate leading discussions of journal papers throughout the semester. All students should come to class prepared to lead, and the leader will be chosen in class. For each article students should be prepared to (1) state the central question or hypothesis of the article, (2) explain the tables and figures, (3) explain the main conclusion(s), (4) review key evidence supporting the conclusion(s), and (5) provide specific questions for general group discussion.

*Writing assignments:* Each of the three instructors will make assignments worth 5%. This may include manuscript reviews, essays, data analyses and/or problem sets.

*Midterms*: Each of the three midterms will include a combination of short answer questions, calculations and essay questions.

*Final exam*: The final exam will be essay format.

**Statement for Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor(s) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

**Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Schedule

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| --- | --- | --- | --- | --- |
| **Date** | **Topic** | **Instructor** | **Reading** | **Assignments** |
| *Evolutionary Processes* | | | | |
| M Jan 7 | Intro to evolution and adaptation | Edmands | H&H pp. 3-17, 285-290 |  |
| F Jan 11 | Journal club | Edmands | Dobzhansky 1973, Gould & Lewontin 1979 |  |
| M Jan 14 | Mutation, genetic drift and gene flow | Edmands | H&H pp. 363-369, 375-382, 387-393 |  |
| F Jan 18 | Journal club | Edmands | Morris et al., 2012; Luo et al. 2017 | Assignment 1 due |
| M Jan 21 | MLK Day (no class) |  |  |  |
| F Jan 25 | Quantitative genetics | Edmands | H&H pp 369-375, 245-248 |  |
| M Jan 28 | Journal club | Edmands | van Wijk et al. 2013, Nacci et al. 2016 |  |
| F Feb 1 | Species and speciation | Edmands | H&H pp. 28-32, Box 22.1, 441-446, 455-464 |  |
| M Feb 4 | Journal club | Edmands | Meyer et al. 2016. Rabosky et al. 2018 | Assignment 2 due |
| F Feb 8 | **Midterm I** | Edmands |  |  |
| *Evolutionary Patterns* | | | | |
| M Feb 11 | Origin of Life | Webb |  |  |
| F Feb 15 | Journal club | Webb |  |  |
| M Feb 18 | Tree of Life (President's Day - no class) | Webb |  |  |
| F Feb 22 | Journal club | Webb |  |  |
| M Feb 25 | Bacteria/Archaea | Webb |  |  |
| F Mar 1 | Journal club | Webb |  |  |
| M Mar 4 | Eukaryotes/Multicellularity | Gracey |  |  |
| F Mar 8 | Journal club | Gracey |  |  |
| USC Spring Break March 9-17 | | | | |
| M Mar 18 | Evo/Devo | Gracey |  |  |
| F Mar 22 | **Midterm 2** | Gracey/Webb |  |  |
| *Selective Agents* | | | | |
| M Mar 25 | Water & Nutrients | Gracey |  |  |
| F Mar 29 | Journal club | Gracey |  |  |
| M Apr 1 | Temperature & Pressure | Webb |  |  |
| F Apr 5 | Journal club | Webb |  |  |
| M Apr 8 | Temperature stress | Gracey |  |  |
| F Apr 12 | Journal club | Gracey |  |  |
| M Apr 15 | Water & Nutrients | Webb |  |  |
| F Apr 19 | Journal club | Webb |  |  |
| M Apr 22 | Hypoxia | Gracey |  |  |
| F Apr 26 | **Midterm 3** | Gracey/Webb |  |  |
|  |  |  |  |  |
| W May 1 | **Final Exam, 11am** |  |  |  |

Journal club papers

Dobzhansky Th. 1973. Nothing in biology makes sense except in the light of evolution. The American Biology Teacher 35(3): 125-129.

Gould SJ & RC Lewontin 1979. The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme. Proc. R. Roc. Lond. B 205:581-598.

Luo H, Y Huang, R Steoanauskas & J Tang. 2017. Excess of non-conservative amino acid changes in marine bacterioplankton lineages with reduced genomes. Nature Micro. 2, 17091.

Meyer JR, DT Dobias, SJ Medina, L Servilio, A Gupta, RE Lenski. 2016. Ecological speciation of bacteriophage lambda in allopatry and sympatry. Science: DOI: 10.1126/science.aai8446

Morris, JJ, RE Lenski & ER Zinser. 2012. The Black Queen hypothesis: the evolution of dependencies through adaptive gene loss. mBio 3(2): e00036-12

Nacci D, D Proestou, D Champlin, J Martinson & ER Waits. 2016. Genetic basis for rapidly evolved tolerance in the wild: adaptation to toxic pollutants by an estuarine fish species. Molec. Ecol. 25: 5467-5482.

Rabosky DL, J Chang, PO Title, PF Cowman, L Sallan, M Friedman, K Kaschner, TJ Near, M Coll, ME Alfaro. 2018. An inverse latitudinal gradient in speciation rate for marine fishes. Nature 559(7714): 392-395.

van Wijk, SJ, MI Taylor, S Creer, C Dreyer, FM Rodrigues, IW Ramnarine, C van Oosterhout & GR Carvalho. 2013. Experimental harvesting of fish populations drives genetically based shifts in body size and maturation. Front. Ecol. Environ. 11(4): 181-187.