

PHILOSOPHY OF BIOLOGY

Course Description

Possible topics for this course include levels of selection and major transitions in evolution, biological individuality, microbes, evolutionary contingency and evolvability, biological explanation, and the nature and origin of life.

For any given course on philosophy of biology, I will choose 4-5 out of the 7 topics below

Readings List (in order of reading schedule)

Articles and chapters can be found in electronic journals and books available through the University Library website.

Additional suggested resource: Charlesworth, Brian and Deborah Charlesworth (2003). *Evolution: A Very Short Introduction*. Oxford, NY: Oxford University Press.

Topic #1 Introduction

Millstein, Roberta L. (2002), "[Evolution](#)", in Peter Machamer and Michael Silberstein (eds.), *The Blackwell Guide to the Philosophy of Science*. Malden, MA: Blackwell, 227-251.

Jacob, Francis (1977). Evolution and Tinkering. *Science: New Series*, 196(4295):1161-66.

Selections from Lewontin, Richard C. (1970). The Units of Selection. *Annual Review of Ecology and Systematics*, 1:1-18.

Topic #2 Levels of Selection and Major Transitions

Elisabeth Lloyd, "Units and Levels of Selection" (in *Cambridge Companion to Philosophy of Biology*)

Okasha, S., 2005. Multilevel selection and the major transitions in evolution. *Philosophy of science*, 72(5), pp.1013-1025.

Clarke, Ellen (2014). Origins of evolutionary transitions. *Journal of Biological Sciences*, 39:303-17.

O'Malley, Maureen and Russell Powell (2016). Major problems in evolutionary transitions: How a metabolic perspective can enrich our understanding of macroevolution. *Biology and Philosophy*, 31(2): 159-89.

Additional Resources:

Szathmari, Eos and John Maynard Smith (1995). The major evolutionary transitions. *Nature*, 374:227-32.

Aktipis, CA, Boddy AM, Jansen G, Hibner U, Hochberg ME, Maley CC, Wilikinson GS (2015) Cancer across the tree of life: cooperation and cheating in multicellularity. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370 (1673): 20140219.

Topic #3 Biological Individuality

Clarke, E. (2013). The multiple realizability of biological individuals. In *Journal of Philosophy*, 110 (8): 413-435.

Godfrey-Smith, Peter (2013). Darwinian Individuals. In *From Groups to Individuals: Evolution and Emerging Individuality*, F. Bouchard and P. Huneman (Eds.). Cambridge: MIT Press.

Ereshefsky, M. and Pedroso, M. (2013). Biological Individuality: The Case of Biofilms. In *Biology and Philosophy*, 28: 331-349.

Kovaka, Karen (2015). Biological Individuality and Scientific Practice. *Philosophy of Science*, 82:1092-1103.

Additional Resources:

Booth, Austin (2014). Symbiosis, selection, and individuality. In *Biol. Philos.* 29: 657-673.

Clarke, Ellen (2016). Levels of selection in biofilms: multispecies biofilms are *not* evolutionary individuals. *Biology and Philosophy*, 31(2): 191-212.

Gilbert, Scott F., Jan Sapp, and Alfred I. Tauber. A symbiotic view of life: we have never been individuals. *The Quarterly Review of Biology*, 87(4):325-341.

Topic #4 A Microbial Perspective

O'Malley, Maureen (2016). Microbiology, philosophy, and education. *FEMS Microbiology Letters*, 363(17): fnw182.

O'Malley MA (2009). [What did Darwin say about microbes, and how did microbiology respond?](#) *Trends in Microbiology*, 17(8): 341–347.

Dupré, J. and O'Malley, M. (2009). Varieties of living things: Life at the intersection of lineage and metabolism. In *Philosophy and Theory in Biology*, 1: e003.

Topic #5 Evolutionary Contingency and Evolvability

Conway Morris, Simon (2006). Evolutionary Convergence. *Current Biology*, 16(19):R826.

Beatty, John (2006). Replaying Life's Tape. *The Journal of Philosophy*, 103(7):336-62.

Turner, Derek (2011). Gould's Replay Revisited. *Biology and Philosophy*, 26:65-79.

Desjardin, Eric (2011). Historicity and experimental evolution. *Biology and Philosophy*, 26:339-64.

Inkpen, Rob and Derek Turner (2012). The topography of historical contingency. *Journal of Philosophy of History*, 6:1-19.

Millstein, Roberta L. (2000), "[Chance and Macroevolution.](#)" *Philosophy of Science* 67(4): 603-24

Rachael Brown, (2013). What evolvability really is. *The British Journal for the Philosophy of Science*, 65(3):549-72.

Pigliucci, Massimo (2008). Is evolvability evolvable? *Nature Reviews: Genetics*, 9(1): 75-82.

Brigandt, Ingo (2015). From developmental constraint to evolvability: how concepts figure in explanation and disciplinary identity. In *Conceptual Change in Biology*, 305-25. Springer Netherlands.

Additional Resources:

Sterelny, Kim (2005). Essay Review: Another Review of Life. *Studies in History, Philosophy, Biology, and Biomedical Sciences*, 36:585-93.

Topic #6: Biological Explanation

Angela Potchnik, "Biological Explanation" (in *Philosophy of Biology: A Companion for Educators*)

Sandra Mitchell, "Exporting Causal Knowledge in Evolutionary and Developmental Biology"

Lisa Gannett, "What's in a cause? The pragmatic dimensions of genetic explanation"

Melinda Bonnie Fagan, "The joint account of mechanistic explanation"

Keller, Evelyn Fox (2009). It is possible to reduce biological explanations to explanations in chemistry and/or physics. In *Contemporary Debates in Philosophy: Contemporary Debates in Philosophy of Biology*, Francisco Ayala and Robert Arp, (eds.) (Read pp. 1-13).

Dupre, John (2012). It is not possible to reduce biological explanations to Chemistry and/or physics. In *Processes of Life: Essays in the Philosophy of Biology*. Oxford University Press. (Read pp. 1-23).

Topic #7 The Nature and Origin of Life

Carol Cleland, "Is a general theory of life possible? Seeking the nature of life in the context of a single sample"

Iris Fry, “Are the different hypotheses on the emergence of life as different as they seem?”

Carol Cleland and Shelley Copley, “The possibility of alternative microbial life on Earth”

Parke, Emily (2013). What could arsenic bacteria teach us about life? *Biology and Philosophy*, 28:205-18.

Dupré J and O'Malley MA (2013). Vita [Life]. In Michelini F, Davies JF (Eds), *Frontiere della Biologia: Prospettive Filosofiche Sulle Scienze Della Vita [Frontiers of Biology: Philosophical Reflections on the Life Sciences]*. Milano: Mimesis Edizioni.

Dupré J and O'Malley MA (2012). The continuity of life and non-life. In Wolfe LT, Normandin S (Eds), [*Vitalism and the Scientific Image in Post-Enlightenment Life Science, 1800–2010*](#). Springer.

Evaluation and Grading

For a Upper Level Undergraduate Course:

FOUR ARTICLE ANALYSIS: 20% (5% each)

Provide a maximum two page, double-spaced summary and critical analysis of one article

PRESENTATION (possibly group presentation if many students): 30%

Students will introduce a selected reading to the class. Presentations should be no longer than 15 minutes. The presentation must include a summary of the article, a critical component (i.e. a concern or objection to the article), as well at least two discussion questions.

FINAL PAPER OUTLINE: 5%

Provide a maximum one-page, single-spaced outline for your final paper. Include a thesis statement (what you are arguing for), as well as sections. Bullet-point format is recommended. Essay questions will be provided, however, students may write on the topic of their choosing so long as they clear that topic with the instructor. Students may submit this outline any time up until the due date.

FINAL PAPER: 45%

The final paper should be a minimum of ten pages to a maximum of twelve pages, double-spaced. For anonymous grading, students must include only their student number. Papers must also include page numbers, one inch margins, a title, and maximum 250 word abstract.

For a Second Year Course (survey/introductory):

ARTICLE ANALYSIS: 10%

Provide a maximum two page, double-spaced summary and critical analysis of one article

QUIZ: 15%

A true-false, multiple choice, fill-in-the blank, and short answer quiz.

MIDTERM EXAM: 30%

Two essay questions. A list of possible midterm exam questions will be provided before the exam. The two essay questions will be chosen from that list.

DISCUSSION QUESTION: 10%

Choose ONE topic and write a clear and concise question about a reading with an short explanation of how that question is relevant to the topic. It should be a question about a specific reading that relates to problems or issues discussed as part of the topic. *Bring a hard copy to class the day we discuss the reading.* Discussion questions that fall under particular topics must be handed in while discussing that topic.

Students are encouraged to submit their questions earlier in the semester.

FINAL PAPER OUTLINE: 5%

Provide a maximum one-page, single-spaced outline for your final paper. Include a thesis statement (what you are arguing for), as well as sections. Bullet-point format is recommended. Essay questions will be provided, however, students may write on the topic of their choosing so long as they clear that topic with the instructor. Students may submit this outline any time up until the due date.

FINAL PAPER: 30%

The final paper should be a minimum of 5 pages to a maximum of 8 pages, double-spaced. For anonymous grading, students must include only their student number. Papers must also include page numbers, one inch margins, a title, and maximum 150 word abstract.

Writing and the grading thereof is a factor in the evaluation of your work for this course.

Final grades will be awarded as follows:

96-100 = A+	75-79 = B	55-59 = C-
90-95 = A	70-74 = B-	50-54 = D+
85-89 = A-	65-69 = C+	45-49 = D-
80-84 = B+	60-64 = C	Below 45 = F

Final averages will be rounded up or down to the nearest whole number.

Assignment Submission and Reading Instructions

Students are expected to hand in all assignments by the due date and as per the instructions for each assignment unless a medical note is provided and/or permission is granted by the instructor *prior* to the set date.

It is the student's responsibility to keep up with lectures, assignments, and readings. Students are responsible for the material covered in class as well as the assigned readings. Students are

expected to read the material prior to attending the lecture. Class readings, as well as the schedule according to which we will be discussing them will be posted on D2L.

Policy on Late Assignments or Missed Exams

No late assignments or make-up exams are permitted. No extra credit assignments will be provided. Students with medical or other extenuating reasons for not taking an exam or finishing an assignment on the designated date will not be penalized if they inform the instructor and provide her with documentation confirming the special circumstances. They can make up the exam or hand in the assignment after consultation with the instructor.

Style and Citation Requirements

- All written work must be double-spaced, with 12 point font and 1 inch margins.
- Whenever you quote someone, provide the source and page numbers from that source. Here's an example: Dr. Blue writes that "all puppies are incredibly cute" (1993, p. 46). '(1993, p. 46)' refers to the article or book and page number where Dr. Blue says that. Place detailed information about the article or book in your bibliography.
- Whenever you attribute a view or idea to a person, provide the source and page number where that claim is made. Here's an example: Dr. Blue likes kittens, but argues that puppies are far cuter (1994, p. 333).
- Use the following method for listing articles and books in your bibliography.
Smith, D. (1997) "A Theory of Dogs," *Philosophy of Science* 44: 60-88.
Smith, D. (1998) *A New Theory of Dogs*, Blackwell Publishers.
Smith, D. (1992) "A Theory of Great Dogs," in J. Armstrong (ed.) *An Anthology on Theories of Great Dogs*, Oxford University Press, 60-88.
Canto, P. (2006). "A Theoretical Discussion of Dogs." <http://ohiou.edu/DogTheory>.

The first entry is for an article, the second for a book, the third for a chapter in an edited book, and the fourth for a website.

Email and D2L

Some class information and handouts will be posted on D2L. You'll be sent class announcements through email. The email account used will be the one you gave the University Registrar, so make sure to check that account.