Evolution Course At-A-Glance:

Week	Major Topic(s)	Key Questions	Readings	Events & Assignments	In-class activities and objectives:	Comp Lab?
01	**The Origin of Evolution**	1. What were the earliest theories explaining evolutionary patterns? 2. Who were the prominent scientists who contributed to early evolutionary theory? 3. What led Darwin and Wallace to their theory of natural selection?	**Zimmer** Chapters 1 & 2		***Group Activity:*** Why were Darwin's ideas revolutionary? • Understand Darwin's ideas in the context of his time. • Explain how the positing of a feasible hypothesis sets up the potential for science. • Describe the ways that Darwin's ideas are still challenging to contemporary ideas.	***NO***
02	**Genes, Traits, & Evolutionary Change**	1. What is the genetic basis for traits? 2. Why is heritability a prerequisite for evolution? 3. What are the different patterns inheritance can take? 4. What is the role of mutation in evolutionary processes?	**Zimmer** Chapter 5		***Individual Activity:*** Discovering the genetic basis of traits • Choose an organismal trait whose genetic basis is of interest. • Using internet and/or library research resources, find scientific evidence for the genetic basis of this trait. • Share your find with your classmates, identifying the nature of this evidence and what it says about the genetic basis of this trait. • Identify whether the evidence found by your classmates is reported in the primary, secondary, or tertiary literature.	***YES***
03	**The Fossil Record**	1. How does geological knowledge contribute to our understanding of evolution? 2. How are fossils used to reconstruct evolutionary histories? 3. What were some of the major evolutionary innovations of early life? 4. What are "fossil intermediates" and why are they important?	**Zimmer** Chapter 3		***Group Activity:*** Homology, Analogy, and/or Homoplasy? • For a variety of paired species, identify a similar trait. • Decide whether this shared trait represents homology, analogy, and/or homoplasy. • Use evidence to explain why this similar trait does or does not represent homology, analogy, and homoplasy.	***NO***

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04	**The Tree of Life 1**	1. What are some ways that life might have gotten started? 2. What is a phylogenetic tree? 3. How do we classify extant organisms based on their evolutionary history? 4. How do changes in genes lead to evolutionary diversification?	**Zimmer** Chapter 4 & p. 194-198		***Individual Activity:*** Flowers and Trees • Explore the basic characteristics and properties of phylogenetic trees. • Discover some common misconceptions about and misinterpretations of phylogenetic trees. • Construct a phylogeny based variation in the traits of extant species.	***YES***
05	**Natural Selection & Adaptation**	1. What is genetic drift and how does it cause evolutionary change? 2. What is natural selection? 3. How does natural selection produce adaptation? 4. Why is genetic diversity needed in order for evolution to occur? 5. How are behaviors adaptive?	**Zimmer** Chapter 6 & p. 185-194 & 327-347		***Individual Activity:*** Drift in Design • Identify ideas about how genetic drift works embedded in an animated video short. • Explain how various "design elements" have been used to communicate these ideas to the viewer. ***Group Activity:*** Putting adaptations to the test • Describe the important features of a trait that might make it adaptive, explicitly explaining how that trait might increase the probability of surviving and reproducing. • Come up with up with a hypothesis as to how this trait evolved by telling an "evolutionary story". • Devise a plan to test this hypothesis using an experiment, a comparative study, or some other scientific means.	***NO***

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06	**The Tree of Life 2**	1. How is DNA evidence used to construct phylogenetic trees and differentiate species? 2. How does horizontal gene transfer complicate our understanding of evolutionary trees? 3. What is evolutionary convergence?	**Zimmer** Chapter 7 & p. 198-209		***Individual Activity:*** Flowers and Trees (continued) • Explore the basic characteristics and properties of phylogenetic trees. • Discover some common misconceptions about and misinterpretations of phylogenetic trees. • Construct a phylogeny based variation in the traits of extant species.	***YES***
07	**Sex & Reproduction**	1. Why do some organisms reproduce sexually? 2. How is sexual selection different from other forms of natural selection? 3. What roles do conflict and cooperation play in reproduction?	**Zimmer** Chapter 9			***NO***
08	**Term Project Proposal** Presentations <u>in class</u>				*n/a*	***NO***

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09	**Speciation**	1. What is a species?
		2. How do we identify different species?
		3. What is the evolutionary process that generates new species?
		4. What drives the patterns of species diversity that we observe across the earth's ecosystems?
			Zimmer Chapter 10		***Group Activity:*** Depicting mechanisms of speciation
					• Discuss how your assigned mechanism of speciation (allopatry, ring speciation, or sympatry) can produce distinct species.
					• Represent your assigned mechanism as a concept map that includes:
					  • The sequence of events that leads to speciation;
					  • A clear definition of the factor(s) that allow speciation to occur;
					  • An explanation of how pre- and post-zygotic reproductive barriers evolve; and
					  • Examples of species that have emerged by your assigned mechanism.
					• Share your concept map with your classmates.
						YES

10	**Macroevolution**	1. Why do extinctions occur? How common is extinction? 2. What causes evolutionary radiations? 3. What are "mass extinctions" and how have they influenced the evolutionary history of the earth? 4. How does the current rate of extinction compare with the past?	**Zimmer** Chapter 11		***Group Activity:*** Do we need to prevent a human-caused mass extinction event? • Consider the question "Do we need to prevent a human-caused mass extinction event?". • Based on the position assigned to your group, devise a series of arguments to support your position. • Identify which of your arguments are scientific and which are normative.	***NO***

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11	**Coevolution**	1. What is coevolution? 2. What is the connection between symbiosis and coevolution? 3. What ecological interactions produce coevolution? 4. How do we find evidence for coevolution? 5. How does artificial selection differ from natural selection?	‣ **Zimmer** Chapter 12 ‣ One CHOICE video		***Group Activity:*** What kind of coevolution? • To identify the type of coevolutionary relationship maintained by a pair of species by assessing the net cost or benefit of the interaction to individuals of each species. • To explain and justify the categorization of a particular species-pair relationship as mutualistic, commensal, parasitic, predatory, or competitive. • To identify and/or hypothesize how the coevolutionary relationship maintained by this pair of species has shaped the adaptations typical of each species.	***NO***
12	**Selection Beyond the Individual**	1. Can selection occur at levels above the individual? 2. How is kin selection different from other forms of natural selection? 3. What is group selection and how is it different from other forms of natural selection? 4. Can cooperation be a product of natural selection?	‣ **Zimmer** p. 347-352 ‣ *Evolution for Everyone* Chapters 18-20			***NO***
13	**Humans & Cultural Evolution**	1. How did humans evolve? 2. How does our evolutionary history compare with other organisms? 3. What is “cultural evolution” and how does it compare with biological evolution?	‣ **Zimmer** Chapter 14 & p. 352-357 ‣ *TED Talks* “Joshua Klein: The amazing intelligence of crows” ‣ *National Public Radio* “As The Crow Flies, Tokyo Battles Avian Pest”		***Group Activity:*** Does culture evolve? • Consider whether our understanding of how biological evolution works could be used to explain how and why culture changes. • Compare and contrast the processes of biological and cultural evolution in a concept map. • Present your concept map to the class.	***YES***

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14	**Prospects for Evolution**	1. How can evolutionary knowledge serve humanity? 2. What are some ways that technology may affect the future path of evolution?	**Zimmer** Chapter 15		***Group Activity:*** Future evolution • Predict how particular traits in particular species may evolve in the future. • Analyze the predictions of your classmates, determining whether each prediction is evolutionarily feasible.	***NO***
15	**Final Exam** taken <u>in class</u> on the *LMS*.				*n/a*	***YES***

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