Syllabus: Biology 301M Ecology, Evolution, and Society - Spring 2020

This constitutes a contract between each student, Prof. Pianka, and UT

Designed for non-science majors. Introduction to environmental adaptations, diversity of organisms, species interactions, organization and processes of communities, population growth and limitations, evolution and population genetics, origin of life, and human impact on the environment.

Three lecture hours and one discussion hour a week for one semester.

May not be counted toward a degree in biology.

NATURAL SCIENCE & TECHNOLOGY PART I (Core Component 030)
This course may be used to fulfill three hours of the natural science and technology (Part I or Part II) component of the university core curriculum and addresses the following four core objectives established by the Texas Higher Education Coordinating Board: communication skills, critical thinking skills, teamwork, and empirical and quantitative skills.

BIO 301M is part of UT's Core Curriculum, and accordingly, this course meets standards and objectives of the Texas Higher Education Coordinating Board for Natural Science and Technology. These include the following four areas:

1. Communication Skills: effective development, interpretation and expression of ideas through written, oral and visual communication.

2. Critical Thinking Skills: creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.

3. Teamwork: ability to consider different points of view and to work effectively with others to support a shared purpose or goal.

4. Empirical and Quantitative Skills: manipulation and analysis of numerical data or observable facts resulting in informed conclusions.

Familiarize yourself with campus safety: https://preparedness.utexas.edu/safety/emergency-terms

Professor (Lectures): Eric R. Pianka, erp@austin.utexas.edu,
Office: Patterson 125, Mon. 1-2 PM, Fri. 1-2 PM, (471-7472) or by appointment

Lectures: Tuesday and Thursday, 11-1230 PM (Welch 2.122)
This course assumes knowledge of High School algebra, geometry, and genetics. You will be expected to be able to understand 3-dimensional graphs and be able to manipulate simple equations.

Discussion Sections (Note: will cover 24 assigned readings as listed on class web page)

Teaching Assistants (Discussion Sections):

David Ledesma Ledesma@utexas.edu, AM Discussion Sections
Office: Patterson 122 (or make appointment by email).

Wednesday 8-9 AM RLP 0.122
Wednesday 9-10 AM RLP 0.122
Wednesday 10-11 AM GDC 2.502
Wednesday 11-12 AM GDC 2.502

Kyle Wilhite kwilhite@utexas.edu, PM Discussion Sections
Office: Patterson 113 -- make appointment by email.

Wednesday 1-2 PM GEA 127
Wednesday 2-3 PM GEA 127
Wednesday 3-4 PM RLM 5.126
Wednesday 4-5 PM RLM 5.126

Philosophy:

We will attempt to teach you the basic ecology and evolution that everyone should know to become better informed citizens of this, our one and only planet, Spaceship Earth -- we will also do our utmost to encourage you to ***think***. Here are links to some of the things we'll cover in discussion sections: You are expected to read all 24 of these. The first eight will be covered on the first exam, the second eight on the second exam and the remaining eight will be covered on the third exam. All 24 will be included on the final exam. Please read "Scientific Methods" as soon as you can, as we will cover this in the first discussion and in the second lecture.

Text:

Pianka, E. R. 2000. Evolutionary ecology, 6th edition. Addison Wesley Longman. Also Available as an eBook 7th ed. Can also be read on line at class webpage

Exams:

Thursday, 20 February

Thursday, 2 April

Thursday, 7 May

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Final Exam:, **Wednesday, May 13, 2-5 pm** 40%

Grading.

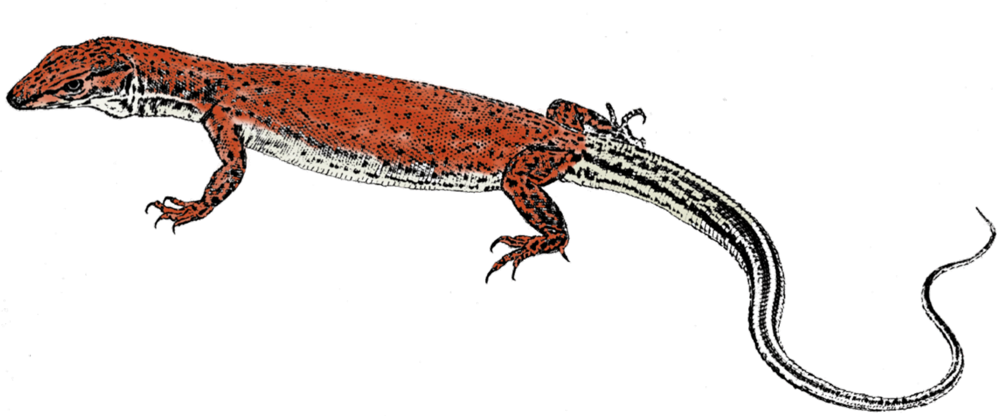
Each hour exam covers one-third of the class. Everyone must take at least two of the three hour exams plus the comprehensive final exam. Performance on problems, essays, and assigned readings in discussion sections makes up the remaining 20% of your letter grade.

Best 2 of the above 3 hour exams will count 20% each (40% total), your performance on problems and essays assigned in discussion sections will count for an additional 20%. The comprehensive final exam makes up the other 40% of your letter grade. These four exams and your performance in discussion sections are your only opportunities to earn your letter grade. UT's "new" plus/minus grading system will be employed. No "extra" points are available. Your lowest hour exam will be dropped, so you can miss ONE exam (for which you'll be scored a zero). You will be expected to "know" everything the instructors say in lecture and discussion sections, including pauses and nuances, as well as everything assigned in reading assignments. Exams will be in multiple choice format. Each hour exam will cover about one-third of the class. Everyone must take at least two of the three hour exams plus the comprehensive 3 hour final exam. **No "Make Up" exams will be given.** Final Grades are **final**, carved in stone, and non-negotiable (please don't even bother to question them!). They are a measure of your own phenotype, and not our responsibility. We expect you to accept your own performance as an integral part of yourself. You have five and only **five** chances to earn your letter grade, listed above. Everyone gets one free make-up exam (the one that's dropped).

This class uses the Lectures Online recording system. This system records the audio and video material presented in class for you to review after class. Links for the recordings will appear in the Lectures Online tab on the Canvas page for this class. You will find this tab along the left side navigation in Canvas.

To review a recording, simply click on the Lectures Online navigation tab and follow the instructions presented to you on the page. You can learn more about how to use the Lectures Online system at http://sites.la.utexas.edu/lecturesonline/.

Please note that your professor decides when and for how long recordings will be available for you to review. You can find additional information about the lecture capture system at: http://sites.la.utexas.edu/lecturesonline/.



Biology 301M — Course Outline

Scaling and the hierarchical structure of biology, levels of approach in biology, domain of ecology, definitions and ground work; anthropocentrism, the importance of wild organisms in pristine natural environments, the urgency of basic ecological research; scientific methodology; models; multiple causality; limiting factors, tolerance limits, the principle of allocation; genetics, natural selection, self- replicating molecular assemblages; units of selection; levels of approach to science, speciation, phylogeny, classification and systematics.

Macroevolution, natural selection and adaptation, the species concept. Origin of life, prokaryotes and eukaryotes, introduction to the diversity of organisms. Domains, traits (and example organisms) of kingdoms [archaebacteria, eubacteria, protists, fungi, plants, animals]. Adaptations, structures, symbiotic relationships, including variations in life cycles

How organisms are classified and why; phylogenetic systematics. One major taxon will be examined in depth (Lizards); we will investigate classification, phylogeny, and biogeography. Evolution will be related to the history of earth (plate tectonics)

History and Biogeography

Self-replicating molecular assemblages, geological past, classical biogeography, continental drift

Meteorology

Major determinants of climate, local perturbations, variations in time and space, global weather modification

Climate and Vegetation
Plant life forms and biomes, microclimate, primary production and evapotranspiration, soil

formation and primary succession, ecotones, classification of natural communities, aquatic ecosystems

Physiological Ecology

Physiological optima and tolerance curves, energetics of metabolism and movement; energy budgets and the principle of allocation; adaptation and deterioration of environment; heat budgets and thermal ecology; water economy in desert organisms; other limiting materials; sensory capacties and environmental cues; adaptive suites and design constraints.

Principles of Population Ecology

Life tables and schedules of reproduction; net reproductive rate and reproductive value; stable age distribution; intrinsic rate of increase; evolution of reproductive tactics; avian clutch size; evolution of old age and death rates; population growth and regulation; Pearl-Verhulst logistic equation; density dependence and independence, fitness and the individual's status in the population; kin selection, reciprocal altruism, parent-offspring conflict, density dependence and independence;

r and *K* selection; population "cycles," cause and effect; use of space (vagility, home range, territoriality, foraging tactics); evolution of sex; sex ratio; mating systems; sexual selection

Interactions Between Populations

Complex examples of population interactions; indirect interactions; competition theory; competitive exclusion; balance between intraspecific and interspecific competition; evolutionary consequences of competition; laboratory experiments and evidence from nature; character displacement and limiting similarity; future prospects; Predation; predator-prey oscillations; "prudent" predation and optimal yield; theory of predation; functional and numerical responses; selected experiments and observations; evolutionary consequences of predation: predator escape tactics; aspect diversity and escape tactic diversity; coevolution; plant apparency theory; evolution of pollination mechanisms; symbiotic relationships, the human microbiome.

The Role of Phylogenetics in Ecology

Phylogenetic systematics, independent contrasts, the comparative method, evolutionary ecomorphology

Community Ecology

Classification of communities; interface between climate and vegetation; plant life forms and biomes; leaf tactics; succession; transition matrices; aquatic systems; macrodescriptors; compartmentation in communities (trophic levels, guild structure, and food webs); connectance; pyramids of numbers, biomass, and energy; energy flow and ecological energetics; secondary succession and transition matrices; community matrix; saturation with individuals and with species; species diversity; diversity of lowland rainforest trees; community stability; chaotic attractors; evolutionary convergence and ecological equivalents; evolution of communities; pseudo-communities. community organization; trophic levels and food webs; the community matrix; guild structure; primary productivity and evapotranspiration; pyramids of numbers, biomass, and energy; energy flow and ecological energetics; saturation with individuals and with species; species diversity; diversity of lowland rainforest trees; community stability; evolutionary convergence and ecological equivalents; ecotones, vegetational continuua, soil formation and primary succession; evolution of communities.

Island Biogeography and Conservation Biology

Classical biogeography; biogeographic “rules;" continental drift; island biogeography; species-area relationships; equilibrium theory; compression hypothesis; islands as ecological experiments: Krakatau, Galápagosfinches, Hawaiian Drosophilidae, other examples; metapopulations, conservation biology, human impacts on natural ecosystems, hot spots of biodiversity, applied biogeography and the design of nature preserves.