Biology 405: Organic Evolution

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Doctor Who

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Evolution: Describing Variation

1. Week One: Time, Space, and Interspecific Varia

1.1 Introduction

Darwin wrote, in his 1859 book On The Origin of Species[1], that evolution was slow, gradual, and practically invisible. He was heavily influenced by the geologist Charles Lyell, who described **uniformitarianism** as the gradual change in geological formations, like mountain building and canyon erosion. Darwin thought evolution could be made visible by looking across long expanses of time, using the fossil record for example.

On the other hand, Darwin also noted, on his *Beagle* voyage, environments sometimes change catastrophically and across small distances. Although Darwin knew that artificial breeding could lead to rapid changes, it was only much after his time that research has shown that evolution in nature can be rapid and observed directly across landscapes.

1.1.1 Objectives

- Appreciate the vast expanse of time available for evolutionary change.
- Appreciate the rate and tempo of change occurring over time.
- Observe variation between species and develop hypotheses for why species differ from one another.

1.2 Evolutionary Patterns in our Regional Plants

We have the opportunity to see evolutionary change in the plants that occur in our region of the Pacific Northwest because of nearby fossil deposits. In some ways, the plants found in our region differ dramatically from those found here in the distant past; but in other ways, there appears to be little evolutionary change. In the lab today, compare the current flora with those fossilized 15-25 million years ago, and consider the pace, rhythm and causes of evolutionary change. Your task is to examine these fossil plants and compare them to the extant plants in order to develop a picture of

[1] Darwin, Charles. "On the origin of the species by natural selection." (1859).

evolutionary changes that might have occurred over 15 million years.

1.2.1 The Extant Flora

Examine the herbarium specimens collected from our region over the past several decades. The list of plants in the region is called by botanists the flora.

Definition 1.2.1 — Flora. The plants of a particular region, habitat, or geological period.

R The table below lists some of the plant families (with suffix *-aceae*) and genera (in italics) found in the flora of Moscow Mountain and Kamiak Butte (list obtained from the WSU Herbarium. Only those families that are also found in the fossil flora are included. Note which are present in the specimens you are examining.

Family	Scientific Name	Common Name	Habitat
Pinaceae	*Abies grandis*	grand fir	North slope and ravines on south slope.
Pinaceae	*Larix occidentalis*	tamarack	Upper slope and on burns on north slope.
Pinaceae	*Picea engelmanni*	Engelmann's spruce	Cedar-grand fir forest.
...	and	so	on

Table 1.1: Table of extant flora of Moscow Mountain and Kamiak Butte for those families also found in Clarkia fossil beds.

1.2.2 The Fossil Flora

Also in lab today are specimens of plant fossils collected from the amazing fossil beds at Clarkia, Idaho (only about 60 miles from Pullman!).

Exercise 1.1 Examine the fossil specimens available in lab. To get oriented, check out this 15 minute video on the Clarkia fossils, which is based on research at the University of Idaho, and answer the following problems: ■

Problem 1.1 What were the environmental conditions in our region 15 million years ago compared to our current conditions? In what ways did the environment faced by the extant plants (those species currently present) change compared to the plants found as fossils?

Problem 1.2 What are the different types of fossils found at this fossil bed? Describe the processes that lead to fossil preservation.

Problem 1.3 The video suggests ways can we study evolutionary change in the flora and the plant traits in our region. There are at least 3: what are they?

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