SCIENTIFIC THINKING IN ECOLOGY (FAS 5901, Section 14245, 2 credits)

Fall Semester 2019

Classroom Section: Wednesdays, Periods 2-3 (8:30– 10:25 a.m.) in 3108 McCarty B

Online Sections: TBA

Course Description:

This course examines general philosophical foundations of science, the nature of scientific disputes, and the relevance of these to ecology. Assigned readings, class discussions and essays provide background, tools, opportunities and feedback designed to help students deliberately develop their professional philosophy. *Prerequisite: One ecology course.*

Course Goals:

1. To foster critical thinking while developing each student's scientific philosophy.
2. To enable students to recognize philosophical differences among scientists, particularly ecologists.
3. To help students place ecological science in the context of intellectual pursuits and human nature.
4. To make explicit for students the foundations of public trust in ecology as a science.

Expected Outcomes:

Upon completion of this course, successful graduate students will be able to:

A. Distinguish ecology from other endeavors and better identify "good" science
B. Formulate and deliver higher quality verbal and written arguments
C. Demonstrate an ability to learn from other fields
D. Interact effectively as a part of a team exploring important issues

Format, Evaluation and Feedback:

Weekly class discussions with Socratic questioning will derive from assigned readings. Students will be asked to lead the weekly discussions. Three essays will be assigned and due as scheduled. Essays will be evaluated by the instructor for critical thinking and intellectual standards, as reviewed at the beginning of the course and throughout the discussions. Regular attendance and participation are expected as discussions cannot be "made up." Class participation will be reinforced and assessed by student blogs written after each discussion. Blogs will be accepted from students absent from discussions due to illness. Everyone is expected to read everyone else's blog prior to the next class period; posting comments is encouraged. Essays will be compiled and posted for review.

Grading:

Class participation		55% (~3.6 pts/class)
3 Essays @ 15 pts each		45%
	Total	100%

A = 90-100%	C = 70-79	E = 59 or less
B = 80-89	D = 60-69	

Instructor:

Robert "Rob" Ahrens
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Office Hours by Appointment

Textbook: Most, **though not all**, reading materials are online at https://lss.at.ufl.edu/. You will need to obtain a copy of these three books.

Kuhn, T.S. 1970. *The Structure of Scientific Revolutions*. (2nd Ed.) Univ. of Chicago Press, Chicago. 210 pp.

Powell, J.L. 1998. *Night Comes to the Cretaceous: Dinosaur Extinction and the Transformation of Modern Geology*. W.H. Freeman & Co. 325 pp.

Reiners, W.A. and J.A. Lockwood. 2010. *Philosophical Foundations for the Practices of Ecology*. Cambridge Univ. Press, New York. 212 pp.

Grades and Grade Points:

For information on current UF policies for assigning grade points, see https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Academic Honesty, Software Use, Campus Helping Resources, Services for Students with Disabilities

Academic Honesty

In 1995 the UF student body enacted an honor code and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

The Honor Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the university, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."**

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office. *(Source: 2012-2013 Undergraduate Catalog)*

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor. This policy will be vigorously upheld at all times in this course.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,* **www.counseling.ufl.edu/cwc/**
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Training Programs

Community Provider Database

- *Career Resource Center*, First Floor JWRU, 392-1601, **www.crc.ufl.edu/**

Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 352-392-8565, **www.dso.ufl.edu/drc/**

Topics and Assignments for FAS 5901 – Fall Semester 2019

Date[1]	Week	Topics	Readings[2] and Assignments
8/21	**1**	Course goals, outcomes, evaluation and feedback Critical Thinking and Intellectual Standards	Online Tool linked in Canvas (Paul & Elder. 2001. 19 pp.)
		Section I: Why ponder science as an ecologist?	
8/28	**2**	Why study science *per se*? What is the aim of science? What is the aim of ecology?	Rigler & Peters. 1995. Ch.1, pp. 5-20. Peters. 1991. Ch. 2. pp. 17-37.
9/4	**3**	Distinguishing science (ecology) and religion	Barbour. 1997. Ch. 1-3. pp. 3-74
		Section II: Applying Philosophy to Ecology	**1st Essay Due by 9/18**
9/11	**4**	Popper's Contribution	Popper *in* Boyd et al. 1995. pp. 98-119.
9/18	**5**	Strong inference & multiple working hypotheses	Chamberlin. 1890. Platt. 1964.
9/25	**6**	Paradigms and Scientific Revolutions	**Kuhn. 1970. 210 pp**.
10/2	**7**	Lakatos' Scientific Research Programs	I*n* Lakatos & Musgrave 1970 pp. 91-196
10/9	**8**	Feyerabend's Anarchism	I*n* Lakatos & Musgrave 1970 pp.197-230 **(**I*n* Motterlini 1999 pp.113-118**)**
10/16	**9**	Case Study: *Night Comes to the Cretaceous*	**Powell. 1998. 325 pp.**
10/23	**10**	A "Kuhnian" looks at Ecology	Cooper 2003. Ch. 2, pp. 27-74 **(**Introduction, Ch.1, 3 & 5**)**
10/30	**11**	Ecologists look to Philosophy	**Reiners & Lockwood 2010.** Ch. 2-4, pp. 9-77
11/6	**12**	Constrained Perspectivism or Ecological Critical Thinking	**Reiners & Lockwood 2010.** Ch. 5-8, pp. 78-116
		Section III: Influences of Beliefs and Values	**2nd Essay Due by 11/13**
11/13	**13**	Professional ethics, a transition to case studies	Peach *in* Penslar 1995. pp. 13-26. (Dudycha & Geedey 2004. 30 pp)
11/20	**14**	Values in Science and Resource Management	Ludwig et al. 1993 Hilborn 2006 Parsons & Wright 2015 Browman et al. 2018
11/27		**Thanksgiving Holiday**	
12/4	**15**	Case Study: *Finding Darwin's God*	Miller 1999. Ch. 3-5, pp. 57-164
			3rd Essay Due by 12/4

[1] Dates are for the classroom section; the online section will meet on a different day of the same week, TBD.

[2] Readings in parentheses are recommended, not required. For longer reading assignments, you can read pertinent sections, while skipping or only skimming other sections of the text. Readings in **Bold & Underlined** are not on the course website.

References and Reading List

Barbour, I.G. 1997. *Religion and Science: Historical and Contemporary Issues*. HarperCollins, San Fransisco. 368pp.

Boyd, R. P. Gasper and J.D. Trout. 1995. *The Philosophy of Science*. MIT Press, Cambridge. 800 pp.

Browman, H.I., and 11 others. 2018. Welfare of aquatic animals: where things are, where they are going, and what it means for research, aquaculture, recreational angling, and commercial fishing. ICES Journal of Marine Science doi:10.1093/ices/jms/fsy067.

Chamberlin, T.C. 1890 (reprinted 1965). The method of multiple working hypotheses. Science 148:754-759.

Cooper, G.J. 2003. *The Science of the Struggle for Existence: On the Foundations of Ecology*. Cambridge University Press, Cambridge. 319 pp.

Dudycha, J.L. and C.K. Geedey. 2004. Ethical Issues in Ecology: Case Studies. Ecological Society of America, Washington, DC. 30 pp.

Feyerabend, P.K. 1978. *Against Method: Outline of an Anarchist Theory of Knowledge*. Verso, London. 339 pp.

Hilborn, R. 2006. Faith-based fisheries. Fisheries 31:554-555.

Keller, D.R. and F.B. Golley. 2000. *The Philosophy of Ecology: From Science to Synthesis.* University of Georgia Press, Athens.366 pp.

Kuhn, T.S. 1970. *The Structure of Scientific Revolutions*. (2nd Ed.) Univ. of Chicago Press, Chicago. 210 pp.

Lakatos, I. 1978. *The Methodology of Scientific Research Programmes*. Cambridge University Press, New York. 250 pp.

Lakatos, I., and A. Musgrave (eds). 1970. *Criticism and the Growth of Knowledge*. Cambridge Univ. Press, New York.282 pp.

Ludwig, D., R. Hilborn and C. Walters. 1993. Uncertainty, resource exploitation and conservation: Lessons from history. Science 260:17+36.

Miller, D. (ed.). 1985. *Popper Selections*. Princeton Univ. Press, Princeton. 479 pp.

Miller, K. R. 1999. *Finding Darwin's God*. HarperCollins, New York. 338 pp.

Motterlini, M. (ed.). 1999. *For and Against Method.* Univ. of Chicago Press, Chicago. 451 pp.

Parsons, E.C.M. and A.J. Wright. 2015. The good, the bad and the ugly science: examples from the marine science arena. Front. Mar. Sci. 2:33. Doi:10.3389/fmars.2015.00033.

Paul, R. and L. Elder. 2001. *The Miniature Guide to Critical Thinking: Concepts and Tools*. Foundation for Critical Thinking, Dillon Beach CA. 19 pp.

Penslar, R.L. 1995. *Research Ethics: Cases and Materials*. Indiana Univ. Press, Bloomington. 278 pp.

Peters, R.H. 1991. *A Critique for Ecology*. Cambridge Univ. Press, New York. 366 pp.

Pickett, S.T.A., J. Kolasa, and C.G. Jones. 1994. *Ecological Understanding*. Academic Press, San Diego. 206 pp.

Platt, J.R. 1964. Strong inference. Science 146:347-353.

Popper, K.R. 1959 (reprinted 1992). *The Logic of Scientific Discovery*. Routledge, New York. 480 pp.

Powell, J.L. 1998. *Night Comes to the Cretaceous: Dinosaur Extinction and the Transformation of Modern Geology*. W.H. Freeman & Co. 325 pp.

Reiners, W.A. and J.A. Lockwood. 2010. *Philosophical Foundations for the Practices of Ecology*. Cambridge Univ. Press, New York. 212 pp.

Rigler, F.H. and R. H. Peters. 1995. *Science and Limnology*. Ecology Inst., Oldendorf/Luhe, Germany. 239 pp.