GeoSci 692G: EVOLUTION GEOGRAPHY SYLLABUS

(7TH Draft, Dec.23) for Spring 2010 Seminar: (Schedule number: 58221)
Lynn Margulis (LM) **and Richard Wilkie** (RW)
Tuesdays: 2:30 to 5pm 3 credits, Size: 14, Seminar room: Morrill 3: room 215

Evolution Geography, a new course develops a conceptual framework for studying evolution within the context of interconnected Earth physical systems and life, including humans, and the processes that have changed them as they relate to geography. Not a course about competition, neoDarwinian population genetics and differential survival, rather we look more at the role of ecological relationships, including symbioses at the level of communities. Communities evolve through an interdependence of a functioning set of systems that all require a continuous flux of matter and energy. In the case of humans, our diffusion over the Earth's surface is correlated with innovation, technology and change. All geographical Earth systems, including those of organisms embedded in their environment, involve interplay of components that lead to change on both physical and human cultural landscapes, some with catastrophic consequences for certain species.

PART I: OVERVIEW

1. Jan. 19: Course Overview: Defining a New Field of Study: Concepts & Approaches

The challenge and an overview of teaching 'Evolution Geography'

--This is a class to get to know each other & what are our expectations of the students. We begin with two brief examples of that describe global forces of change across physical and human systems:

RW briefly looks at how the field of geography has studied change through time in the context of regions, places and global systems. An early example was by Alexander von Humboldt in the late 1700s and early 1800s to understand how the Earth's physical systems interconnect at different latitudes and elevations and how they related to human settlement realms. (15 min.)

LM discusses Christian Ehrenberg a young colleague of the geographer and naturalist Alexander von Humboldt who recommended that he travel on a scientific expedition to the mid-east (1820-1825). Ehrenberg collected thousands of specimens of plants, animals and other beings. He detailed "phytozoa," coral marine organisms. Later, Ehrenberg concentrated his studies on microscopic organisms in general, which until then had not been systematically studied by science. In a period of nearly 30 years Ehrenberg examined samples of water, soil, sediment, rock - virtually whatever material might contain living or fossil microscopic organisms - and described thousands of new species, and hundreds of new genera. As the result of this enormous work, Ehrenberg laid the foundation for today's fields of micropaleontology, protistology, botany, phycology (algology), "the everywhereness of life." (30 min.)

RW also provides an example from his Historical Atlas of Massachusetts of how the New England climatic and physical setting related to human settlement and socio-economic development through time. (15 min.)

LM hands out initial readings and assignment for week 2

2. Jan. 26: Earth History, Paleobiology & Geological Time Scale (LM)

"Deep Time" -- gaia theory, paleontology, preCambrian, paleobiology, geochemistry
Mike Williams will give the class a 30-40 minute presentation covering the history of geological time and prior Earth geographies, shifting of continents, etc.]

RW hands out his initial readings and assignment for week 3

3. Feb. 2: Human Systems Models (RW)

On the international geological Earth history time scale, modern humans arrived in the last several minutes of Dec. 31st, but their impact on the environment has become a major concern.

RW will cover:
The 'Journey of Man' –tracing genetic studies of population movement around the globe
The 'Demographic Transition' – forces that have led to the rise of human populations
History of the rise of human populations globally, by latitude, by ecological region

LM & RW hand out readings & assignment for week 4

4. Feb. 9: Current Look at Earth Systems with regard to Human Systems: More on Gaia Theory and other holistic studies of the processes of change that cut across disciplinary lines:
LM: -Biosphere and evolution of its embedded life
-Biotic potential (exponential growth, heredity variation and natural selection)
-RW: Physical Elements Diagram of current Earth system relationships, including the impact of human populations on biomes and species by latitude and biographical regions
-A discussion of 'structure, structure of change, and process of change' and other paradigm approaches; quantitative vs. qualitative issues in geography, the sciences and humanities

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Feb. 16: holiday (no class) **-- [but initial bibliographies submitted by Friday, Feb. 19]**

PART II: CASE STUDIES: *Natural Selection, Ecological Succession, Symbioses and Human Development: Change in Selected Communities:*

LM: Microbial mat xylophagous insect cellulose degradation communities (physical)
RW: (1) A deeper look at Alexander von Humboldt, who bridged both physical and human studies, and (2) a case study tracing changes over two centuries in a community of Argentine Volga-German immigrants living in a prairie grassland environment (human).

5. Feb. 23: LM Physical Session One: Energy, matter and electron flow (gradients in natural communities, Archean eon—to present example (coastal microbial mats)

6. March 2: RW Human Session One: Alexander von Humboldt
A session on von Humboldt's systematic attempts to scientifically look at Earth global systems of climate, vegetation, and volcanic forces at different latitudes and elevations and their relationships with human settlements and agricultural systems.
As Charles Darwin stated: *"He was the greatest travelling scientist who ever lived…. I have always admired him; now I worship him."*

7. March 9: LM Physical Session Two: Bacteria as units of life: Sediment as "traces of bygone ecospheres:" VI Vernadsky, JE Lovelock, Ian McHarg

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Spring Vacation (March 12-21)

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8. March 23: RW Human Session Two: A Volga-Deutsch community in Entre Rios, Argentina
RW's case study of Volga-German migrants over 250 years: from leaving southern Germany in the 1760s after Catherine the Great (of German ancestry) decreed new land for Germans in the Volga River region of Russia around Saratov—to migration to Argentina, the U.S. and elsewhere after the 1870s Czarist reforms forced them to migrate once again. RW has studied the history of families in the Argentine Volga-Deutsch village of Aldea San Francisco (Entre Rios Province) since it was founded in 1878, and his in-depth studies of behavioral decision-making by villagers and out-migrants began in 1966. Several key variables that surfaced from within the study centered on how child-rearing practices and the age of child environmental exploration strongly influenced environmental attitudes and behavior of villagers as they grew older, especially in regard to two important variables: "trust versus fear" of the natural environment and "use and dominate" the environment versus "preserve and protect" the environment. Attitudes and values about nature and the environment among villagers vary by age in the live-cycle, gender, social class position and parental relationships and balance of power in the home. They also play a role in influencing the kinds of places in which migrants ultimately are successful, especially with regard to the sizes and rural to urban complexities of places were out-migrants live or hope to live.

9. March 30: FIELD TRIP I: Harvard Forest (Petersham, MA) **or Wilkie's Land** (South Amherst)

PART III: STUDENT REPORTS (3 or 4 a day)

10. April 6: Student Presentations
11. April 13: Student Presentations
12. April 20: Student Presentations

13. April 27: FIELD TRIP II: Catamount Mountain, Colrain

14. May 4: Course Conclusion:

STUDENT PROJECTS AND ASSIGNMENTS

Each student chooses an example of a community with spatial and temporal continuity. Each will report on the identity, natural historical continuity, preservation potential, geographical growth, distribution and spread, and other aspects of his/her choice that can be located in space and time.

FOR STUDENTS WHO SELECT A PHYSICAL TOPIC:

Examples from Archean through Phanerozoic (including extant) eon communities include:

1. Iron-manganese lacustrine nodule communities
2. Oolitic microbial communities in tropical carbonate rich landscapes
3. Desert varnish fungal-bacterial associations
4. Desert crust (terrestrial microbial mats)
5. *Rangifera* arctic mammalian-lichen intestinal communities of reindeer
6. Xylophagic insects (wood-eating roach, termites, sow-bugs)
7. Sub-photic zone coral reef communities: sources of energy and food?
8. Ocean-planktobenthic foraminifera, or coccolithophorid communities
9. Environmental change: dormancy and resistant stages, especially spores, cysts, seeds, tardigrades (water bears) tuns

FOR STUDENTS WHO SELECT A HUMAN GEOGRAPHY TOPIC:

One option is to study one of the broader geographical themes outlined in sessions one through four, such as:

- Earth temperature and biotic changes through time
- Human evolution and global migration issues
- Discussing organized human systems such as economic, cultural, geopolitical, beliefs/religions, energy exploitation and use (eg., petroleum), etc., as they relate to how humans view Earth space
- Population densities/resource pressures in various ecological regions

A second option is to select a community study from either the list that is provided or one that you choose and defend by showing key references. Writers such as Wallace Stegner, Barry Lopez, Aldo Leopold, Peter Hoeg and Raymond Williams (and others) have struggled with many of the important issues discussed in the course using more humanistic approaches, so readings along these lines may be substituted with permission.

GRADING

1.	Initial annotated bibliography and refinement (submitted with final paper)	**10**
2.	One class presentation (15 minutes)	**30**
3.	Final presentation (5 min.)	**10**
4.	Final paper (10 pages)	**40**
5.	Attendance, participation (field trip 1 page report)	**10**

total: 100