#### PATTERNS OF EVOLUTION Chapter 16 & 17



#### Slide show by Kelly Riedell/Brookings Biology

http://www.baystatereplicas.com/images/repro\_dino\_pecksrex3.jpg

#### traits are

## controlled by two or more genes.

## A bell shaped curve is typical of polygenic traits











Graph from BIOLOGY by Miller and Levine; Prentice Hall Publishing©2006

#### The

#### of individuals near each other will not be very different, but fitness may vary from one end of curve to the other.



Natural selection can affect the distribution of phenotypes in 3 ways:

selection

selection

selection

#### DIRECTIONAL SELECTION



## Individuals at \_\_\_\_\_\_ of the curve have higher fitness than individuals in middle or at other end.

Graph shifts as some individuals fail to survive at one end and succeed and reproduce at other

#### **EXAMPLE OF DIRECTIONAL SELECTION**





Beak size varies in a population

Birds with bigger beaks can feed more easily on harder, thicker shelled seeds.

Suppose a food shortage causes small and medium size seeds to run low.



Directional Selection

Birds with bigger beaks would be selected for and increase in numbers in population.

http://www.animalbehavior.org/ABS/Stars/ONI/Podos\_-\_finch\_graphic.jpg

Graph from BIOLOGY by Miller and Levine; Prentice Hall Publshing©2006

Selection against

both extremes keeps curve narrow and in same place.



#### Individuals in of the curve have higher fitness than individuals at either end

Birth Mass

Graph stays in same place but narrows as more organisms in middle are produced.

#### **STABILIZING SELECTION**

Male birds use their plumage to attract mates. Male birds in the population with less brilliant and showy plumage are less likely to attract a mate. while male birds with showy plumage are more likely to attract a mate.



Male birds with showier, brightlycolored plumage also attract predators, and are less likely to live long enough to find a mate. The most fit, then, is the male bird in the middle-showy, but not too showy.

#### **EXAMPLE OF STABILIZING SELECTION**



Human babies born with low birth weight are less likely to survive.

Babies born too large have difficulty being born.

#### Average size babies are selected for.



http://www.animalbehavior.org/ABS/Stars/ONI/Podos\_-\_finch\_graphic.jpg

Graph from BIOLOGY by Miller and Levine; Prentice Hall Publishing©2006

#### DISRUPTIVE SELECTION



Individuals at \_\_\_\_\_\_ of the curve have higher fitness than individuals in middle.

Can cause graph to split into two. Selection creates \_\_\_\_\_

PHENOTYPES

#### **EXAMPLE OF DISRUPTIVE SELECTION**







Suppose bird population lives in area where climate change causes medium size seeds become scarce while large and small seeds are still plentiful.

Birds with bigger or smaller beaks would have greater fitness and the population may split into TWO GROUPS. One that eats small seeds and one that eats large seeds.

#### Large scale evolutionary patterns and processes that occur over long periods of time =



#### **Mass Extinctions**

At several times in Earth's history large numbers of species became extinct at the same time

#### **Caused by several factors:**

- erupting volcanoes
- Plate tectonics (continents were moving)
- Sea levels were changing
- Asteroids hitting the Earth
- Global climate change

#### Example: At the end of the \_\_\_\_\_ ERA

### More than HALF of all plants and animals were wiped out... including the dinosaurs



http://www.changbi.com/file\_img/webzine/dinosaur02\_02.jpg

#### Effects of mass extinctions: \_\_\_\_\_\_ and provides opportunities for <u>remaining</u> species

## After mass extinctions there is often a \_\_\_\_\_\_ that produces many

#### **EX: Cenozoic era that followed**

= "\_\_\_\_" Mammals species

increased dramatically

Image from: BIOLOGY by Miller and Levine; Prentice Hall Publishing©2006



When a single species or small group of species has evolved through \_\_\_\_\_\_ into diverse forms

#### that live in different ways = adaptive radiation OR divergent evoluti



#### More than a dozen species evolved from one s

http://www.pbs.org/wgbh/evolution/library/01/6/image\_pop/l\_016\_02.h

Sometimes different organisms evolution in different places or at different times but in

environments...and end up looking very similar.

Process by which unrelated organisms come to resemble each other =

#### **Example:**



#### Sharks, penguins, dolphins have all developed



Penguins

Sharl

and appendages to move through water.



PhotoIste

# The process by which the species evolve in response to changes in each othe over time

#### See many examples of coevolution http://biology.clc.uc.edu/courses/bio303/coevolution.htm

#### How fast does evolution operate?



Darwin believed evolution happened slowly over a long time

If biological change is at a slow pace, it is called

http://animals.timduru.org/dirlist/dino/FlyingDinosaurus-Pterodon-

# Fossil record shows evolution happebaretore in

Pattern of a long stat period interrupted by a period of more rapid change



Rapid evolution after long periods of equilibrium can occur for several reasons:

1) Happens when a small population is \_\_\_\_\_ from the main population OR

2) A small group \_\_\_\_\_\_to a new environment (like Galápagos finches)



http://www.pbs.org/wgbh/evolution/library/01/6/image\_pop/l\_016\_02.html

http://tolweb.org/tree/ToLimages/blank\_map.250a.gif