

## **Confusing terms and ideas in evolution theory**

How can we distinguish between **facts**, **hypotheses** and **theories**?

What is the difference between **evidence** and **proof**?

What is an adaptation, and what kinds of adaptations lead to evolution?

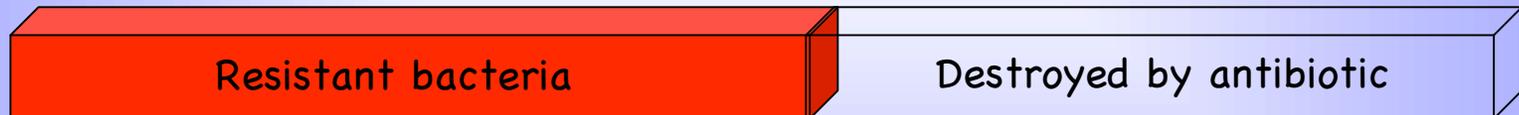
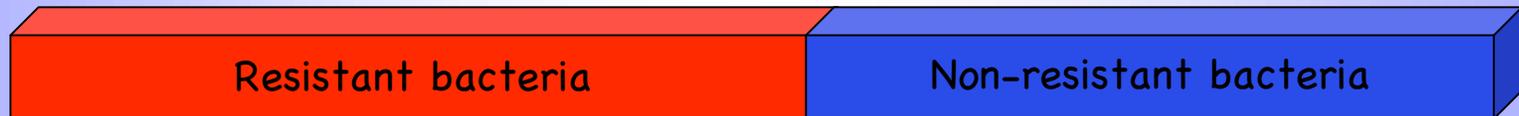
What is the difference between a **relative** and an **ancestor**?

Is it appropriate to say that evolution always proceeds from simple to complex, or from primitive to advanced?

Why do scientists say that they **accept** evolution rather than saying that they **believe** in evolution?

# Change in Allele Frequency over Time: Evolution

Resistant bacteria



## **The Definition:**

Biological evolution is descent with modification. This definition encompasses small-scale evolution (changes in gene frequency in a population from one generation to the next) and large-scale evolution (the descent of different species from a common ancestor over many generations).



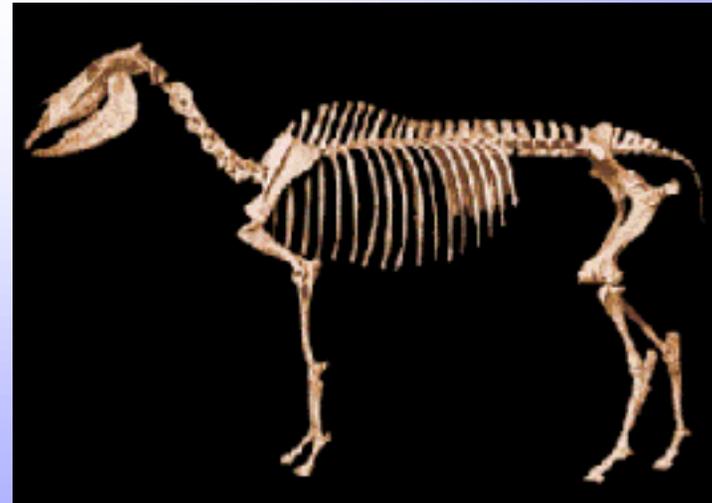
*Hyracotherium* is better known as "eohippus" - which means "the dawn horse."

The name also refers to the fact that it lived during the Eocene.

This small dog-sized animal represents the oldest known horse. It had a primitive short face, with eye sockets in the middle and a short diastema (the space between the front teeth and the cheek teeth).

Although it has low-crowned teeth, we see the beginnings of the characteristic horse-like ridges on the molars.

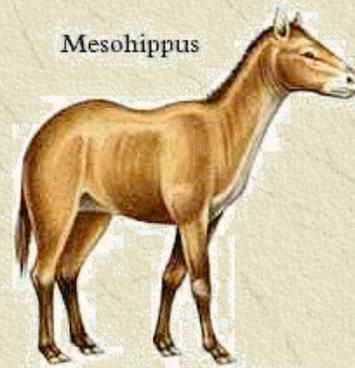
*Equus* is the only surviving genus in the once diverse family of horses. Domesticated about 3,000 years ago, the horse had a profound impact on human history in areas such as migration, farming, warfare, sport, communication, and travel. **Where & When?** Species of *Equus* lived from 5 million years ago until the present. Living species include horses, asses, and zebras. Fossils of *Equus* are found on every continent except Australia and Antarctica.



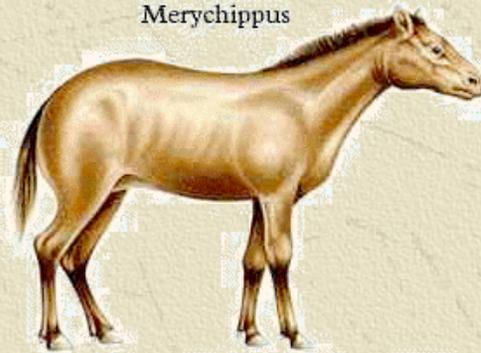
Hyracotherium



Meshippus



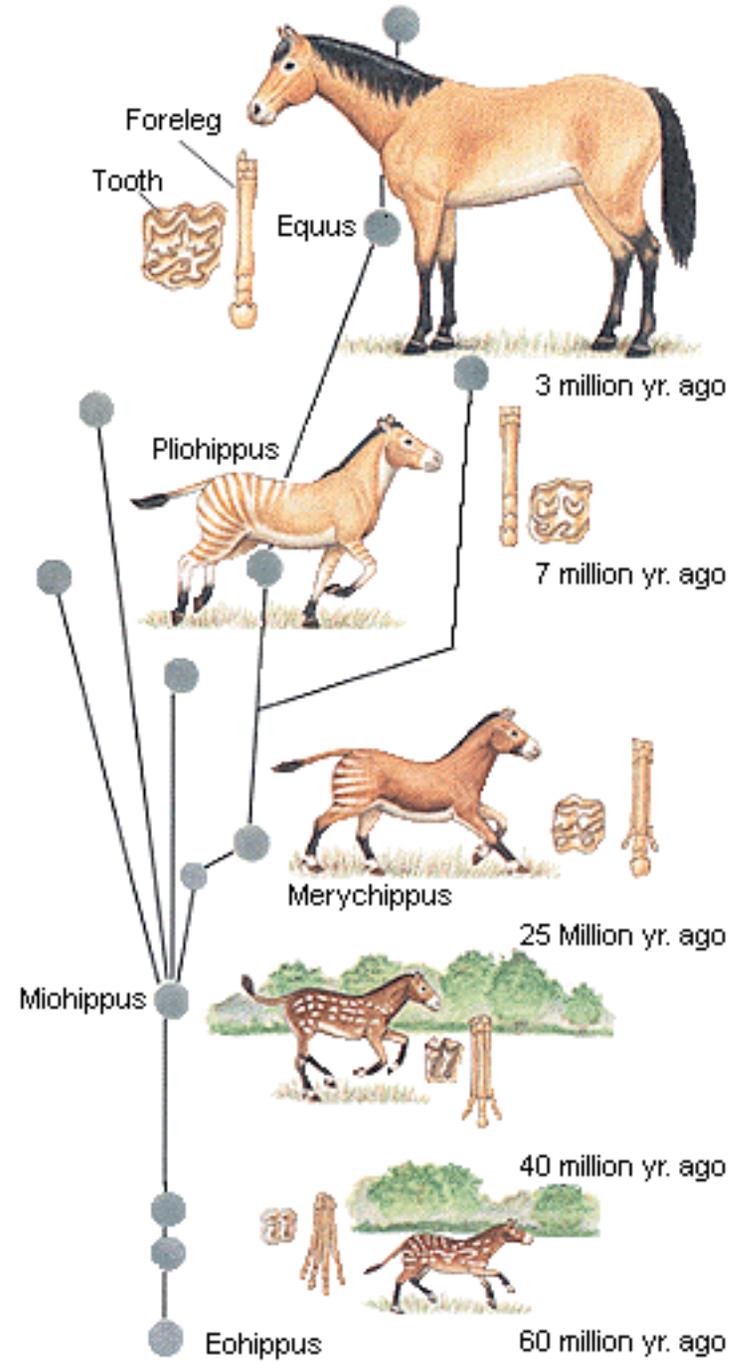
Merychippus



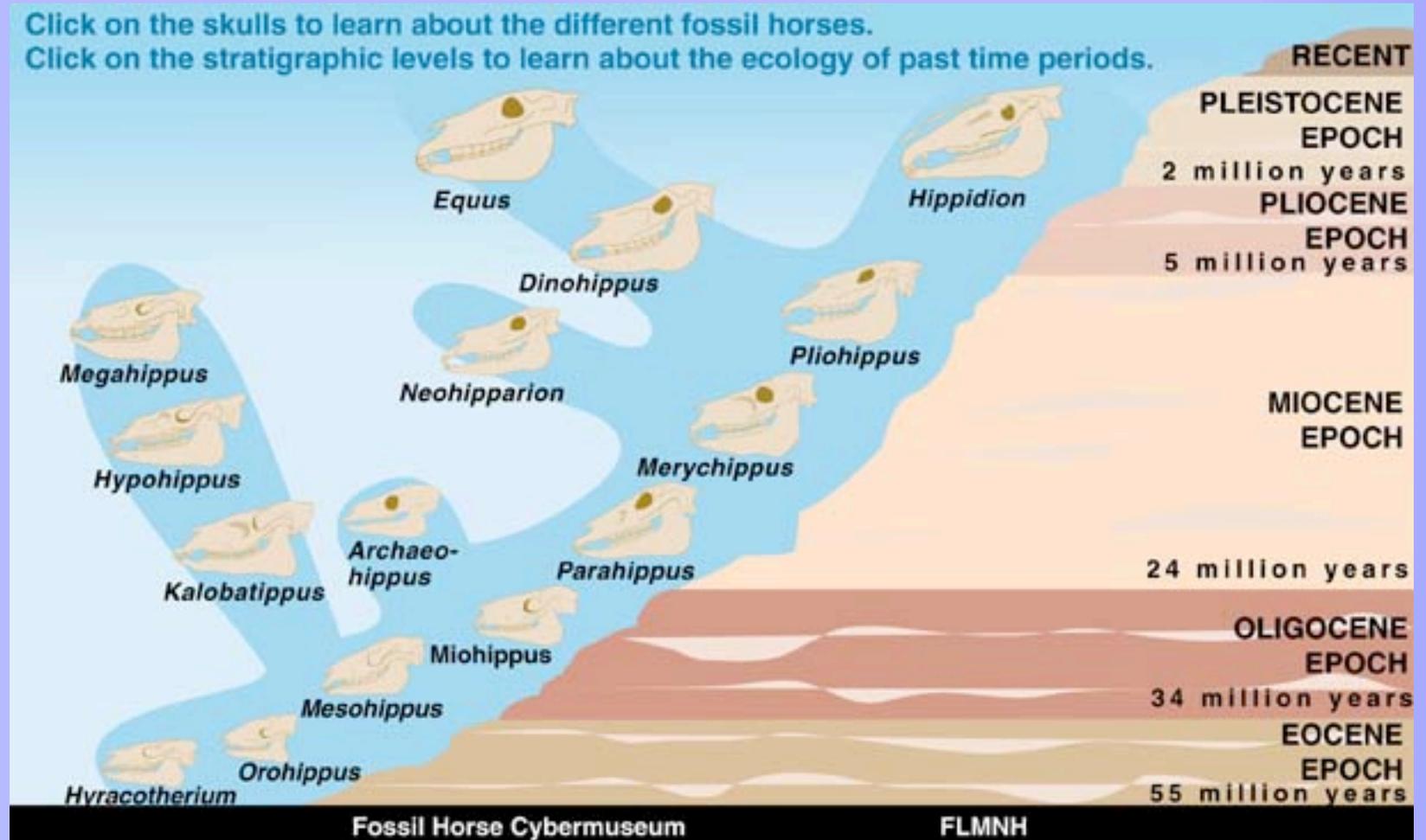
Przewalski's  
horse



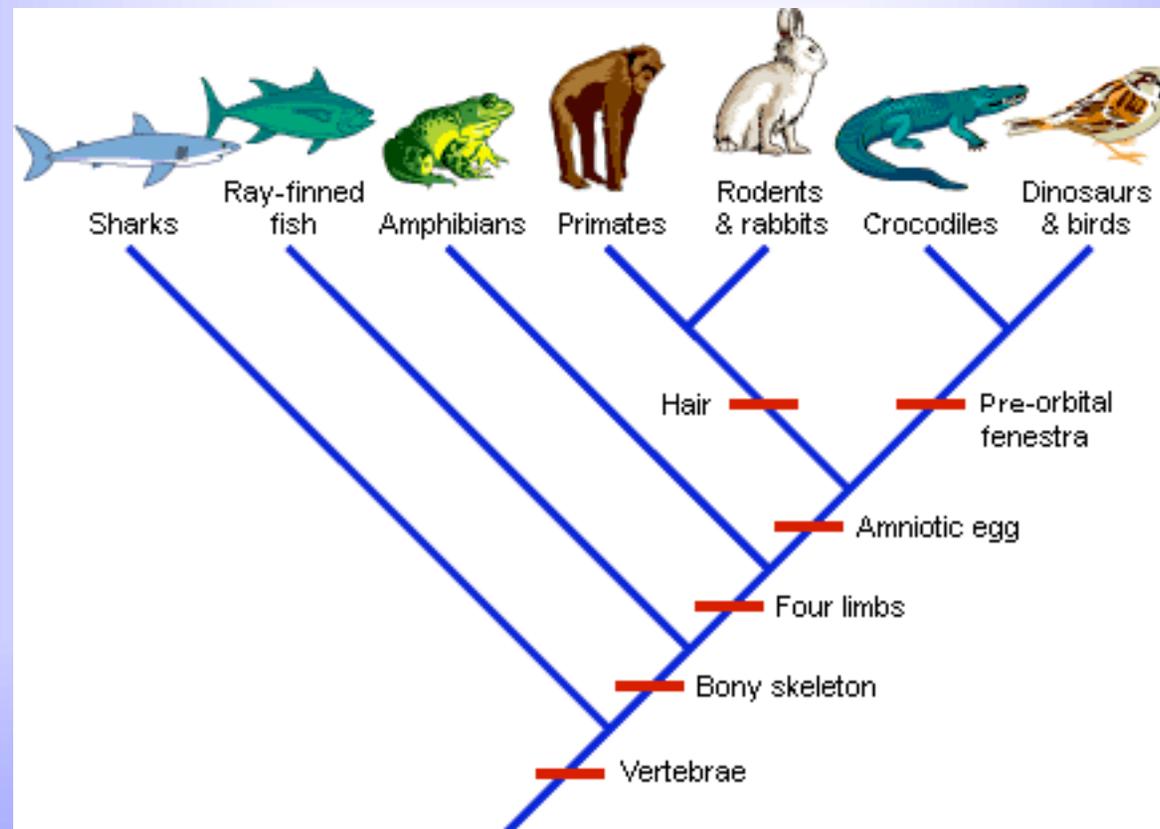
Recent  
Pleistocene  
Pliocene  
Miocene  
Oligocene  
Eocene

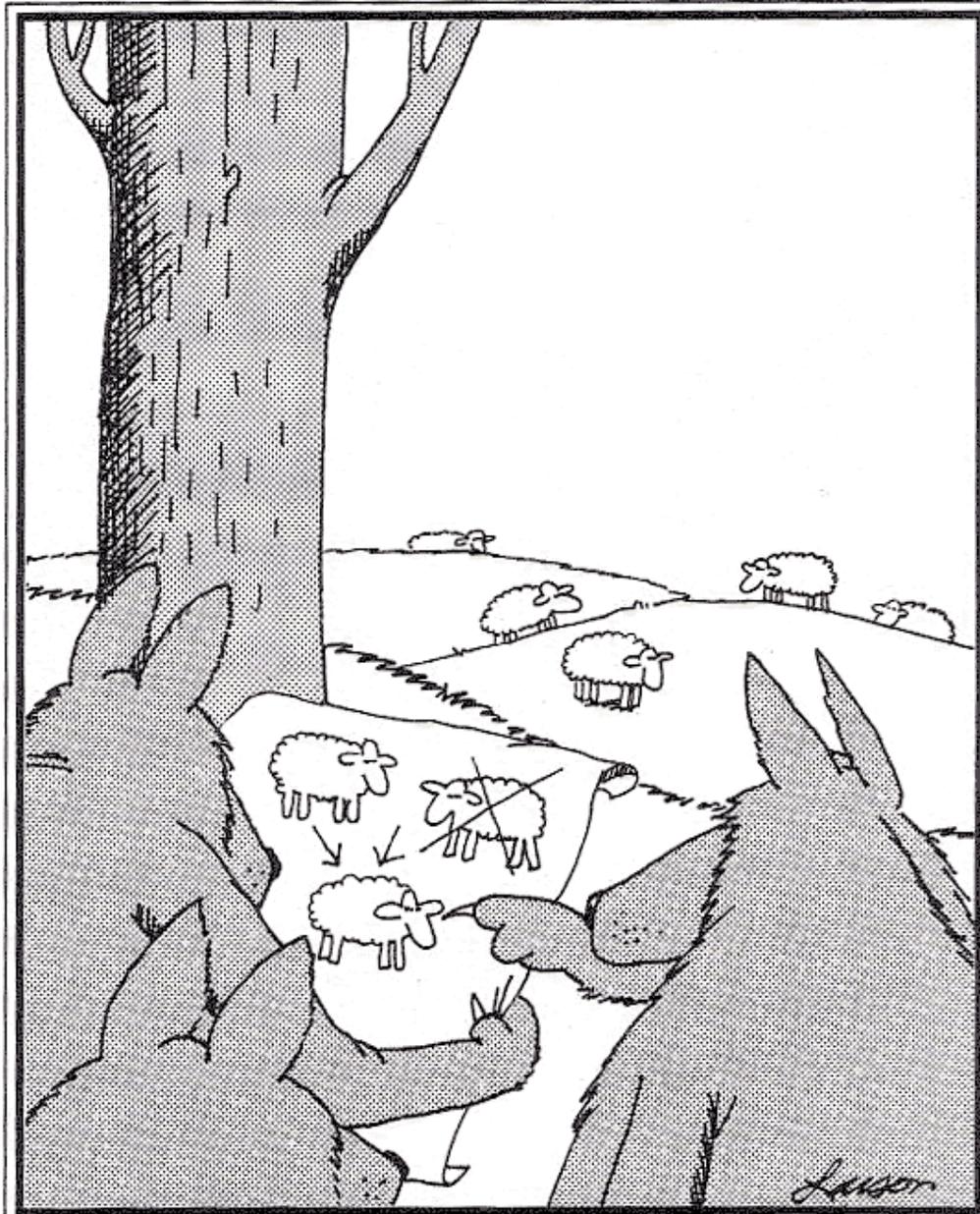


Click on the skulls to learn about the different fossil horses.  
Click on the stratigraphic levels to learn about the ecology of past time periods.

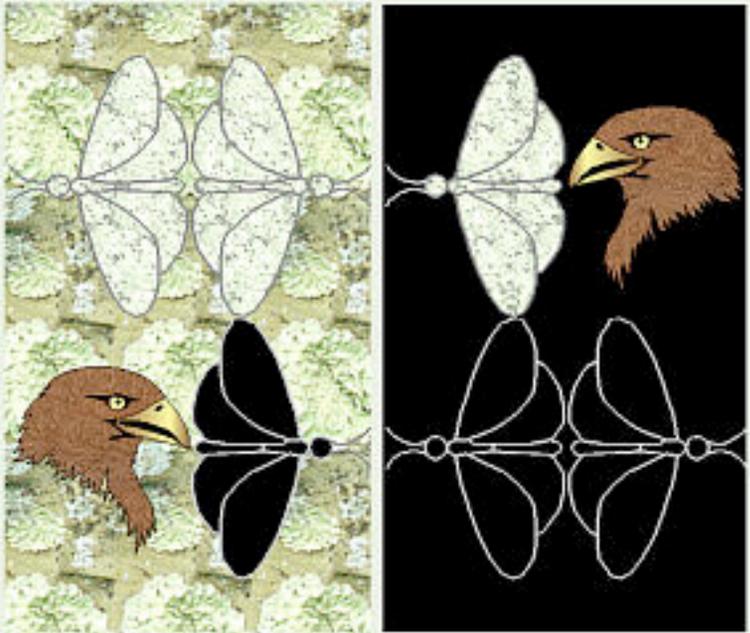
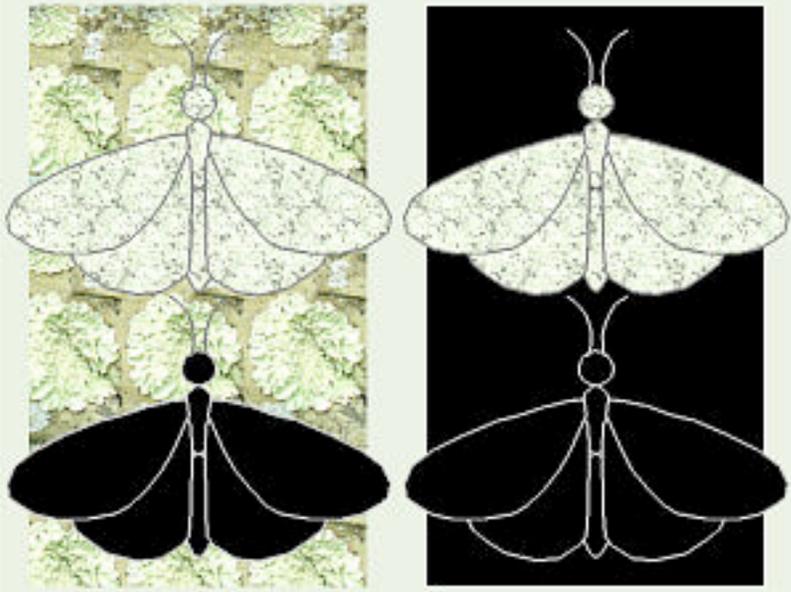


The central idea of biological evolution is that all life on Earth shares a common ancestor, just as you and your cousins share a common grandmother.





Natural selection at work

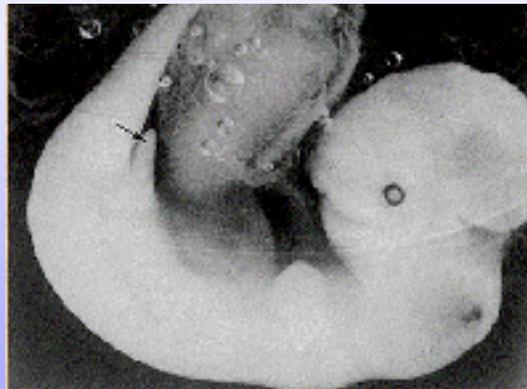




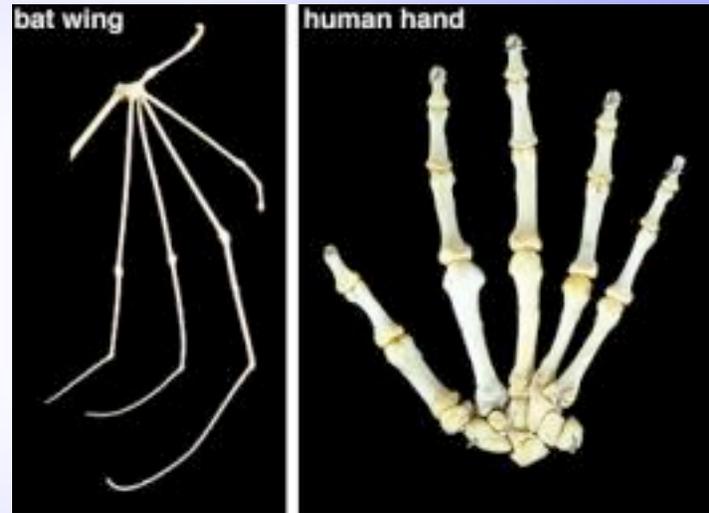
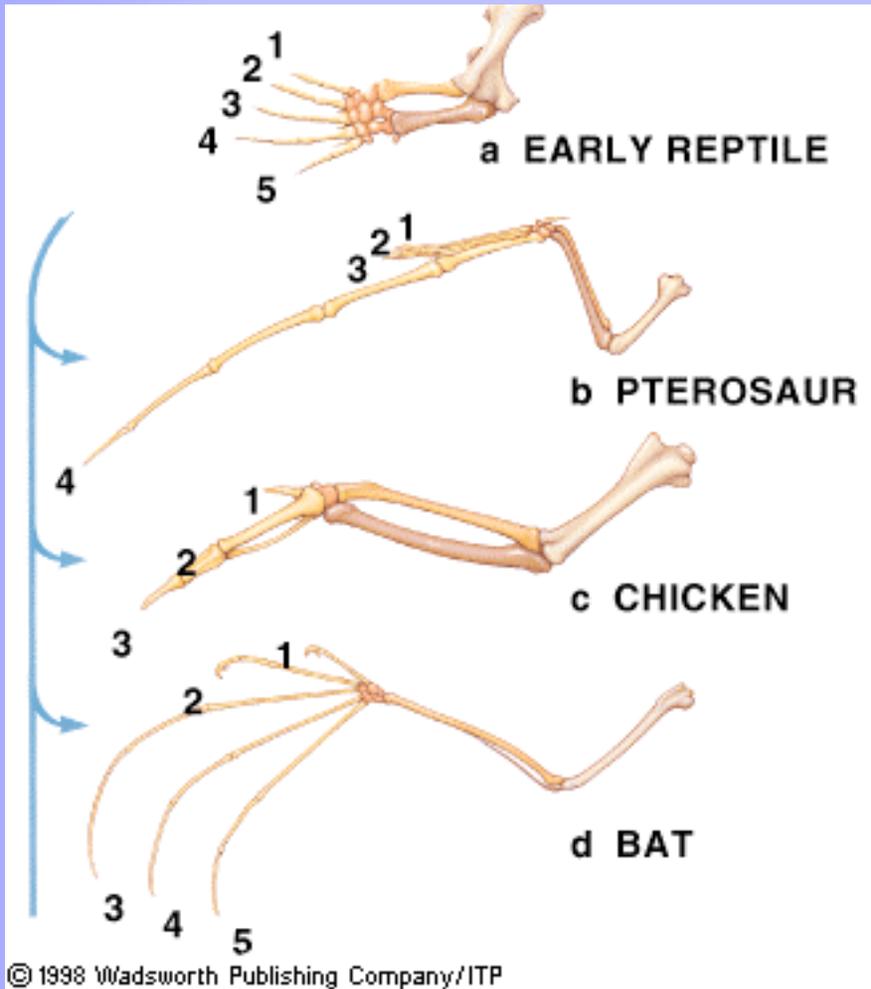
**Mouse**



**Human**



**Whale**



**Dinosaur footprint**



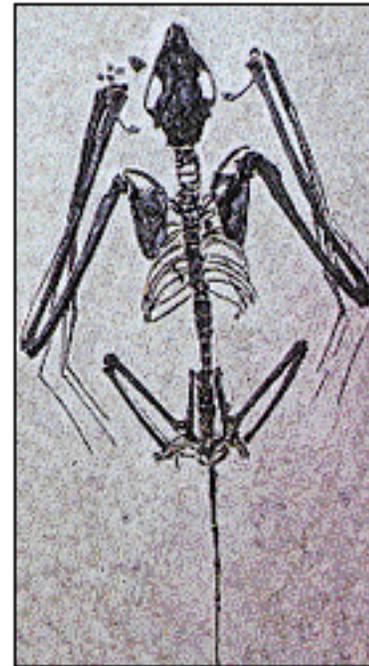
**Devonian tree fern**



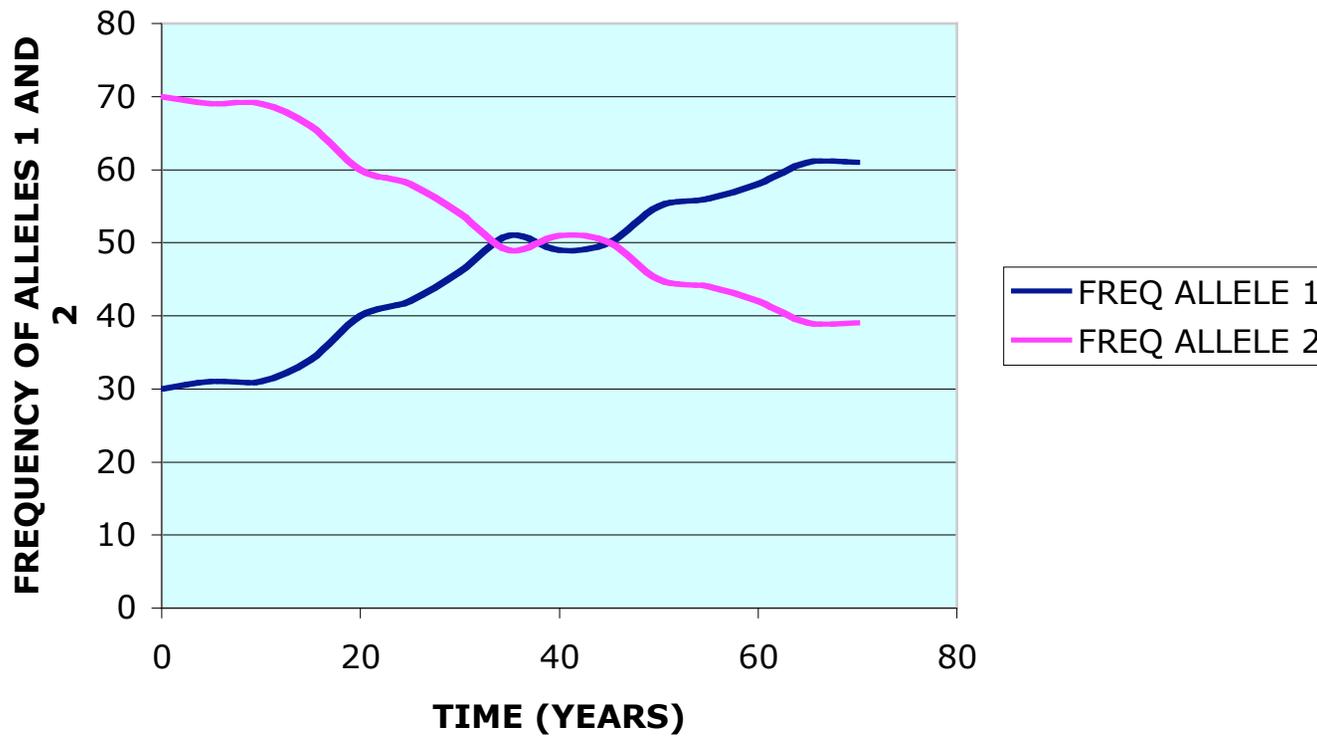
**Trilobite fossil**



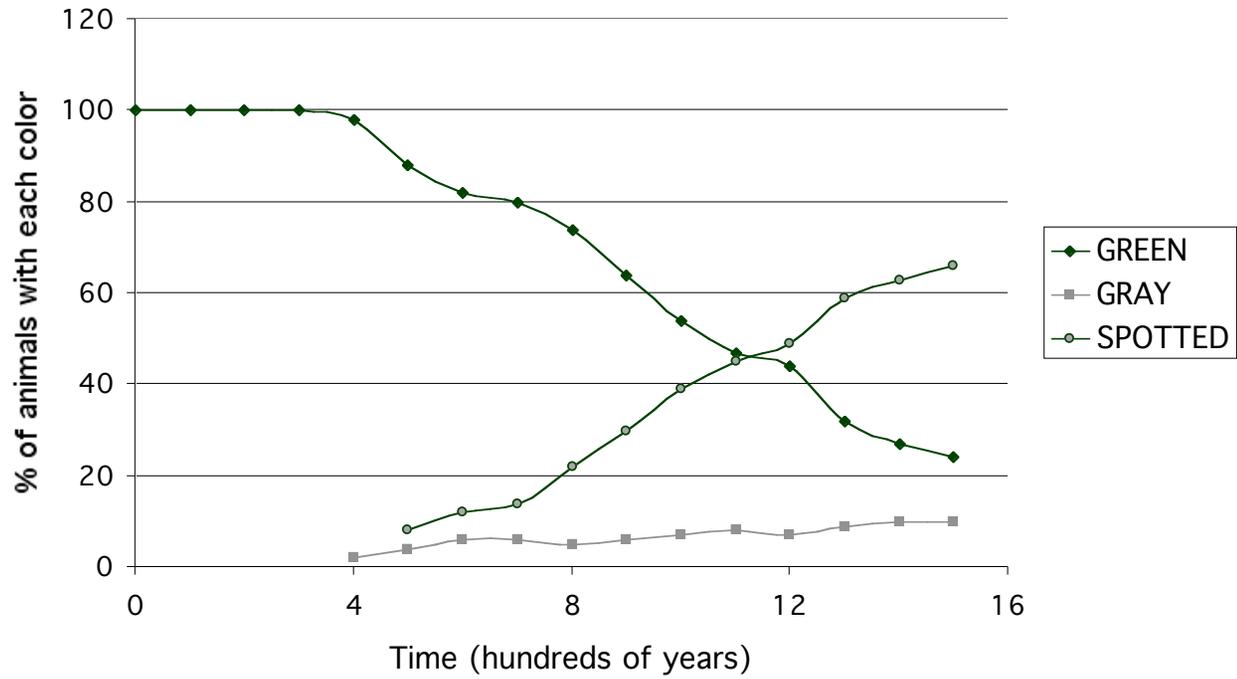
**Bat fossil**

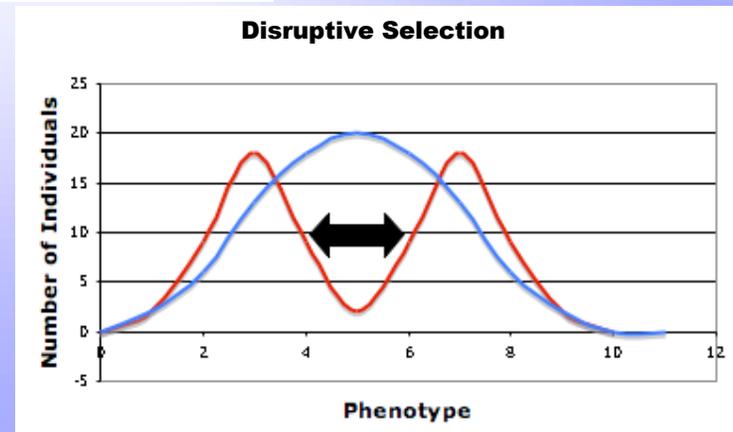
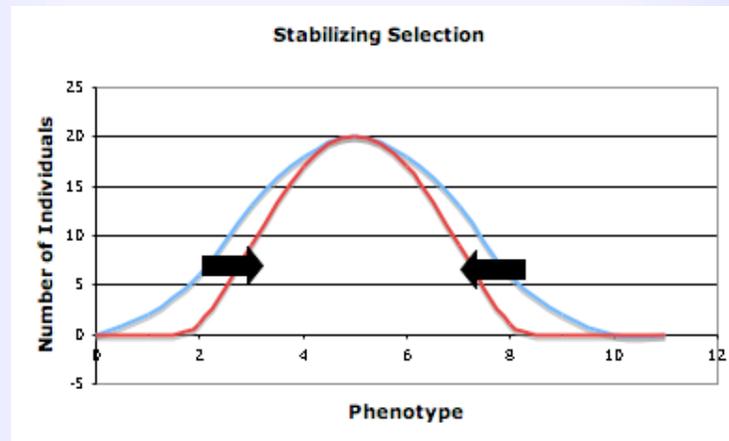
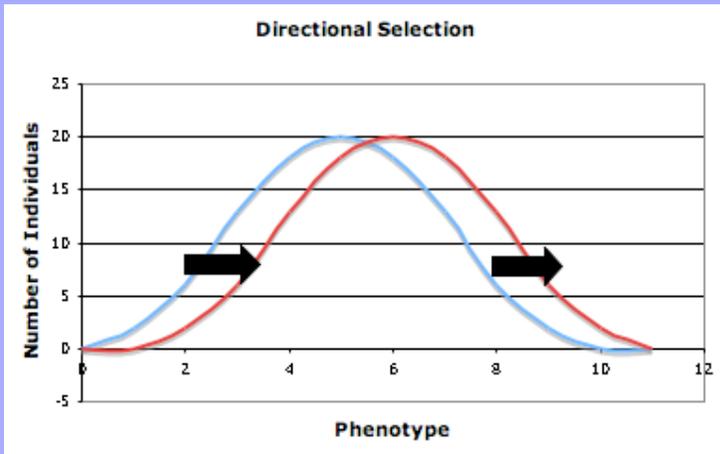


## ALLELE FREQUENCY VS TIME

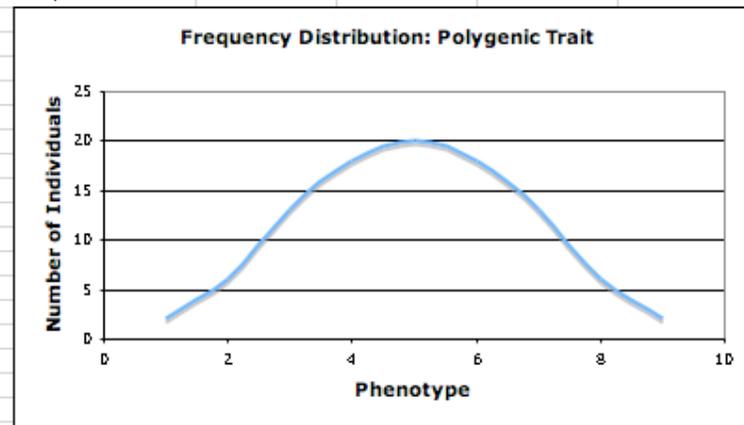
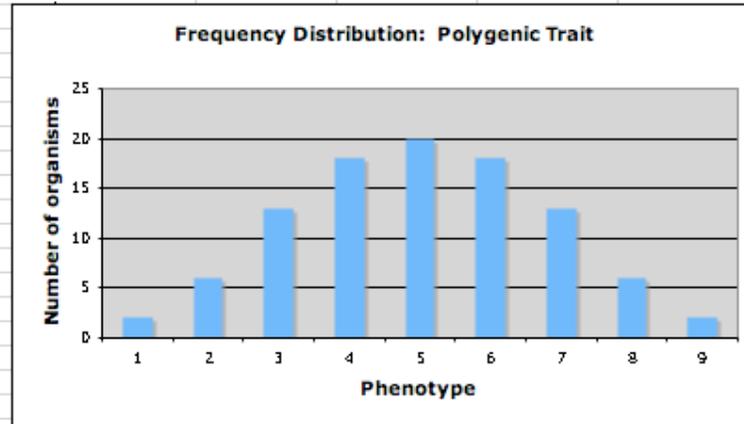


## TURTLE SHELL COLOR



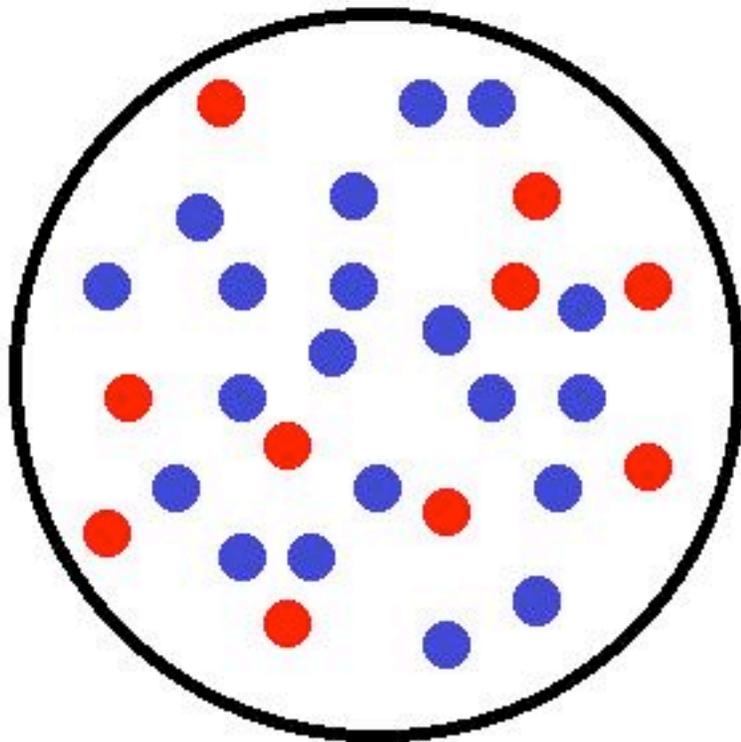


# Evolution of Polygenic Traits

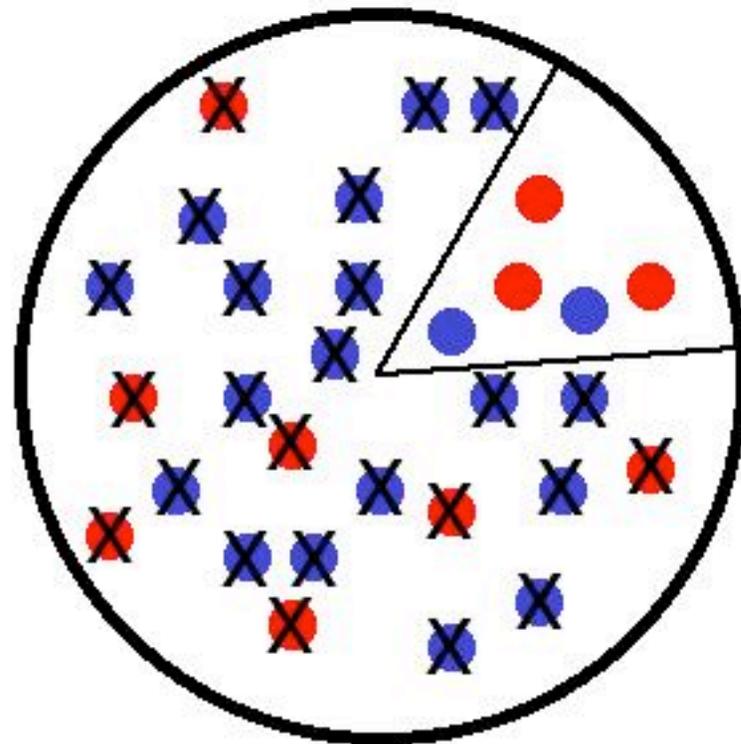


# Genetic drift

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**20 blue**  
**10 red**



**2 blue**  
**3 red**



**Stephen Jay Gould  
(punctuated equilibrium)**



All belong to the same species (*Theridion gallator*, happy-faced spider)

Different species:  
*Sturnella neglecta*  
(Western meadowlark)  
and *Sturnella magna*  
(Eastern meadowlark)

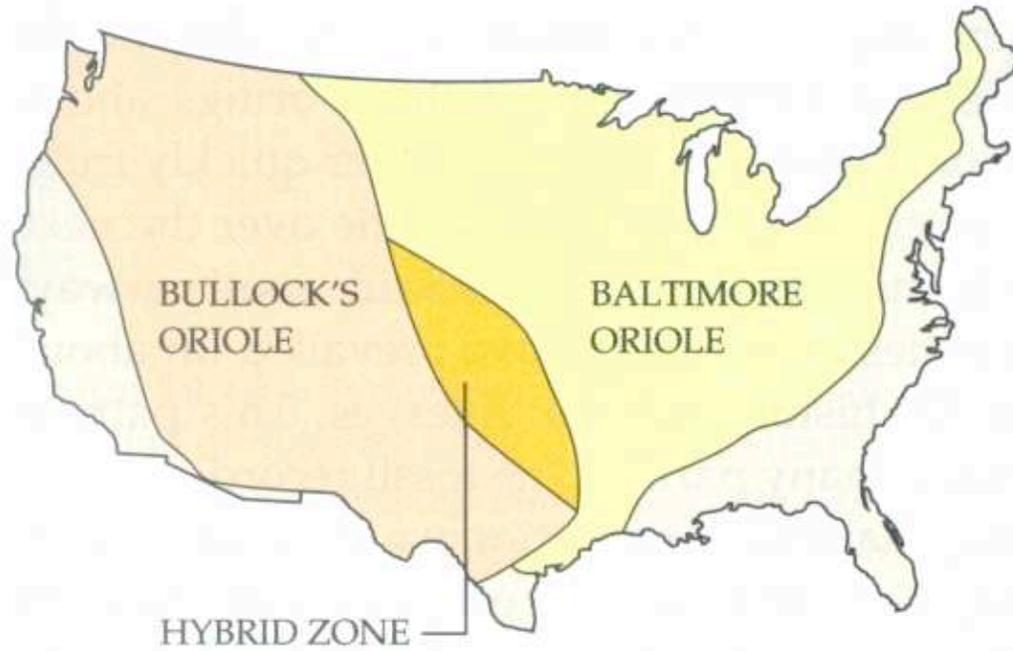




BULLOCK'S ORIOLE



BALTIMORE ORIOLE





*Ensatina eschscholtzi* is a lungless salamander of the family Plethodontidae. The distribution of this species is from British Columbia in Canada, through Washington, Oregon, California and into Baja California of Mexico. Presently, seven subspecies are recognized, and all occur in California. The subspecies are *eschscholtzi*, *xanthoptica*, *oregonensis*, *picta*, *platensis*, *croceater* and *klauberi*.



(modified from Stebbins, 2003)



*"oregonensis"*



*picta*



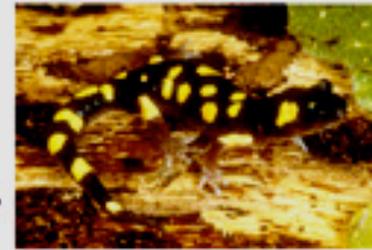
*xanthoptica*



*eschscholtzi*



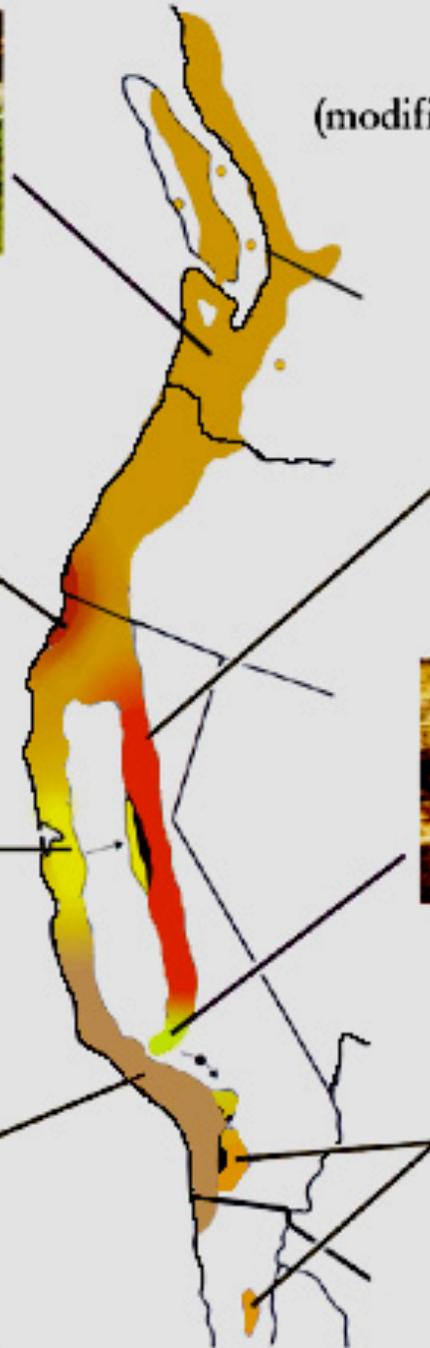
*platensis*



*croceater*



*klauberi*





**small ground finch**



**medium ground finch**



**large ground finch**



**sharp-beaked ground finch**



**cactus finch**



**large cactus finch**



**small tree finch**



**large tree finch?**



**vegetarian finch**

<http://www.rit.edu/~rhrsbi/GalapagosPages/DarwinFinch.html>

The  
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By Gabe Martin



After years of searching, Walter finally found  
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