SYLLABUS

ECOL 8000   Fall 2009
Ecological Thought: Past to Present
Credit: 3 hours
Instructor: Alan Covich
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Thursdays: 2:00 to 5:00 PM
Ecology Conference Room 12
First Meeting: August 27, 2009

OBJECTIVES

1. Review major lines of ecological development, from past to present
2. Gain exposure to concepts and methods in ecological sub-disciplines
3. Acquire experience in team-generated scientific communication

Background Reading
[Amazon.com is a source of used copies, or ask last year’s grad students?]

COURSE ELEMENTS

1. Readings and Discussion. These discussions will be organized into topics reflecting major lines of thought in the development of ecology as a science. Early papers and recent papers will be reviewed each week. A team of two students will prepare summary handouts and lead the discussion. Teams will make selections from: i) Early “classic” papers, taken from Real & Brown (1991); and ii) recent papers (post 2000) that are of special interest to the research areas among enrolled students.

2. Research Proposal. Each student will prepare an introduction and literature review on a research topic that would be suitable for possible submission to the National Science Foundation’s Doctoral Dissertation Improvement Grants (DDIG) Program. This preparation is intended to help students organize their plans for beginning their own research. This proposal is due October 1. Further experience in proposal writing will continue in another core course (Concepts and Approaches to Ecosystem Ecology, ECOL 8322).

3. Term Paper. Each student will follow up with a more in-depth analysis of a specific research topic that further develops a conceptual basis for a possible doctoral research project. This term paper is due December 3 and is limited to 10 pages including references cited.
SUGGESTED TEMPLATE FOR SUMMARIES

Purpose: The primary purpose of the weekly summaries is to help initiate discussion. Briefly highlight the main points from the article and discuss the general context and significance. Graphs, photos or diagrams are encouraged. Maximum length: two pages

I. Major themes covered.

II. Stated purpose(s) or goals of the article. What questions were asked, what hypotheses were tested?

III. Significance in the historical development of the theme or topic.

IV. New contributions to the line of thought, and suggestions for new research directions.

V. Evaluation: How well did the article fulfill its stated goals? How clearly was the main message of the article presented? Did you learn something significant about the field from this article? Who cited this paper? Would you cite this article in your research? What is the author’s background? Are there any biases? How were the ideas and results illustrated?

VI. Questions for the class: List 3 or 4 questions to start the group discussion.

A listserv will be established for Ecology 8000 to distribute PDFs of recent papers and your discussion summaries. If you would like to send a message to fellow class members and the instructors, use the address shown below. You may attach files to these emails for distributing PDF’s of papers or topic summaries to the class.

ECOL8000@listserv.uga.edu.

ASSIGNMENTS:

1. Research proposal due date: October 1

2. November 12: Write a concise (3 to 5 pages) review of the three recent journal papers that you found most interesting from your research perspective.

3. Term paper due date: December 3, 2009

1. Where did Ecology originate?

Ecology is usually considered a relatively new science, having only become prominent in the second half of the 20th Century. Ecology gained wide public prominence in the 1960s due to widespread concern for the state of the environment. Many people first encountered ecological ideas in reading *Silent Spring* by Rachel Carson, published in 1962. However, ecological thinking has been around for a long time. The principles of ecology developed gradually, closely intertwined with the development of other biological and geological disciplines.

The early Greeks were likely the first “ecologists - naturalists.” Aristotle and his student, Theophrastus, had interests in studies of plants and animals. Theophrastus described interrelationships among organisms and among organisms and their environment as early as the 4th century BC. The Chinese also had detailed knowledge of the natural world and wrote early studies of natural history and landscape-level dynamics. Modern ecology emerged as a distinct discipline at the turn of the 20th Century. The first professional organization, the Ecological Society of America, was formed in 1915.

The role of natural history in the historical development of ecology is well documented. Today, the significance of descriptive natural history is that these early studies formed the basis for modern ecological lines of thought. Natural history still has a great appeal for many people and professional ecologists are often drawn to the science of ecology by this biophilia. These early studies form the basis for modern ecology: both empirical and theoretical research begins with careful observation of ecological communities.

Early studies in natural history began with an “anecdotal stage” and then led to systematic natural history. The characteristics are:

- attention to detail
- precision of recording
- recognition and manipulation of influences
- awareness of others' observations

Some “classic” examples:

Aristotle (384-322 BC) recognized *four causes* (like "dynamical systems") to provide a formal classification that considered the “environment”:

- *Causa efficiens* (efficient) — energy or motive force
- *Causa materialis* (material) — matter or substance
- *Causa formalis* (formal) — plan or blueprint
- *Causa finalis* (final) — goal or purpose

Theophrastus (372-287 BC) may have been the first ecologist-naturalist. As a botanist and successor to Aristotle, he was the head of Lyceum. He distinguished...
different kinds of plants, plant propensities and tolerances, different kinds of habitats, plant associations with habitats, and the significance of climate and soil.

René Antoine Ferchault de Réaumur (French, 1683-1757) was a scientist, philosopher, and mathematician. His major work: Mémoires pour servir à l'Histoire des Insectes (1734-1742; 6 volumes, 267 plates).

The goal of Charles Darwin's voyage of the Beagle beginning in 1835 was to collect new forms of life and provide a natural history of these organisms and their biogeography. Darwin did some “experiments” as well as make careful observations that later led to his theory of natural selection in 1859. Alfred Russell Wallace and Alexander von Humboldt were other naturalists involved in collecting organisms in the context biogeography.

2. Who originated the term “ecology”?

There is some difference of opinion about the first use of this new word. Some historians note that Henry David Thoreau used the term “ecology” in a letter written in 1858 regarding plant biogeography, while others indicate he really meant “geology.”

Haans Reiter, a German biologist, was the first to combine the Greek term οικός (household) and λόγος (study) to form the term "ecology" in 1865. How are these same Greek roots (οικος and λόγος) used to define economics?

Ernst Heinrich Philipp August Haeckel (February 16, 1834 - August 9, 1919), another German biologist, is thought to be the first to define "ecology" in 1866 (or 1873) in biological terms. Haeckel’s defined ecology as the science of relations between organisms and their environment.

Haeckel was an eminent naturalist, philosopher, physician, professor and artist who discovered, described and named thousands of new species, mapped a genealogical tree relating all life forms, and coined many terms in biology, including phylum, phylogeny and the kingdom Protista as well as ecology. Haeckel promoted and popularized Charles Darwin’s work in Germany and developed the controversial recapitulation theory ("ontogeny recapitulates phylogeny") claiming that an individual organism's biological development, or ontogeny, parallels and summarizes its species' entire evolutionary development, or phylogeny.

The published artwork of Haeckel includes over 100 detailed, multi-colour illustrations of animals and sea creatures (see: Kunstformen der Natur, "Artforms of Nature"). As a philosopher, Ernst Haeckel wrote Die Welträthsel (1895-1899, in English, The Riddle of the Universe, 1901), the genesis for the term "world riddle" (Welträthsel); and Freedom in Science and Teaching to support teaching evolution. Haeckel was a free-thinker who went beyond biology, dabbling in
anthropology, psychology, and cosmology. Haeckel's speculative ideas and possible fudging of data, plus lack of empirical support for many of his ideas, tarnished his scientific credentials. However, he remained an immensely popular figure in Germany and was considered a hero by his countrymen.

In the United States, Mount Haeckel, a 13,418 ft (4,090 m) summit in the Eastern Sierra Nevada, overlooking the Evolution Basin, is named in his honor, as is another Mount Haeckel, a 2,941 m (9,650 ft) summit in New Zealand.

3. Discussion Questions

What connections do you see between natural history observations and your ideas on the subject matter of modern ecology?

How useful is a natural history background for building an understanding of the roots of modern ecology? For your own studies of ecology?

Do you think modern practitioners of natural history observations are contributing to ecology today?

Where is natural history published today? in scientific journals?

How important is quantification of observations in the practice of science?

Do you think qualitative natural history descriptions qualify as scientific data?

Who are the major contributors to early ecological thinking?

How many individuals have you read about in your previous courses?

Can you put them in a temporal sequence?

4. Examples of time lines in publishing some big ideas in ecology

Franklin, B. 1755. Observations concerning the increase of mankind. Peopling of countries. S. Kneeland, Boston, MA


Thoreau, H.D. 1854. Walden, or Life in the woods. Ticknor and Fields, Boston, MA.


Elton, C.S. 1924. Periodic fluctuations in the numbers of animals: Their causes and effects.


Lokta, A.J. 1925. Elements of physical biology. Williams and Wilkins, Baltimore, MD


WEEK 2: SEPTEMBER 3. EARLY IDEAS STILL DEVELOPING TODAY

1. Recent Papers on the Development of Big Ideas in Ecology


**WEEK 3: SEPTEMBER 10. POPULATION ECOLOGY- MODELS**

**1. Early Papers on Population Growth (select two)**


**2. More Recent Papers (select two or suggest others)**


WEEK 4: SEPTEMBER 17.  POPULATION ECOLOGY - THE NICHE

1. Early Papers on defining the niche (select two)


2. Recent Papers on use of the niche concept (select two or suggest others)


WEEK 5: SEPTEMBER 24. POPULATIONS GROWTH - SPECIES INTERACTIONS

1. Early Papers on Population Regulation- Competition and Predation


2. More Recent Papers (select two or suggest others)


WEEK 6: SEPTEMBER 25. POPULATIONS – COMPLEX LIFE HISTORIES

1. Early Papers on Population Regulation


2. More Recent Papers (select two or suggest others)

