PHIL*6740 Philosophy of Biology

Fall 2019
Section(s): C01

Department of Philosophy
Credit Weight: 0.50
Version 1.00 - September 09, 2019

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1 Course Details

1.1 Calendar Description

A general introduction to the history and philosophy of biology.

1.2 Course Description

This course is designed with two types of student in mind: philosophy grad-students interested in how biology might inform their understanding of the world, and biology grad-students interested in questioning the foundational assumptions of their discipline. We have therefore tailored this course to be accessible to both groups even if they have little or no expertise in one or the other discipline.

Each year the course focuses on a different theme. This year we take a historical perspective on the nature/nurture controversy. Time and again, biologists have struggled with the problem of how to understand and measure the hereditary components of an organism, as distinct from the parts which are in some sense acquired. As we will see, many of the same questions tend to arise in different historical contexts. We begin with the debate between Darwin and Wallace during the 1860s over whether the human mind is a product of evolution by natural selection. We then review several classic debates during the 20th century, such as Fisher vs Hogben, Lehrman vs. Lorenz, and Lewontin vs Herrnstein. The final part of the course will focus on more recent “epigenetic” critiques of gene-centric thinking. Our aim is to determine whether there is a common thread underlying these debates. Why do some of the same issues apparently recur? Is there perhaps a fundamental shortcoming in the biological concept of heredity? What would it mean to transcend the nature/nurture dichotomy?

The course meets for three hours once per week. Students will come to understand the material by first writing short (1-2) page reflections each week, and then discussing the readings in class. These two activities comprise 40% of the final grade. There will be a short (4 page) paper due in roughly week six. Then a final paper (8-10 pages) is due at the end of semester. Students are free to write the final paper on any theoretical topic, ideally something related to their own graduate research projects.

1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

1.4 Final Exam

There is no final exam for this course.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Stefan Linquist
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3 Learning Resources

3.1 Required Resources

Beyond Versus (Textbook)
James Tabery (2014) Beyond Versus: The Struggle to Understand the Interaction of Nature and Nurture. MIT Press

Extended Heredity (Textbook)
Russel Bonduriansky & Troy Day (2018), Extended Heredity: A New Understanding of Inheritance and Evolution. Oxfird University Press.

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4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Understand the basic principles of evolutionary biology. Understand the nature vs nurture debate from a historical perspective. Have a critical understanding of the epigenetic "revolution" in biology. Write a critical/philosophical essay on a theoretical topic. Be able

to comprehend and critically evaluate theoretical claims about evolution and genetics.

5 Teaching and Learning Activities

5.1 Seminar

Week 1

Topics: Basic concepts in evolutionary biology .

This week, we begin to develop a shared vocabulary that will carry us through the course. Students will attempt to define such key terms as "evolution," "adaptive," "adaptation," and "gene." We will also discuss some of the ideas in this week's reading.

References: T. R. Gregory (2009), “Understanding natural selection: essential concepts and common misconceptions. Evolution Education and Outreach 2: 156-175.

Week 2

Topics: **Darwin vs Wallace on human instincts**

This week we review Darwin's account of human instinct and consider his debate with Wallace about whether the human mind is a product of natural selection.

References: Focal readings:

C. Darwin (1870), The Descent of Man and Selection in Relation to Sex, CH 3- The Moral Sense.

Princeton University Press.

C. Gross (2010), “Alfred Russel Wallace and the Evolution of the Human Mind.” The Neuroscientist 16:

496-507.

Week 3

Topics: **The interactionist critique of ethology**

The distinction between innate versus acquired traits underwent a revival between 1940-1960 with the rise of ethology as a discipline. Konrad Lorenz, who pioneered this discipline, defended the classification of behaviour into innate versus learned components. He was challenged by several American comparative psychologists, in particular by Daniel Lehrman and T.C. Schneirla. This week we will focus on the reasons offered by these critics for rejecting the innate/learned distinction and attempt to understand the model of behavioural development offered in its place.

References: Focal reading:

Schneirla, T.C. (1966), Behavioural development and comparative psychology. Quarterly Review of Biology. 41: 283-302.

Supplementary readings:

LEHRMAN, D. S. 1953. A critique of Lorenz's " objectivistic" theory of animal behavior. Quart. Rev. Biol., 28: 337-363

Lorenz, K. (1965), Evolution and Modification of Behaviour. University of Chicago Press.

Lehrman, D.S. (1970). Semantic and conceptual issues in the nature-nurture problem. In L.R. Aronson, D.S. Lehrman, E. Tobach, & J.S. Rosenblatt (Eds.), Development and evolution of behavior (pp. 17-52). San Francisco, CA: Freeman

Week 4

Topics: **Nature vs Nurture in the Eugenics Controversy**

In the early 1900s, biologist and statistician Ronald Fisher developed the analysis of variance (ANOVA) as a method to distinguish between innate versus acquired contributions to development. Some critics saw this effort as part of his broader effort to apply eugenic principles to human social engineering. Others criticized the theoretical foundations of ANOVA as a method for partitioning causes into genetic vs acquired. This week we review this debate, focusing on James Tabery's analysis of the debate between Fisher and Hogben.

References: Focal reading:

Tabery, J. (2014) Beyond Versus, Chapters 1 & 2 (p.1-42).

Supplementary Readings:

Fisher, R.A. (1918), The correlation between relatives on the supposition of Mendelian inheritance. Transactions of the Royal Society of Edinburgh 52:399-433.

Fisher, R.A. (1926), Eugenics: can it solve the problem of decay of civilizations? Eugenics Review 18:128-136.

Hogben, L (1933), The limits of the applicability of correlation techniques in human genetics. Journal of Genetics 27: 379-406.

Week 5

Topics:

Nature vs Nurture in the IQ controversy

In the 1960s & 70s, the debate over nature vs nurture was revived by the idea that genetic and environmental contributions to human IQ could be distinguished using twin studies and similar techniques. This led to renewed criticisms of the analysis of variance and related experimental methods. This week we focus on Richard Lewontin's classic paper against the use of ANOVA in genetics, using Tabery's discussion as our guide. Students are encouraged to also read Sesardic's discussion of this debate.

References:

Focal Readings

Lewontin, R. C. (1974), The analysis of variance and the analysis of causes. American Journal of Human Genetics, 26:400-411.

Tabery, J (2014), Beyond Versus Ch 3. Race, Genetics and IQ (p.44-72).

Supplementary readings:

Sesardich, N. (2005), Making Sense of Heritability, Ch. 2 "A tangle of interactions" (p. 48-89).

https://lesacreduprintemps19.files.wordpress.com/2012/11/making sense-of-heritability-neven-sesardic.pdf

Week 6

Topics: No seminar - Thanksgiving.

Week 7

Topics: **Lumbering Robots and all that**

The rise of selfish gene theory in the 1970s introduced a new perspective on heredity. The idea of an "immortal" replicator took center stage in discussions about evolution and natural selection. Environmental influences on development were reclassified as having to do with "vehicles" not "replicators" and since evolution is about replicators, developmental interactions were relegated to other disciplines besides evolutionary biology. This week we consider arguments for and against this replicator-centric point of view.

References: Focal readings

R. Dawkins (1978), “Replicator selection and the extended phenotype.” Zeitschrift für Tierpsychologie 47: 61-76.

Bateson, P. (2006), The nest's tale: a reply to Richard Dawkins. Biology and Philosophy, 21:553-558.

Week 8

Topics: **The rise of epigenetics as a research program**

Recent years have seen the emergence of epigenetics

as an alternative theoretical framework for understanding gene/environment interactions. This subject will be our focus for the rest of the semester. This week we consider the reasons offered by epigenetics proponents for thinking that traditional approaches to heredity and development are inadequate.

References:

Focal readings

Bondurainsky and Day (2018), Extended Heredity, Ch's 1-3 (p 1-51).

Background readings

Haig, D. (2004). The (dual) origin of epigenetics. Cold Spring Harbor Symposia on Quantitative Biology, 69, 67-70. doi:10.1101/sqb.2004.69.67

Holliday, R. (2002). Epigenetics comes of age in the twenty-first century. Journal of Genetics, 81, 1-4. doi:10.1007/BF02715863

Week 9

Topics:

The evidence for non-genetic inheritance

What is the evidence that epigenetic influences on development are inherited? If they are inherited, does this mean that epigenetic factors are on par with genes as far as evolution and development are concerned? This week we address these questions by focusing on Chapters 4 & 5 of Extended Heredity.

References: Focal readings

Bonduriansky and Day (2018), Extended Heredity, Ch's 4 & 5 (p. 51-101) .

Week 10

Topics: **Implications of epigenetics for evolutionary theory**

Does an appreciation of epigenetic inheritance require major revision of our understanding of evolution? This week we consider arguments in favour of this claim.

References: Focal readings

Bonduriansky & Day (2018), Extended Heredity Ch 6 & 7 (p.102-136).

Keller (2014), From gene action to reactive genomes. The Journal of Physiology 592: 2423-2429.

Week 11

Topics: **An exaggerated revolution?**

Critics of epigenetics argue that this revolution is exaggerated and faddish. This week we consider some objections to this approach and the replies that have been offered in defense of the epigenetic revolution.

References: focal readings

Hafner A.J. & Lund, J.H. (2016), Great expectations: Epigenetics and the meandering path from bench to bedside. Biomedical Journal 39_166-176.

Bonduriansky & Day (2018), Extended Heredity Ch 8

(p.137-157). .

Week 12

Topics:	**Future directions in epigenetic research**
	Where is this field going and can we predict its impact on traditional questions in the nature/nurture controversy?
References:	Focal readings
	Bonduriansky & Day (2018), Extended Heredity Ch's 9 & 10 (p.158-220).

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6 Assessments

6.1 Assessment Details

Weekly reflection assignments (25%)

participation in seminar discussion (25%)

Short analytical paper (20%)

Final research paper (30%)

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7 University Statements

7.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

7.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

7.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

7.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

7.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be

noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

7.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

7.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

7.8 Resources

The Academic Calendars are the source of information about the University of Guelph’s procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

https://www.uoguelph.ca/academics/calendars