

Term Information

Effective Term Spring 2015

General Information

Course Bulletin Listing/Subject Area Entomology
Fiscal Unit/Academic Org Entomology - D1130
College/Academic Group Food, Agric & Environ Science
Level/Career Undergraduate
Course Number/Catalog 2400H
Course Title Evaluating Evidence in Biology & Medicine
Transcript Abbreviation Evaluate Evidence
Course Description The course explores information and scientific literacies in biology and medicine, with emphasis on science as reported in the media and the use of insects and other organisms as model systems. We use evolutionary theory as the unifying framework for all life on earth. The ability to scrutinize science as reported in popular sources and to procure additional, credible information is emphasized.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites One biological or physical science course, sophomore standing, honors status, or permission of instructor.
Exclusions

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 26.0702
Subsidy Level Baccalaureate Course
Intended Rank Sophomore, Junior, Senior

Requirement/Elective Designation

General Education course:
Biological Science

Course Details

Course goals or learning objectives/outcomes

- Expected Learning Outcomes: Biological Science
 1. Students understand the basic facts, principles, theories and methods of modern science.
- 2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
- 3. Students describe the inter-dependence of scientific and technological developments.
- 4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.
- Expected Learning Outcomes: Information Literacy
 1. Students locate, contextualize and assess information and content from different sources (e.g. scholarly, OER, user-generated)
- 2. Students contrast nature of scientific information found in textbooks vs review articles vs primary articles; evaluate sources & authors
- 3. Students locate a current, primary source and a related, "classic" source, and explain how technology has advanced current understanding of the subject area
- 4. Students obtain and evaluate information from various reliable sources (e.g., newspapers, government websites, primary and secondary research articles)

Content Topic List

- Week 1
Course Overview: goals, learning outcomes, activities, policies
Other “ways of knowing”-- the arts, humanities, religion, etc.
- Week 2
Science as a way of knowing: empiricism, hypotheses, models, peer-review, corroboration; pseudoscience
Terminology: theories vs laws, probability vs uncertainty, correlation vs causation, statistical significance, graphs.
- Week 3
Information Literacy: Using OSU Libraries e-databases
Evolutionary theory as paradigm: Before vs since Darwin, recognizing evolution as the unifying principle for all life forms, extinct & living, including Homo sapiens
- Week 4
Do vitamin C and other antioxidants benefit health? Using observations & experiments to test medical hypotheses
“Feeling detoxified”-- Case study on placebo effect: spa claims that ionic foot bath removes toxins from the body
- Week 5
Exam #1: discussion of answers (posted by groups in week 4)
Evaluating the credibility and authority of scientists
- Week 6
New York Times Tuesday Science: discussion of selected article
Police dogs smelling criminals? Testing behavioral hypotheses
- Week 7
Why are frogs in trouble? Complementary observations and experiments to test hypotheses in ecology
- Week 8
How do animals find stored food? Strong inference by testing alternative hypotheses
- Week 9
What causes cancer? The complexities of causation
- Week 10
Exam #2: discussion of answers (posted by groups in week 9)
- Week 11
New York Times Tuesday Science: Students report on articles of their choice
How does coffee affect health? Results of multiple studies
- Week 12
Immunization and vaccination: facts, myths; “herd immunity”
Case Study: Sex and vaccination— Texas tempest over HPV
- Week 13
Case Study: Sex and vaccination— current status; resolution
Wrapping up: The role of science in society
- Week 14
Science today: funding sources, where scientists work
New York Times Tuesday Science: Students report on articles of their choice
- Week 15

Final Exam (Cumulative): Emphasis on applying skills & scientific understanding to explain and evaluate science-based information

Attachments

- ConcurrenceEEOB.jpg: form signed by EEOB
(Concurrence. Owner: Welty, Celeste)
- Entomology 2400H CLSE Concurrence.pdf: form signed by CLSE
(Concurrence. Owner: Welty, Celeste)
- ENTMLGY 2400H 21 Oct '14 Spr 2015 TO UPLOAD.pdf: updated syllabus
(Syllabus. Owner: Welty, Celeste)

Comments

- Please correct class times in the syllabus. *(by Neal, Steven Michael on 10/21/2014 03:16 PM)*
- Recommendations for changes in course title, prerequisites, syllabus, and concurrence have been incorporated. Two additional documents attached.
Syllabus also includes alignment of general education learning goals and outcomes, and examples of assignments and exam questions. *(by Welty, Celeste on 10/13/2014 05:32 PM)*
- See 9-22-14 e-mail.
(For prereq: Is it any biological or physical science course, or does it refer to a GE Natural Sc--Biological Sc or Physical Sc course?) *(by Vankeerbergen, Bernadette Chantal on 09/22/2014 01:47 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Welty, Celeste	06/05/2014 10:56 AM	Submitted for Approval
Revision Requested	Neal, Steven Michael	07/08/2014 07:39 AM	Unit Approval
Submitted	Welty, Celeste	07/08/2014 08:31 AM	Submitted for Approval
Approved	Neal, Steven Michael	07/09/2014 11:09 AM	Unit Approval
Approved	Neal, Steven Michael	07/09/2014 11:09 AM	College Approval
Revision Requested	Vankeerbergen, Bernadette Chantal	09/22/2014 01:48 PM	ASCCAO Approval
Submitted	Welty, Celeste	10/13/2014 05:34 PM	Submitted for Approval
Approved	Welty, Celeste	10/13/2014 11:04 PM	Unit Approval
Revision Requested	Neal, Steven Michael	10/16/2014 12:10 PM	College Approval
Submitted	Welty, Celeste	10/16/2014 02:57 PM	Submitted for Approval
Approved	Welty, Celeste	10/16/2014 02:59 PM	Unit Approval
Revision Requested	Neal, Steven Michael	10/21/2014 03:16 PM	College Approval
Submitted	Welty, Celeste	10/21/2014 05:58 PM	Submitted for Approval
Approved	Welty, Celeste	10/21/2014 07:10 PM	Unit Approval
Approved	Neal, Steven Michael	10/22/2014 09:03 AM	College Approval
Pending Approval	Nolen, Dawn Vankeerbergen, Bernadette Chantal Hanlin, Deborah Kay Jenkins, Mary Ellen Bigler Hogle, Danielle Nicole	10/22/2014 09:03 AM	ASCCAO Approval

“Evaluating Evidence in Biology & Medicine”

Instructor:	Dr. Carol Anelli, in collaboration with Mr. Craig Gibson
Course:	ENTMLGY 2400H
Prerequisite:	One biological or physical science course, sophomore standing, honors status, or permission of instructor
GE category:	Natural Science/Biological Science
Credits/Delivery:	3 cr/Interactive recitation with discussion
Time/Location:	Tues & Thurs 9:35-10:55 AM/201 Kuhn
Office Hours:	By appointment: email anelli.7@osu.edu

Course Overview

This course explores information and scientific literacies in biology and medicine, with emphasis on science as reported in the media and the use of insects and other organisms as model systems. It makes use of evolutionary theory as the unifying framework for all life on earth from about 3.8 billion years ago to the present. It also hones skills for life: the ability to scrutinize science as reported in various popular sources and to procure additional, credible information if desired.

We begin with an understanding of science as a process (“way of knowing”) and evolution as a utilitarian, evidence-based, predictive theory. To acquire needed foundational knowledge we will discuss different science methodologies, interpret data and evidence, evaluate sources and scientific credentials, examine science in the context of health and well being, and weigh the pros and cons of controversial findings and issues to render informed decisions. In a final case study on human vaccination we will explore a science-based, complex contemporary issue that illustrates ethical concerns and difficult choices faced by people in their personal lives and as citizens of a democracy.

General Education: Natural Science

Goals: Students understand the principles, theories, and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and technology to address problems of the contemporary world.

Expected Learning Outcomes: Biological Science

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

Expected Learning Outcomes: Information Literacy

1. Students locate, contextualize and assess information and content from different sources (e.g. scholarly, OER, user-generated)
2. Students contrast nature of scientific information found in textbooks vs review articles vs primary articles; evaluate sources & authors
3. Students locate a current, primary source and a related, “classic” source, and explain how technology has advanced current understanding of the subject area
4. Students obtain and evaluate information from various reliable sources (e.g., newspapers, government websites, primary and secondary research articles)

Required Materials

- Textbook: *How Science Works: Evaluating Evidence in Biology and Medicine*. 2004. S.H. Jenkins. Oxford University Press, New York. 227 pp. This text provides a brief historical perspective for most chapter themes and references to classic papers. The narrative is augmented with data as tables and graphs.
- Newspaper: *The New York Times Tuesday Science Section* (OSU Libraries)
- Essays and articles: Selected by instructor [listed in syllabus, posted at Carmen]
- Podcasts, YouTube videos: Selected by instructor (e.g., Science Times, Science Talk, and Science) [links posted at Carmen]

Note: Podcast interviews with scientists and science journalists (“Science Talk” from *Scientific American*, “Science Times” from *New York Times*, “Science” from *Science*), YouTube videos, and related prompts will be posted at Carmen.

Required Assignments & Point Allocations

Homework (ungraded; brief written responses to readings, podcasts, YouTube videos)	5%
Library homework	5%
Attendance, participation, team work	10%
Response to Discussion Prompts (written; posted periodically at Carmen)	5%
Group Take-home Exam #1	15%
Group Take-home Exam #2	15%
Final Case Study (written with small group, approx. 4 students/group)	15%
<i>New York Times</i> Article Report (three total).....	12%
Final Exam (cumulative)	18%
TOTAL	100%

Course Outline (Spring 2015)

Wk	Theme	Day and Topic <i>Note: To prepare for class discussion, students will complete assigned readings and respond to prompts at Carmen before class</i>	Readings		
			Jenkins Textbook	NYT & Additional Sources	
1	Science Basics	Tu Course Overview: goals, learning outcomes, activities, policies Th Other “ways of knowing”-- the arts, humanities, religion, etc.	Ch 1	syllabus	
2		Tu Science as a way of knowing: <i>empiricism, hypotheses, models, peer-review, corroboration; pseudoscience</i> Th Terminology: <i>theories vs laws, probability vs uncertainty, correlation vs causation, statistical significance, graphs</i>		Gillen Loomis Mayr Greenspan	
3		Tu Information Literacy: <i>Using OSU Libraries e-databases</i> Th Evolutionary theory as paradigm: <i>Before vs since Darwin, recognizing evolution as the unifying principle for all life forms, extinct & living, including Homo sapiens</i>		Gibson Nesse, Shubin, Mindell	
4	Science Methodologies in Current Contexts	Tu Do vitamin C and other antioxidants benefit health? <i>Using observations & experiments to test medical hypotheses</i> Th “Feeling detoxified”-- <i>Case study on placebo effect: spa claims that ionic foot bath removes toxins from the body</i>	Ch 2	McCallam & Prud’homme-Généreux	
5		Tu Exam #1: discussion of answers (posted by groups in week 4) Th Evaluating the credibility and authority of scientists		Anelli	
6		Tu <i>New York Times Tuesday Science:</i> discussion of selected article Th Police dogs smelling criminals? <i>Testing behavioral hypotheses</i>	Ch 3	NYT Gawande 1	
7		Tu & Th Why are frogs in trouble? <i>Complementary observations and experiments to test hypotheses in ecology</i>	Ch 4	Blaustein	
8		Tu & Th How do animals find stored food? <i>Strong inference by testing alternative hypotheses</i>	Ch 5		
9		Th & Th What causes cancer? <i>The complexities of causation</i>	Ch 6	Gawande 2	
10		Tu Exam #2: discussion of answers (posted by groups in week 9) Th No class-- Dr. Anelli at scientific conference			
11		Tu <i>New York Times Tuesday Science:</i> Students report on articles of their choice Th How does coffee affect health? <i>Results of multiple studies</i>	Ch 8	NYT	
12		Science & Society	Tu Ecosystems: Structure, function, processes; energy & matter flow Th Case Study: Reintroduction of wolves into Greater Yellowstone Ecosystem		Misconcepts; White & Garrott; NPS
13			Tu Case Study: Wolves in Yellowstone— current status; resolution Th Wrapping up: The role of science in society		White & Garrott
14	Tu Science today: <i>funding sources, where scientists work</i> Th <i>New York Times Tuesday Science:</i> Students report on articles of their choice		Ch 10	Augustine NYT	
15	Final Exam (Cumulative): Emphasis on applying skills & scientific understanding to explain and evaluate science-based information				

Learning Goals and Outcomes Assessment Grid

GE Biological Science Learning Goal	Related Information Literacy Goal	Outcome: Students should be able to:	Emphasis in course	Goal & Related Outcomes evaluated by: * *(see <i>Sample Evaluation Examples</i> , pp. 8-10)
LG #1. Students understand basic facts, principles, theories and methods of modern science.	Locate, contextualize, and assess information and content from different sources (e.g. scholarly, OER, user-generated)	Relate basic tenets of evolutionary theory; explain peer-review, correlation vs. causation, placebo effect, corroboration; infer from findings; identify scholarly vs non-scholarly sources	Weeks 1, 2, 3 (Interactive lectures, OSU Libraries, augmented by info posted at Carmen and readings)	<i>Anonymous pre- and post-course questionnaires</i> <i>Homework assignments</i> —identify tenets of evolutionary theory, distinguish between correlation vs. causation, infer from probabilities <i>Library homework</i> --evaluate sources (CRAAP Test—see “Additional Sources” p. 6, this document) <i>Case Study: “Feeling detoxified”</i> (placebo effect) <i>Group Take-home Exam #1 & 2</i> —Performance on Q’s on evolutionary tenets, approaches & processes of modern science, data interpretation
LG #2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.	Contrast the nature of scientific information in textbooks vs review articles vs primary articles; evaluate sources & authors	Recognize current research as provisional, yielding data that refines & builds on core theories (e.g., germ theory of disease, evolutionary theory)	Weeks 2, 3, 6, 11, 14 (<i>NYT Reports</i>); Weeks 4-6, 7, 9 (Jenkins case studies & readings)	<i>Library homework</i> on sources; other <i>Homework</i> <i>NY Times Article Reports</i> (see attached example) and student presentations of reports in-class; <i>Group Take-home Exam #2</i> — Locate scholarly source of scientific information in media; interpret and contextualize findings; evaluate sources and scientific credibility of authors
LG #3. Students describe the interdependence of scientific and technological developments.	Locate a current, primary source and a related, “classic” source; explain how technology has advanced our current understanding	Explain that discoveries deriving from modern models (e.g., fruit fly molecular genetics, computer simulations, etc.) are extrapolated and applied to humans	Weeks 4, 6 (Case studies in Jenkins, augmented by scientific literature & readings)	<i>Response to Discussion Prompts</i> --extrapolation from modern scientific models to humans <i>Group Take-home Exams #1 & 2</i> —Connect current discoveries advanced <i>via</i> technology to related, past knowledge; interpret data deriving from instructor-selected scientific articles <i>NY Times Article Reports</i> -- (attached)
LG #4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.	Obtain & evaluate information from various reliable sources (e.g., newspapers, gov’t websites, review articles)	Integrate and synthesize information from multiple sources, draw evidence-based conclusions, make ethical and value judgments	Weeks 12 & 13 (Wolf re-introduction into Greater Yellowstone)	<i>Final Case Study</i> : Quality of answers to questions posed in case study, of sources used as references, and of arguments mustered to resolve case study (AAC&U VALUE Rubrics will be consulted to create evaluation rubric; see p. 6 this document)

Grading Policies

Homework assignments that are ungraded (1 pt each) must be complete and represent “good faith” efforts for the assignment. *New York Times* article reports (see below) are graded per the rubric (posted at Carmen with a model report). Answers to the Final Case Study questions will be graded for accuracy and completeness (rubric will be posted).

Group work (two midterm, group take-home exams plus the final case study) will be evaluated on quality of answers as well as teamwork. For elements of good teamwork, see forms for self and peer evaluation (attached), which are required for all group work.

Group Assignments (“Group Contract” is attached for perusal)

The instructor will assign student groups, each to comprise about 4 students. Each group will devise a Group Contract, i.e., a written plan for the assignment, which will be signed by all group members and submitted to the instructor. By signing the Contract, group members indicate their intention to adhere to the written plan and to act in accord with the behaviors and responsibilities stated in the Contract.

Dissension Document (attached)

Groups comprise 3-5 students; any student may opt to disagree with his/her group’s answer. If a student disagrees with the group’s answer and provides the CORRECT ANSWER, said student will earn the appropriate points (and the group will not). If a student dissents and provides an INCORRECT answer, the student will lose points accordingly.

How to dissent: A student will provide his/her dissent in a document with a brief but complete justification for an alternate answer. The student will post the dissent document to the group’s Carmen site, indicating his/her name with the word “DISSENT.” If more than two students decide to dissent and wish to provide the same answer, it may be posted as a single dissension, but the document must indicate clearly the names of the dissenting students.

Grading Scale

A	93-100%	C	74-76
A ⁻	90-92	C ⁻	70-73
B ⁺	87-89	D ⁺	67-69
B	84-86	D	64-66
B ⁻	80-83	E	< 64
C ⁺	77-79		

New York Times (NYT) Article Reports

We will discuss current NYT articles from the Tuesday Science Section in class three times during the semester; students will summarize three NYT articles per the NYT Article Report template (attached). We will discuss and model this assignment in-class. Each NYT written and oral report will contribute 4% toward the final grade, for a total of 12%.

Additional Sources (some for students, others for course development)

- AAC&U VALUE Rubrics: Valid Assessment of Learning in Undergraduate Education.
http://www.aacu.org/value/rubrics/index_p.cfm
- Anelli, C. 2011. Scientific literacy: What is it, are we teaching it, and does it matter?
American Entomologist 57(4):235-243.
- Anelli, C. 2011. Major criteria for evaluation of science authors.
<http://libguides.wsulibs.wsu.edu/content.php?pid=108535&sid=3017961>
- Augustine, N. 1998. What we don't know does hurt us: How scientific illiteracy hobbles society. *Science* 279:1640-1641.
- Blaustein, A.R., and Kiesecker, J.M. 2002. Complexity in conservation: Lessons from the global decline of amphibian populations. *Ecol. Lett.* 5:597-608.
- Gawande, A. 2001. Under suspicion: The fugitive science of criminal justice. *New Yorker*, Jan issue, p. 50.
- Gawande, A. 1999. The cancer-cluster myth. *New Yorker* 8 Feb; reprinted in The Best American Science and Nature Writing 2000, D. Quammen (ed), Houghton-Mifflin, Boston
- Gibson, J. C. 2015. Lecture and in-class discussion/demo on sources and electronic use of OSU Libraries
- Gillen, C.M. 2007. Reading Primary Literature: A practical guide to evaluating research articles in biology. Pearson Benjamin Cummings, San Francisco
- Greenspan, R.J. and Kreitman, M. 2008. The evolution of fruit-fly biology. *The Lancet* 372:S28-S33.
- Hebblewhite, M., White, C.A., et al. 2005. Human activity mediates a trophic cascade caused by wolves. *Ecology* 86(8): 2135–2144.
- Loomis, W.F. 2008. "The value of life," In: Life As It Is: Biology for the Public Sphere, pp. 1-25. University of California Press, Berkeley
- Mayr, E. 1997. "What is science?" In: This Is Biology, pp. 24-44. Harvard University Press, Cambridge
- McCallam, G., and Prud'homme-Généreux, A. 2012. Feeling detoxified: Expectations, effects, and explanations. National Center for Case Study Teaching in Science.
http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=626&id=626
- Mindell, D.P. 2009. Evolution in the everyday world. *Scientific American* Jan issue: 82-89.
- Misconceptions: Using the power of story. 2014. Overcoming Ecological Misconceptions,
<http://ecomisconceptions.binghamton.edu/index.htm>
- Moran, A.L. 2004. Egg size evolution in tropical American arcid bivalves: the comparative method and the fossil record. *Evolution* 58: 2718-2733.
- Mnookin, S. 2011. The Panic Virus: A True Story Behind the Vaccine-Autism Controversy. Simon & Schuster, New York
- Moore, J.A. 1993. Science as a Way of Knowing. Harvard University Press, Cambridge
- NPS. 2014. <http://www.nps.gov/yell/naturescience/wolves.htm>
- Nesse, R.M. and Stearns, S.C. 2008. The great opportunity: evolutionary applications to medicine and public health. *Evolutionary Applications* 1:28-48.
- Scott, E. C. 2005. "Science: 'Truth without certainty,'" Chapter 1 In: Evolution vs. Creationism: An introduction, pp. 3-21. University of California Press, Berkeley
- Shubin, N.H. 2009. This old body. *Scientific American* Jan issue: 64-67.

University of Oregon Libraries. Critical evaluation of information sources.

<http://library.uoregon.edu/guides/findarticles/credibility.html>

White, P.J. and Garrott, R.A> 2005. Yellowstone's ungulates after wolves: Expectations, realizations and predictions. *Biological Conservation* 125: 141–152.

WSU Libraries. Undated. Evaluating Sources: The CRAAP Test.

<http://libguides.wsulibs.wsu.edu/content.php?pid=108535&sid=816820>

WSU Libraries. Undated. Information Literacy Research Skill Building (tutorials).

<http://libguides.wsulibs.wsu.edu/search.php?iid=984&c=0&gid=340&pid=108535&search=information%20literacy%20research>

Attendance, Participation, and Late Work Policy

Students should plan to attend all classes. If a class is missed, the student must notify Dr. Anelli *before* class and provide a reason for the absence. Students should also accept the responsibility to meet with an informed, engaged student (not Dr. Anelli) to learn what occurred in class, what assignments may have been discussed, etc.

All assignments and exams are *due at the beginning of class*; late work is subject to grade reduction of 10% each day it is late. All completed assignments must be posted to the course's Carmen site. Individual groups will be assigned online space that is accessible only to members of a given group.

Academic Misconduct Statement

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Academic Disabilities Statement

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

Welcome to the course!
I look forward to working and learning with you.

Sample Evaluation Examples: Student Attainment of Goals & Outcomes

Please refer to *Learning Goals and Outcomes Assessment Grid*, p. 4.

Goal #1. Basic facts, principles, theories; locate and contextualize information

Homework assignments on identifying tenets of evolutionary theory, distinguishing between correlation vs. causation, inferring from probabilities, explaining statistical significance:

Identify tenets of evolutionary theory

1. Based on your readings, provide three examples and explain how each exemplifies this statement: Human body “design flaws” reveal both evolutionary constraints and our own ancient lineage.

Indicate whether each relationship below is one of causation or correlation:

- a) Alcohol consumption of > 8 oz/day is linked to breast cancer.
- b) Children who play electronic games also enjoy watching television.
- c) Smoking cigarettes is a leading cause of lung cancer.
- d) A controlled study with women shows that consuming > 2 servings of a sugary drink per day results in a 40% higher risk of heart disease.

Inferring from probabilities, explaining statistical significance:

1. What is a p-value, and why would a scientist want to determine one?

Refer to RESULTS portion of Moran (2004) titled, “Estimating Egg size of Fossils...”:

2. What do the statistical analyses suggest about the size of eggs from Recent Eastern Pacific Ocean vs. fossil Eastern Pacific Ocean?
3. What do the statistical analyses suggest about the size of eggs from the Recent Western Atlantic Ocean vs. fossil Western Atlantic Ocean?

Library homework-- CRAAP test (assignment will require application of the CRAAP test, explained at this link: <http://libguides.wsulibs.wsu.edu/content.php?pid=108535&sid=816820>)

Case Study: “Feeling detoxified” (placebo effect, scientific credibility of sources)

Questions for students (some to answer via Carmen, some for in-class discussion)

1. Why might you be tempted to believe what the spa attendant says and to believe the information in the spa pamphlet? Why should you be skeptical of the information?
2. Which of the two variables tested by the researchers appears to have the largest effect on improved health?
3. What can you conclude from the researchers’ experiment?
4. If the placebo effect is real, where’s the harm in letting people remain uninformed (or falsely informed) about the mechanism of action of ionic foot baths?
5. Why do people sometimes turn away from evidence-based medicine and scientifically trained experts in the treatment of their health?

Group Take-home Exam #1— Performance on Q’s focused on evolutionary tenets, approaches & processes of modern science, interpretation of data

1. Applications of Evolutionary Theory to Medicine. Retrieve Nesse and Stearns (2008) *Evol. Appl.* 2008; **1**: 28-48, and answer the following questions:
 - a. In your own words, give 5 specific examples illustrating the application of modern phylogenetic methods in medicine.
 - b. Give 6 reasons why natural selection has not made us more resistant to disease.
 - c. According to the hygiene hypothesis, what might our ancestral co-existence with intestinal helminth parasites have to do with autoimmune diseases?

Goal #2. Development of science; scientific knowledge evolves; compare and evaluate sources

Library assignment on sources:

1. Locate the following journal article and choose an article from its bibliography:
Lobell, D.B. *et al.* (2014) Greater sensitivity to drought accompanies maize yield increase in the U.S. Midwest. *Science* 344(6183):516-519.
2. Evaluate the article you chose in terms of the characteristics that make a written work popular or scholarly, primary or secondary, and other criteria for evaluation we discussed.
3. Use the Web of Science to comment on the relative value of your chosen article in terms of JIF (compare to journals in the subject area “agriculture”), times cited and (first) author authority (h-index).
4. Find a scholarly article on the antimicrobial effects of garlic, published between 2004-2014, using library indexes and databases. Write a full CSE citation for the article.
5. Is your “garlic” article a primary or secondary source? Please explain.
6. Is your “garlic” article from a peer-reviewed journal?

Homework assignment on scientific knowledge evolving (questions below refer to Moran 2004):

1. According to Moran, what type of evidence is lacking about the theory of egg size evolution in marine invertebrates?
2. In your own words but with necessary details, state Moran’s hypothesis for her research (you should be able to do this in 1 sentence):
3. Is Moran developing a new theory or refining an existing one? Give a brief reason for your answer.

NY Times Article Reports (see attached example) and student presentations of Reports in-class;

Group Take-home Exam #2— Locate scholarly source of scientific information recently in media; interpret and contextualize findings; evaluate sources and scientific credibility of authors:

1. Read about “sexy orchids” at this Reuter’s news link:
<http://www.reuters.com/article/email/idUSN0742189220080508> Next, locate the original publication (*via* OSU Libraries) and answer the following questions:
2. Is this a peer-reviewed publication? What evidence can you provide?
3. From the **Introduction**: What two null hypotheses do the authors test here? (Note: I am not referring to their meta-analyses, and please state your answer as null hypotheses.)
4. How many blobs of sperm ejaculate were brought from the field to the lab for analysis?
5. Figure 3 states, “Orchid species causing ejaculation...have higher pollination success than orchids stimulating less extreme sexual behavior...” Is this statement supported by statistically significant data? On what do you base your opinion?
6. In the **Discussion** section, the researchers state, “Pollinators of *Cryptostylis*... do learn to avoid sexually deceptive orchids.” Did they demonstrate this in their study? On what specifically do you base your opinion?
7. In their **Abstract** the researchers state, “...female insects deprived of matings by orchid deception could still produce male offspring, which may even enhance orchid pollination.” What evidence do they present in support of that hypothesis?
8. Using criteria we discussed (Anelli 2011), evaluate the scientific credentials of the article’s author, Dr. Anne Gaskett.
9. In the **Literature Cited** section, what type of source is the publication by Wedell *et al.* (2002)?
10. The authors cite a publication by Schiestl *et al.* (1999). Retrieve this via OSU Libraries. In your own words (50 or less!), what did Schiestl *et al.* demonstrate?

Goal #3. Interdependence of science and technology; current and related “classic” source

Response to Discussion Prompts on extrapolation from modern scientific models to humans

1. For each statement below, provide one specific illustrative example accompanied by a complete explanation:
 - (a) Evolutionary theory is used in modern forensic analyses.
 - (b) “Deep homology” is useful for studying human diseases.

Group Take-home Exams #1 & 2— Connect current discoveries advanced *via* technology to related, past knowledge; interpret data deriving from instructor-selected scientific articles.

1. *Darwin’s Drugs*: Read this short blog, (http://www.goodreads.com/author_blog_posts/2881952-darwin-s-drugs-my-article-in-today-s-new-york-times) by *New York Times* science journalist Carl Zimmer. From it, retrieve Zimmer’s article (21 Aug 2012 *New York Times*) and answer the following.
 - a. When did humans and yeast most recently share a common ancestor?
 - b. In plain English and in your own words, explain to someone who is ignorant of this story (1) the goal of Dr. Marcotte’s research team, (2) how the team used *technology* to identify and select the 13 genes that they ended up studying, and (3) what makes TBZ particularly exciting for human medicine. Check your answer for completeness!
2. *What Darwin didn’t know and you could tell him*: After consulting your lecture notes and other sources noted in class, with your group decide the **3 most important things** that Darwin didn’t know, which would have greatly strengthened his theory. For each one of these things, explain:
 - a. what was known in Darwin’s day
 - b. any misinformation Darwin would have had to deal with
 - c. how Darwin addressed the problem (i.e., what he said about it—check Darwin Online (for *Origin of Species*) <http://darwin-online.org.uk>)
 - d. why the knowledge Darwin lacked was critical for his theory, and
 - e. what you could tell him now, owing to *scientific knowledge advanced through technology*

Goal #4. Social/philosophical implications; global applications; synthesize info, render decision

Final Case Study: Evaluate learning outcomes by quality of students’ answers to case study questions, of sources used as references, and of arguments mustered to resolve the case study (an evaluation rubric will be developed as informed by AAC&U VALUE Rubrics; see “Additional Sources,” p. 6 this document). Representative questions follow:

1. *A growing number of parents have opted not to have their children vaccinated, fearing that vaccines can cause autism or even result in death.*
 - a. *What evidence can you cite to either support or question the basis of these fears? How would you characterize each of your sources of information?*
 - b. *By what criteria are you evaluating your information sources?*
 - c. *List additional factors that can influence whether parents have their children vaccinated.*
2. *If vaccines are not harmful, should they be made mandatory? Why or why not? What concerns exist (if any) in not having a child vaccinated?*

New York Times Article Report-- Tuesday Section of "Science Times" (4% of final grade)

Student Name: [A. Student](#) ***Upload the NYT article and your primary article to Carmen.
Type into form and adhere to word limits indicated. Restrict document to a *single page*.

Date of NYT article (0.1 pt)	Tuesday, October 4 th 2011
Title of article (0.1 pt)	An Addiction Vaccine, Tantalizingly Close
Author of article (0.1 pt)	Douglas Quenqua
<p>NYT article summary (200 words or less) (1.0 pt)</p> <p>This article discusses the concept of a vaccine to treat addiction, since it has recently been defined as a physical alteration of the brain, rather than a psychological condition. Dr. Kim Janda, from Scripps Research Institute, has spent over 25 years developing and tweaking his vaccination that uses a concept similar to disease vaccination. The molecules of most drugs are too small for the immune system to recognize, so in order for an immune reaction to create antibodies against a drug, Dr. Janda has attached a large protein, a hapten, which stimulates immune response. This vaccination would replace anti-opiates like methadone, which are also addictive, and uses natural antibodies to counteract the "high" feeling administered by the addictive drug. At this time, trials on animals have demonstrated effects suggesting the treatment's success, but no clinical trials have produced consistent results. Even if a dependable drug is produced, the question remains where will funding come from, as most of the large pharmaceutical companies are hesitant to purchase a vaccination associating them with drug addicts. Finally, in order for this treatment to work an addict has to want to get better, it will not single handedly cure them of addictive behaviors.</p>	
<p>Primary scientific article citation: Author(s). Date. <i>Journal abbreviated title</i>. Vol:pp-pp. (0.2 pt)</p> <p>Fox, B.S., Katak, K.M., Edwards, M.A., Black, K.M., Bollinger, B.K., Botka, A.J., French, T.L., Thompson, T.L., Schad, V.C., Greenstein, J.L., Gefter, M.L. Exle, M.A., Swain, P.A., Briner, T.J. 1996. <i>Nature Med.</i> 2: 1129-1132.</p>	
<p>Important additional information from a relevant primary scientific article (75-100 words) (1.2 pts)</p> <p>This article discussed cocaine vaccination effects in rats. Antibodies produced by the immune system in response to cocaine post-vaccination cannot cross the blood-brain barrier, so for successful prevention of a cocaine high the antibody must be present in equal or greater quantities and block the cocaine before it reaches the brain. The antibody was also effective against repeated injections, which is a realistic quality of drug users. It was shown that vaccination would not create a second addiction throughout the course of treating the first. Finally, the vaccine should be targeted at relapse prevention; it does not prevent withdrawal or counteract brain damage.</p>	
<p>Relevance of primary scientific article to biology (significance, applicability, etc.) (50 words or less) (1 pt)</p> <p>This article is particularly applicable to the medical field because of its potential for a physical solution to the disease of addiction. Cocaine is a highly addictive drug and finding a plausible therapeutic aid for those fighting an addiction to it contributes to the greater good and overall public health.</p>	
<p>Reason(s) you selected this NYT article (3 sentences or less) (0.3 pt)</p> <p>I think even the concept of a vaccine to treat addiction is fascinating, let alone the fact that it is currently being investigated as a legitimate option of treatment for people trying to overcome addiction.</p>	

Group Contract for Midterm Exams & Final Case Study—complete and submit to Dr. Anelli

ENTOM 2400 “Scientific Literacy in Contemporary Society”

GROUP NAME _____

We, the undersigned, have together devised and agreed to the following initial plan for working on the assignment (include initial deadline(s) for work to be shared via Google docs).

Plan:

Each of us also agrees to do the following:

1. Attend group meetings (virtually or in-person)
2. Maintain contact w/group members
3. Communicate constructively to group discussion & answers
4. Be cooperative and understanding
5. Take a leadership role as needed
6. Encourage and assist my team members
7. Complete all tasks agreed upon by the group in a timely manner
8. Contribute intellectually to the best of my ability
9. Complete my fair share of the workload
10. Read, comment on, and edit drafts of our *entire document* in a timely manner
11. Notice and work to curtail whatever tendencies I may sometimes exhibit that others may perceive as uncooperative

If any one of us causes difficulty with the group, and/or breaks the contract in any way, we understand that the other team members have the right and are expected to contact Dr. Anelli and inform her of the situation. We further understand that Dr. Anelli will serve as arbiter and may decide to penalize the teammate in question by lowering his/her grade in accord with the situation, or making the teammate complete the assignment alone.

Signed,

Dissension Instructions for Midterm Exam Answer ENTOM 2400

If you disagree with an answer provided by your group, you must register via Carmen your dissent BEFORE the group posts its final answers.

If you disagree with your group's answer and you provide the CORRECT ANSWER, you will earn the appropriate points (and your group will not earn those points).

If you disagree with your group's answer and the answer you provide is INCORRECT, you will lose points according to your answer (i.e., the group's answer will not count in your favor).

How to dissent: State the question to which you would like to dissent, provide your dissent with a brief justification for your alternate answer. Post your dissent to the upload folder in Carmen with your last name and the word "DISSENT" in the file name. If more than two of you decide to dissent and wish to provide the same answer, you may post one dissention document, but you must indicate to Dr. Anelli the names of the students dissenting in the document itself. If it is unclear to which answer you are dissenting, or why you are dissenting, or who is dissenting, you will not earn points for your answer. *Thanks for adhering to these guidelines!*

Peer Assessment Form for Group Take-Home Exam & Final Case Study

Team name _____

Student being assessed: _____

Student making the assessment: _____

For each aspect, rate the student on a scale from 1-3 using the following guide:

1: did this very well **2:** did this adequately **3:** did this less than adequately/poorly

General Aspect	Specific Aspect	Comment	Rating
Group Process	Attended majority of group meetings (virtual or in-person)		
	Maintained contact with other group members		
	Communicated constructively to discussion/answers		
	Generally was cooperative		
	Took a leadership role as needed		
	Encouraged and assisted other group members		
The Exam/Case Study (which consists of "tasks")	Made a genuine attempt to complete all tasks agreed upon by group		
	Made an intellectual contribution to the completion of task(s)		
	Did (at least) his/her fair share of the work		
	Read and commented in a timely manner on drafts		
	Contributed a significant amount (measured in ideas, words, behavior)		
Overall	Based on your ratings & comments, summarize teammate's overall contribution		
As Teammate	Would you like to work with this person again? Please answer and explain <i>briefly</i> . Use back of sheet only if needed.		

Adapted from: Issacs, G. (2002) Assessing Group Tasks. Teaching and Educational Development Institute. Queensland, Australia.

Self-Assessment for Group Take-Home Exam & Final Case Study

Team name _____

My name: _____

For each aspect, rate yourself on a scale from 1 to 3 using the following guide:

1: I did this very well **2:** I did this adequately **3:** I did this less than adequately/poorly

General Aspect	Specific Aspect	Comment	Rating
Group Process	I attended majority of group meetings (virtual or in-person)		
	I maintained contact with group members		
	I communicated constructively to discussion/answers		
	I generally was cooperative		
	I took a leadership role as needed		
	I encouraged and assisted other group members		
The Exam/Case Study (which consists of "tasks")	I made a genuine attempt to complete all tasks agreed upon by our group		
	I made an intellectual contribution to the completion of task(s)		
	I did (at least) my fair share of the work		
	I read and commented in a timely manner on drafts of the exam answers		
	I contributed a significant amount (measured in ideas, words, behavior)		
Overall	Based on my ratings & comments, I summarize my overall contribution as...		
Tell Dr. Anelli any positive things about this experience			
Tell Dr. Anelli any negative things & how to improve them			

Adapted from: Issacs, G. (2002) Assessing Group Tasks. Teaching and Educational Development Institute. Queensland, Australia.

Ohio State Department Course Review Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should respond to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: Entomology Department (CFAES)

Date: 6.30.2014

Registrar's Listing: ENTMLGY

Course Number: 2400 Level: U P G

Credit Hours: 3

Course Title: Scientific Literacy in Contemporary Society (proposed title)

Type of Request: New Course Group Studies Workshop Study Tour Course Change

Academic Unit with related interests asked to review the request (use a separate form for each unit while requesting concurrences from multiple units):

Date responses are needed: 8 Jul 2014 to Dr. Carol Anelli (anelli.7) 292-9325

B. Information from academic units *reviewing* the request:

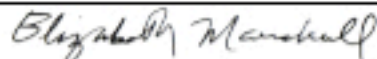
EEOB

College of Arts & Sciences

- The academic unit *supports* the proposal
 The academic unit *does not support* the proposal.

Please explain:

The academic unit suggests:



Signature of Department Chair

Signature of Graduate Studies Chair (if applicable)

Ohio State Department Course Review Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should respond to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: Entomology Department (CFAES)

Date: 6.30.2014

Registrar's Listing: ENTMLGY

Course Number: 2400H Level: U P G

Credit Hours: 3

Course Title: Scientific Literacy in Contemporary Society (proposed title) *

Type of Request: New Course Group Studies Workshop Study Tour Course Change

Academic Unit with related interests asked to review the request (use a separate form for each unit while requesting concurrences from multiple units):

Date responses are needed: 26 Sept 2014 to Dr. Carol Anelli (anelli.7) 292-9325

B. Information from academic units *reviewing* the request:

Center for Life Sciences Education

- The academic unit *supports* the proposal
 The academic unit *does not support* the proposal.

Please explain:

Given the flexibility of the case studies approach, whoever is teaching this course should choose cases to ensure coverage of most of the core concepts of biology.

- The academic unit suggests:

**Revising the title to be less broad, perhaps "Evaluating Scientific Evidence in Biology and Medicine"*

Caroline Brenten
Signature of Department Chair

Signature of Graduate Studies Chair (if applicable)