

GEOL 104 Dinosaurs: A Natural History  
Exam Test I Review Sheet

The nature of Science: empirically based hypothesis testing; observation, inference & speculation; role of publication and peer review; falsification, parsimony, consilience. Scientific publications. Peer-review.

Major events in history of paleontology, evolutionary biology, and geology, in particular the major contributions of:

Georges Cuvier	William Buckland	Gideon & Mary Ann Mantell
Richard Owen	Joseph Leidy	Edward Drinker Cope & Othniel Charles Marsh
John Ostrom	Nicolas Steno & James Hutton	Carolus Linnaeus
William "Strata" Smith	Charles Darwin & Alfred Russel Wallace	Willi Hennig

Major changes in our understanding of dinosaurs since the early 19<sup>th</sup> Century

Major groups of rocks, with emphasis on sedimentary rocks (biogenic, chemical, and detrital) and how they form (weathering, transport, deposition, cementation, recrystallization)

Environments of deposition and sedimentary structures; be able to reconstruct the environment from rock type and sedimentary structures (high energy vs. low energy; sedimentary structures [e.g., cross-beds, mudcracks, ripple marks, trough cross-beds, coal, etc.]

Body Fossils vs. Trace Fossils

Taphonomy : burial, fossilization [unaltered, permineralized, replaced, carbonization, impressions]  
Different preservational potentials in different types of organisms and different environments

Basics of Stratigraphy:

- Principles of Original Horizontality, Superposition, Cross-Cutting Relationships, Fossil Succession Formations
- Relative vs. Numerical Ages
- Index fossils and correlation; properties of a good index fossil
- Radiometric dating, Magnetostratigraphy
- Combining relative and radiometric dating to find possible ages for fossils
- The Geologic Time Scale: Eras, Periods, Epochs (**know the periods & epochs of the Mesozoic**)

Plate tectonics: How does it affect the surface of the Earth? How does plate tectonics result in the Rock Cycle?

Ecology:

- Photosynthesis and aerobic respiration. Autotrophs vs. heterotrophs.
- Trophic relationships, trophic levels (producers, decomposers, consumers (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, etc.)).
- Food chains/webs, Energy pyramid

Comparative Anatomy:

- Homology vs. Analogy
- Functions of the skeleton; how does the skeleton work and fit together?
- Anatomical directions
- Be familiar with major skull landmarks, skull bones, and postcranial bones

Taxonomy: know the basic rules, principles, and grammar of Linnaean taxonomy (esp. for genera and species); principle of priority; lumping vs. splitting

Species: What are species? What are some of the sources of variation that makes it difficult to distinguish species (sexual, ontogenetic, geographic, stratigraphic, individual)

Evolution = Descent with Modification

Initial evidence of evolution: homologies; adaptations; vestigial organs; the Linnean hierarchy; natural hybrids; transitional/intermediate fossils; embryology; fossil succession; biogeography

Fixed vs. Changing views of the world

Natural Selection = Differential Survival and Reproduction of Variants in a Population Resulting in Net Change in the Phenotype of the Descendant

Darwin & Wallace's contributions: Common Ancestry, Individual Variation, Natural Selection

Genetics and inheritance; mutations. The importance of geologic time, environmental change, and isolation for evolution.

What is "fitness" in the evolutionary sense?

Patterns of Evolution: Divergence, Correlated Progression, Adaptive Radiations, Niche Partitioning; Sexual Selection, Convergence, Co-evolution, Heterochrony (Paedomorphosis vs. Peramorphosis), Mass Extinctions

Systematics: **Be able to read a cladogram!**

Why cladograms are more secure than trying to reconstruct direct ancestor-descendant trees

How are cladograms constructed? How are they read?

Be able to recognize shared derived, shared primitive, unique, convergence, and reversed character states: which are useful in phylogenetic analysis?

Using cladograms to recognize membership in higher taxa, infer missing information, and determine minimum divergence times