

**Evolutionary Patterns:**  
**Perspectives Across Biology, Material Science, and Communication Studies**

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What principles drive evolution? What does evolution mean for different subjects? Are the principles determinate, or can we escape and arrest them? What does this mean for humans and their past, present, and future?

In the first half of this course we will lay out principles of natural selection and entropy (disorder / randomness) in a broad conceptual fashion. We will then examine how these principles, and generated subordinate principles, manifest as real world empirical phenomena. Some phenomena to be examined will be animal mimicry, cooperativity and community among organisms, and technological evolution, particularly in materials.

In the second half of the course, we will apply these principles to human activity and civilization. Specifically, the evolution of language, culture, and technology, in addition to intersocietal and intrasocietal selection and entropy, will lead in the last quarter of the course to student led discussion of how the principles examined shape the empirical reality we live in, and how this knowledge going further can shape our choices, consciousness, constraints, and potentialities.

Note: While this course assumes the validity of evolutionary theory and natural selection, belief in evolution is not required. Students with religious or moral objection to evolutionary theory are not discouraged from enrollment; indeed their perspective is welcome. However, the class will be conducted assuming evolutionary theory is true, and while questioning those assumptions is welcome, outright disruption is not.

Course mission: Students will learn to apply theories from a variety of disciplines in novel ways, which will help them to become creative problem solvers in their future careers. (Continue writing to integrate w/others' ideas)

**Grading Criteria/Scale**

**Qualitative**

A = Superior (uniformly excellent in creativity, thoughtfulness, preparation)

B = Very Good (exceeds the expected level of competence / preparation)

C = OK / Satisfactory (fulfills requirements at an average level)

D = Needs improvement (falls short of average level of competence & preparation)

F = Fail / Unsatisfactory (fails to engage with components of the assignment / course)

**Quantitative**

A (92.5 – 100)      A - (89.5 – 92)

B+ (86.5 – 89.4)    B (82.5 – 86.4)      B- (79.5 – 82.4)

C+ (76.5 – 79.4)    C (72.5 – 76.4)      C- (69.5 – 72.4)

D+ (63.5 – 69.4)    D (59.5 – 63.4)

F (below 59.5)

**Grading will consist of the following:**

Attendance and Participation: 10%  
Short Paper 1: 10%  
Short Paper 2: 20%  
Short Paper 3: 20%  
Student Led Discussion: 20%  
Final Exam: 20%

**Attendance and Participation:**

You are expected to attend class, on time, having completed the assigned readings. Attendance will be taken at the start of every class meeting. You will be considered absent if you arrive at the class more than 5 minutes late. Due to the interdisciplinary structure of this course, it is imperative you come to every class. However, since perfect attendance is probably unlikely, you have three absences that you can use at your discretion. ANY ABSENCES BEYOND THREE WILL RESULT IN YOUR OVERALL GRADE DROPPING 1/3 OF A LETTER GRADE (i.e., if you had a B+ but had four absences, you would receive a B; five absences, a B-, etc.). If missing class is unavoidable for University approved reasons (see catalog), you should inform us of your probable absence PRIOR to the day you will be absent (and be able to provide appropriate documentation when you return to the course). E-mail is fine for letting us know you won't be able to attend, but an official excuse note will have to follow. This policy is not negotiable.

Your active participation in class is necessary for your success in this course. You are expected to share your reactions to course material, to bring up individual questions for clarification, to practice applying critical terms and concepts from this class to specific texts, and to be otherwise involved in class discussion. IT IS IMPORTANT TO NOTE THAT SIMPLY BEING PRESENT DOES NOT EQUAL A PERFECT PARTICIPATION GRADE. You will earn your grade based on your level of involvement in the class. While we hope you will be interested enough in the material to talk on your own, we will call on students if necessary. Although no quizzes are scheduled for this course, we reserve the right to give pop quizzes or additional assignments if we feel it necessary.

**Short Papers:**

Short papers will start with a choice of prompts, after which you will choose a prompt and write a 3-4 page response. We will look for a clear argumentative claim or thesis statement, data consisting of what you have read (inside or outside class and properly cited), and a summary conclusion. You are expected to make a claim or argument, NOT TO SUMMARIZE THE READINGS. Papers will be due on the course website (in word document form) BEFORE the class date they are due. Late assignments will lose 5% after deadline and every 24 hour period thereafter.

**Student Led Discussion:**

You will be responsible in the last three weeks to participate in a group and initiate class discussion based on a set of questions and a ten minute presentation you develop together. You can bring in anything relevant to the previous course readings and topics. The purpose of this exercise is for you to make connections from the course material to topics relevant to yourselves and the rest of the class, based on the broad theme of discussion for the week. If you would like suggested reading for your assigned class, we can discuss these with you.

**Final Exam:**

You will sit at the University designated exam time for a handwritten short answer exam. This will consist of choosing two of three given questions, and giving argued responses to those. The exam will be closed book.

**Other Things****Office Hours/ E-mail:**

Please take advantage of office hours to discuss anything of importance to you regarding this course. You may also contact us via e-mail. However, be aware that we will not discuss any specific grades or assignments over e-mail.

**Assignment Formatting:**

All submitted work should be typewritten in 12-point double spaced type with one-inch margins. Pages should be numbered and your name should be clearly visible on the assignment. Your assignments should be either stapled or fastened together with a paper clip. E-mail or hardcopy is acceptable.

**Honor Code:**

We expect you to adhere to the honor code on all assignments. Please include a signed pledge on every piece of work submitted. Any suspected plagiarism will be immediately referred to the Honor Court.

**Students with Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653.

[http://www.ncsu.edu/provost/offices/affirm\\_action/dss/](http://www.ncsu.edu/provost/offices/affirm_action/dss/) For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation ([http://www.ncsu.edu/policies/academic\\_affairs/courses\\_undergrad/REG02.20.1.php](http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.1.php)).

SYLLABUS MATERIAL SUBJECT TO CHANGE AT INSTRUCTOR'S DISCRETION

**Course Schedule:**

Week 1:

Syllabus condensed: Universal principles, their opponents, objects of contestation.

Hayley: [Science and Creationism: A View from the National Academy of Sciences, second edition](#) pages 14-36

Introduction to Darwin's *Origin of the Species*

Week 2:

Entropy:

Hanlin: thermodynamic entropy. A general introduction to the first and second law.

Ref: Atkin, physical chemistry part 1 chapter 1-3.

Chris: Entropy, Music, and Noise: *Noise: The Political Economy of Music* Chapter 1 and 2

Week 3:

Evolutionary principles: natural selection & the subordinate principles it generates (to be enumerated in future weeks)

Chris: Chapter 4 of Origin of the Species: Natural Selection. Basic Hegelian Synthesis?

Hayley: [Emerging model systems in eco-evo-devo: the environmentally responsive spadefoot toad](#). Ledon-Rettig, et al. *Evolution & Development*. 2011.

**Response 1 Due**

Week 4:

Examples of natural selection: both biological – social & technical selection & replication

Chris: How is technology selected? Intro to *Media, Technology, and Society*, Brian Winston.

Leakey, “Man the Noble Hunter?” from *The Origin of Humankind*,

Hanlin: Display material choice evolution: introduction to the evolution and mechanism of CRT, LCD, LED, electronic paper. And how they are related to everyday device like ipad, iphone, kindle.

Week 5:

Cooperativity, cost of complexity in evolution

Chris: Liberalism and politics. Selections from Hobbes, *Leviathan*, or appropriate reader

Hayley: The Superorganism by E. O. Wilson, Chapter 3, Sociogenesis

Week 6:

Novel adaptations: the power of natural selection to produce a diversity of adaptations to perform specific functions (plants & animals).

Chris: Andy Clark, *Natural Born Cyborgs*, selected chapter. From the *Atlantic*, “Is Google Making Us Stupid?”

Hanlin: Biomaterials – requirements for good biomaterials. Examples: cardiac stent; materials for hip replacement; materials for teeth replacement.

**Response 2 Due**

Week 7:

Mimicry – intro to communication (dyad to org), also biology & consumer products

Chris: Hebdige “Style as Intentional Communication, Bricolage” from *Subculture: The Meaning of Style*

Hayley: [http://www.ted.com/talks/lang/eng/janine\\_benyus\\_shares\\_nature\\_s\\_designs.html](http://www.ted.com/talks/lang/eng/janine_benyus_shares_nature_s_designs.html) (23 minutes) and [http://www.ted.com/talks/robert\\_full\\_on\\_engineering\\_and\\_evolution.html](http://www.ted.com/talks/robert_full_on_engineering_and_evolution.html) (20 minutes)

3rd quarter: Principles and humanity

Week 8:

Language and its bases –

Chris: Leakey, “The Language of Art, The Art of Language,” from *The Origin of Humankind*.

Hayley: [Human language as a culturally transmitted replicator](#). M. Pagel. *Nature reviews, Genetics*. 2009.

Week 9:

Human prehistory technique – evolution of technology & language

Chris: Megarty, "Tools and Culture" from *Society in Prehistory*, Ellul, "Techniques" in *The Technological Society*.

Hanlin: What are the energy source options? (Water, oil, wind, nuclear, sunlight, heat). For the upcoming energy crisis, what are the advantages and disadvantages?

### **Response 3 Due**

Week 10:

Selection between societies, evolution of "culture"

Chris – Earle and Johnson, Introduction to *The Evolution of Human Societies*; Slack and Wise: "Articulation" and "Assemblage" from *Culture and Technology*

Hayley: From *Coevolution*, "Cultural mediation: The evolution of adult lactose absorption" or "The taboo against incest"; chimps? Jane Goodall? Violations of Hardy Weinberg?

Week 11:

Selection criterion for behavior within society – apply earlier principles of cooperativity & communication to individual decision making; feedback between individual behavior & societal culture

Chris: Weber, "The Spirit of Capitalism and the Protestant Work Ethic," and/or Lynn, "The Breakdown of Natural Selection," from *Dysgenics*

Hanlin: Solar Cell: Solid Silicon cell, DSSC, polymer solar cell. Ref. Selected paper from Gratzel and Nathan Lewis.

Last quarter: These principles in present

Week 12:

Where we are now: 21st century America – current topics as examples: global warming, media tech.

Chris: Rose, intro to *The Politics of Life Itself*,

Hanlin: Modern imaging system. Principles for optical lens, XRD, SEM, TEM, AFM, MRI, PET.

Week 13:

Student led discussion: Our choices: intended and unintended consequences: Sex and Death....

Week 14:

Student led discussion: Self consciousness: can we escape the forces that created us.

Neoevolution – Human agency driven...Cryostorage, Designer Babies

Week 15:

Student led discussion: Summary: constraints and potentialities