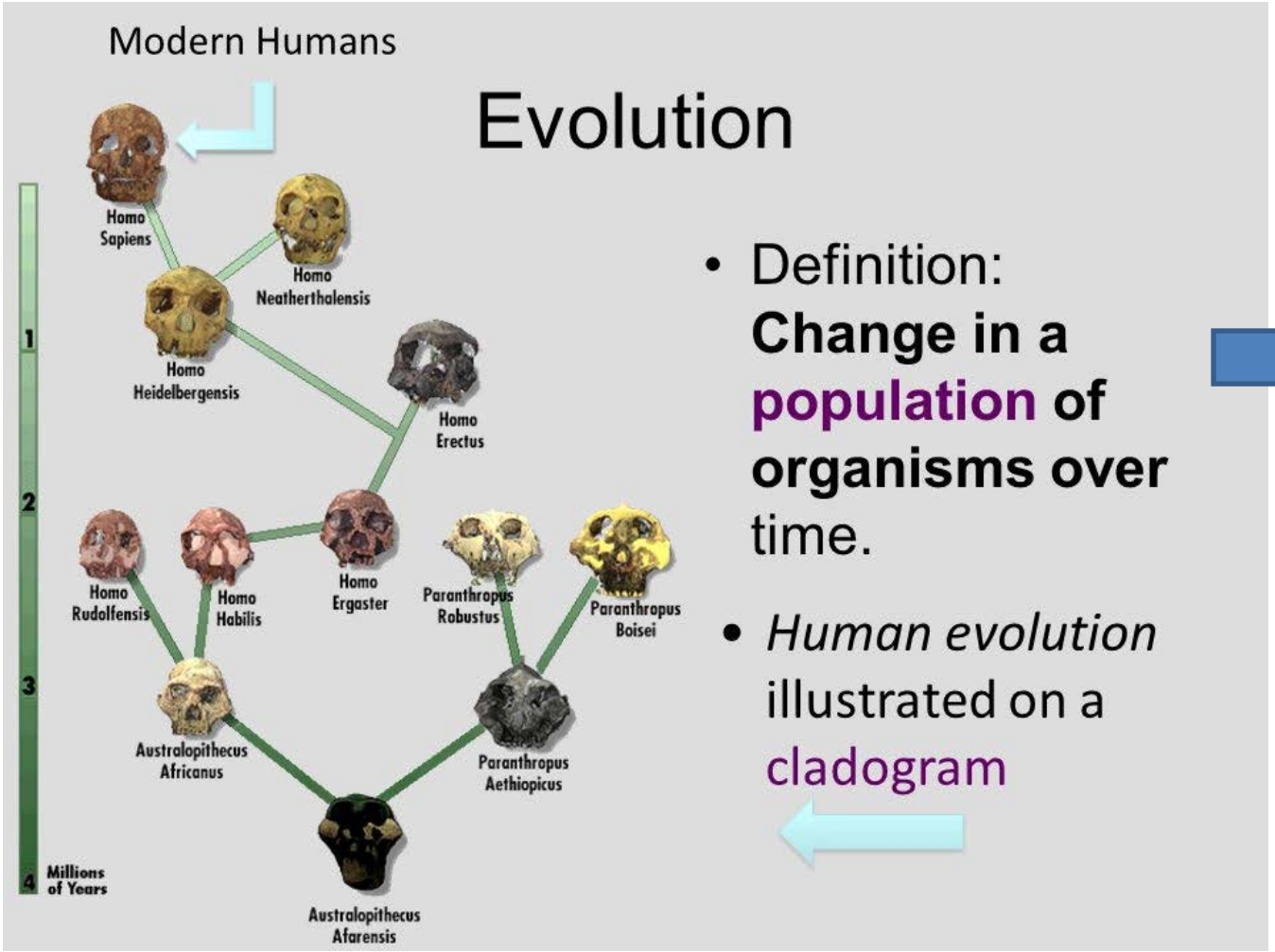
Review Quiz for Exam 1

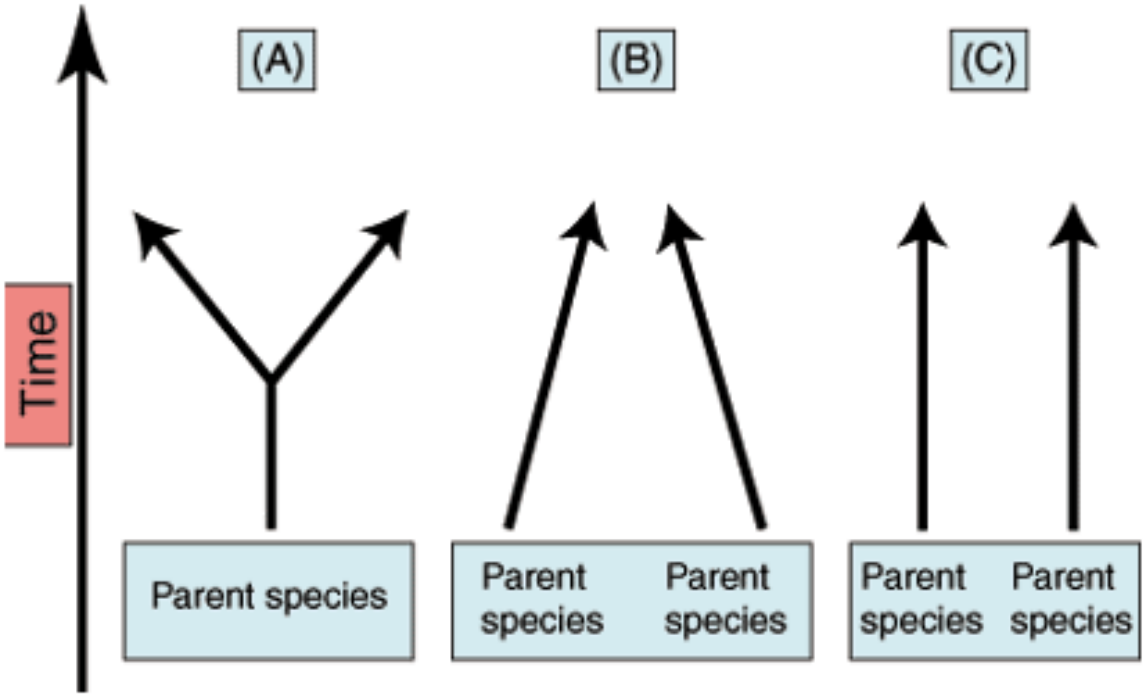
Answers

1. Evolution



D

2. Evolutionary Patterns



a. Divergent
b. Convergent
c. Coevolution or parallel

3. Divergent Evolutionary Selection

- Adaptive Radiation
- Sexual
- Artificial

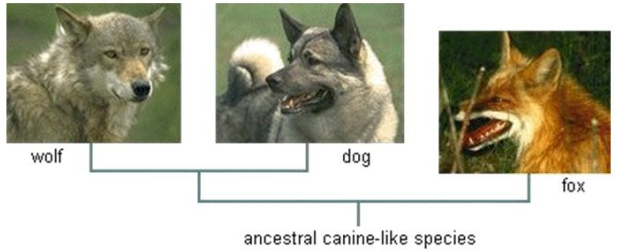
Patterns of Evolution (p. 335-341)

Divergent evolution

Example:

- All canines have long legs, walk on their toes, non-retractable claws, and dew claws because they all come from a common ancestor.
- Different populations diverged at different points an created all these species (domestic dogs, wolves, coyotes, foxes, etc.)

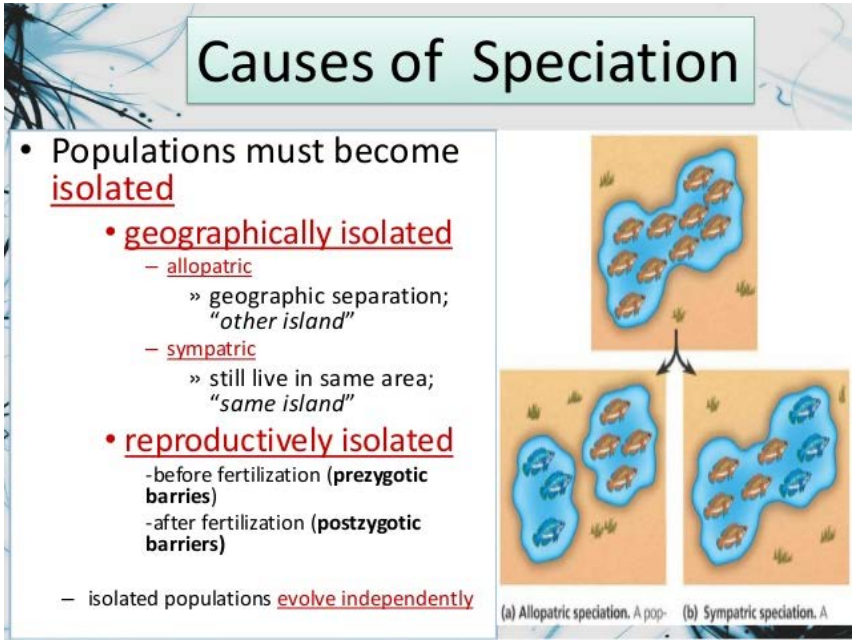
Divergent evolution is sometimes called **adaptive radiation** and may lead to speciation.



4 and 5: Speciation

Speciation

- Speciation = formation of a NEW species
  - Caused by disruptive selection (see Ch 23)
- 3 Requirements for speciation:
  1. Variation in the population
  2. Selection
  3. Isolation

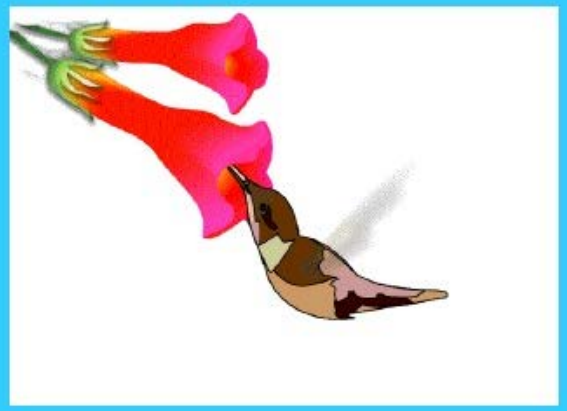


4. B

6. Natural Selection

Natural Selection

- Definition: process that results in the adaptation of an organism to its environment by means of selectively reproducing changes in its genotype



A

7. Natural Selection Processes

Natural Selection

- **Definition** – process by which traits become MORE or LESS common in a population
  - – 4 principles of Natural Selection
    - **Variation** – individuals in a population are different from one another
    - **Heritability** – variations are inherited from parents
    - **Overproduction** – populations produce more offspring than can survive
    - **Reproductive Advantage** – some variations allow organisms to have more babies than others

All
Except
B
Need Inheritance

8. Definitions

GENE FLOW	GENETIC DRIFT
Gene flow refers to the transfer of genes or alleles from one population to another population	Genetic drift refers to the variation of the relative genotypic frequencies in a small population, allowing the disappearance of particular genes due to death of individuals or incapability to reproduce
Allows the alleles to move from one population to the other	Is the changes in allele frequencies in a small population
Works on more than one populations at once	Works on small populations
Gene transfer allows the origination of new species	The accumulation of non-adaptive mutations and allele fixation facilitates speciation
Examples: Transportation of pollen for large distances and the mating of Europeans and native Americans, which results in offspring with mixed features	Examples: The random deaths of green beetles, leaving brown beetles alive

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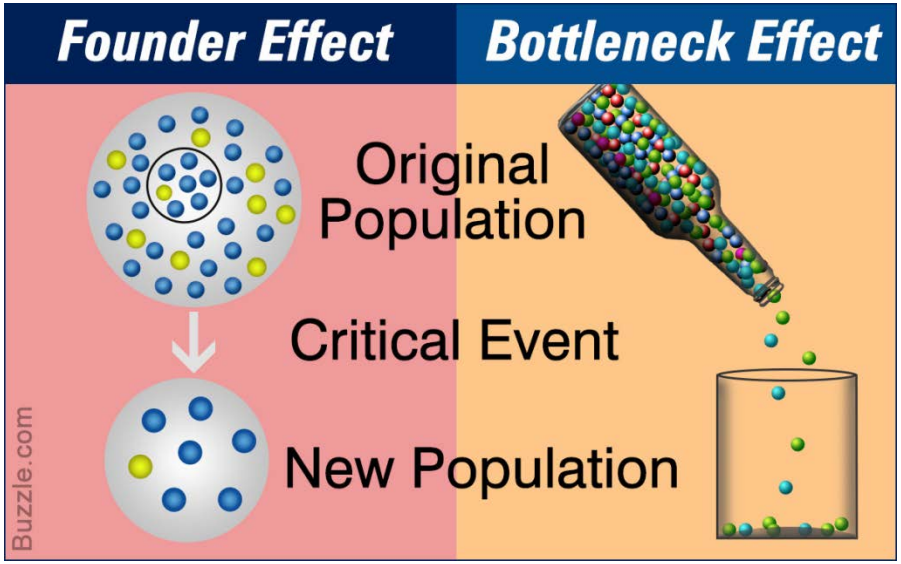
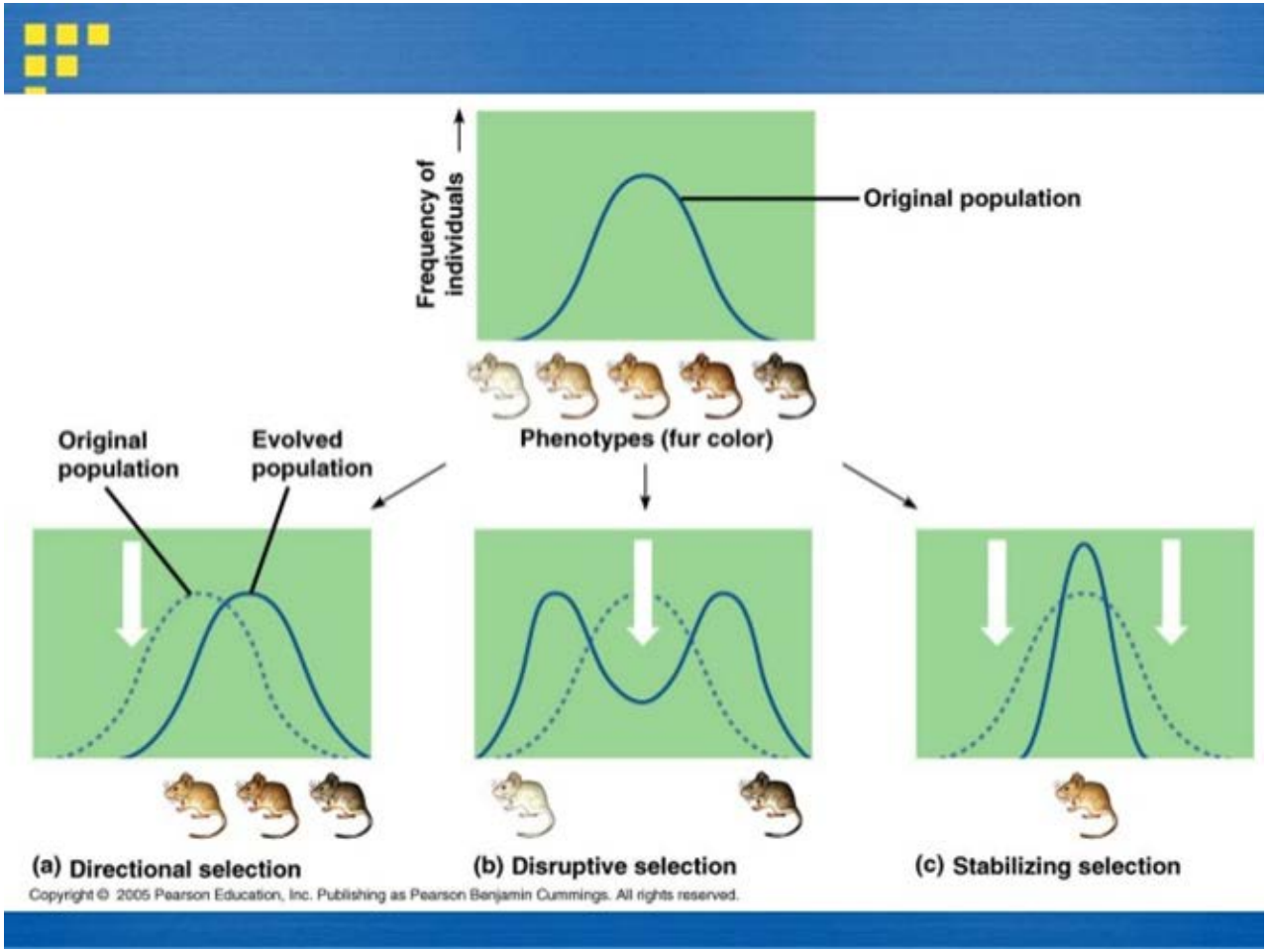
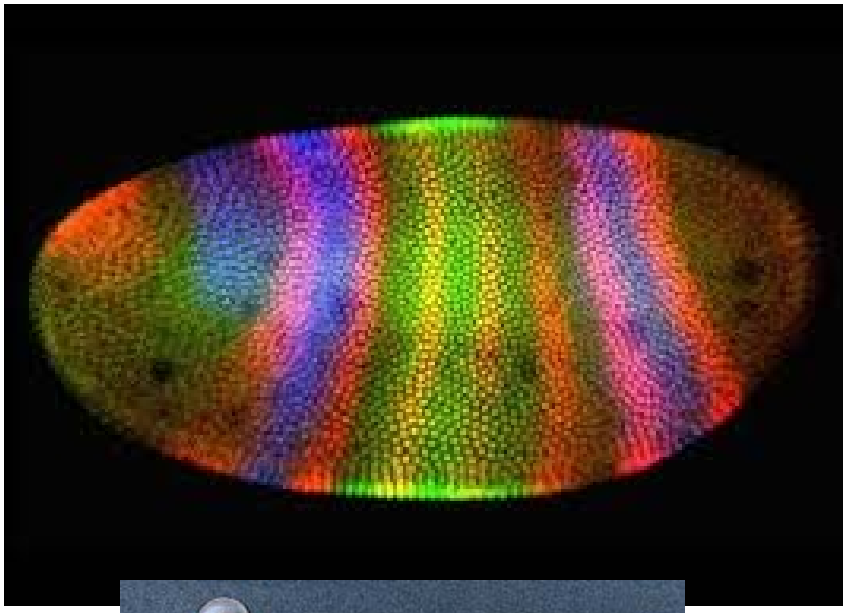
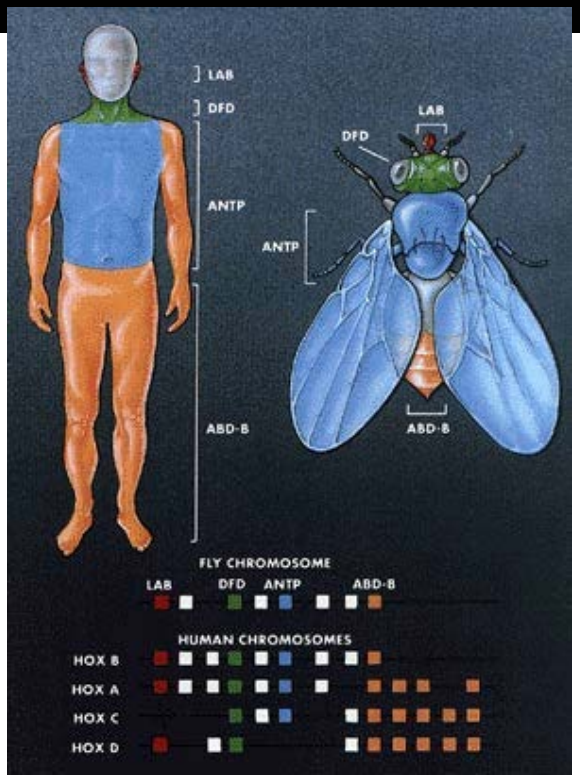


8d.



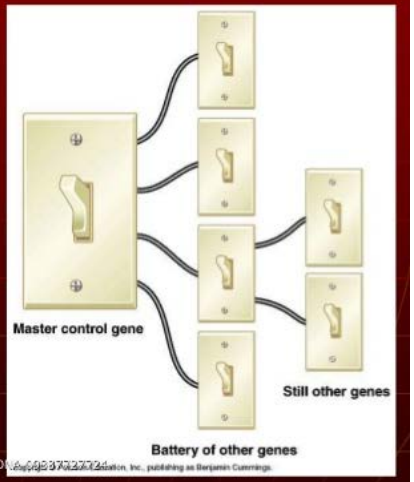


9. Master Gene



HOMEOTIC GENES

- Homeotic genes are master genes that regulate the expression of numerous other genes
  - Some of the regulated genes are regulatory themselves

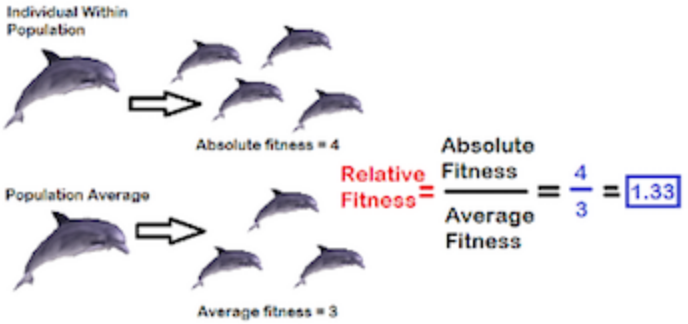


10. Relative Fitness

Relative fitness (ω)

- Average number of surviving progeny of one genotype compared to a competitive genotype.
- Survival rate = "N" after selection / "N" before selection.
- Genotype with highest survival rate has ω = 1.
- Assumes equal fecundity for all genotypes.

Genotype	A1A1	A1A2	A2A2
N(before)	100	100	100
N(after)	80	56	40
Survival rate	0.8	0.56	0.4
Rel. fitness (ω)	1	0.56/0.8 = 0.7	0.4/0.8 = 0.5



10. D

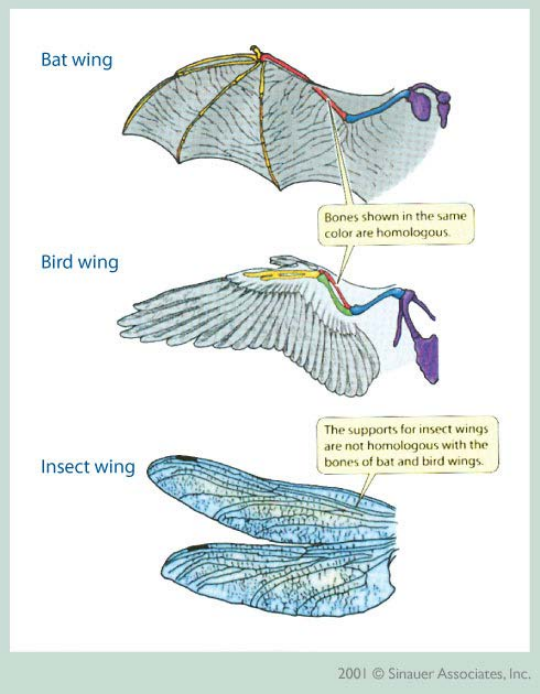
11. Evolutionary Evidence

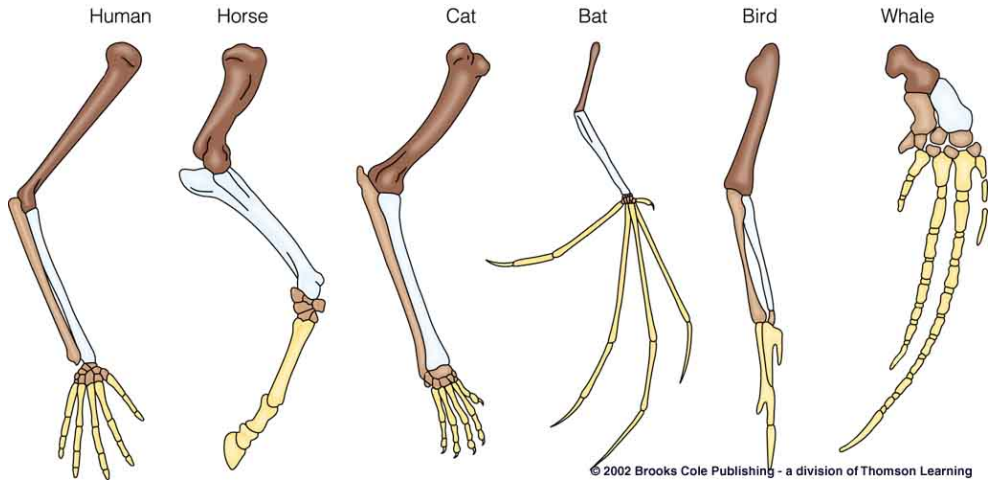
Evidence for Evolution

- 5 scientific disciplines:
  1. Paleontology
  2. Biogeography
  3. Embryology
  4. Comparative anatomy
  5. Molecular biology

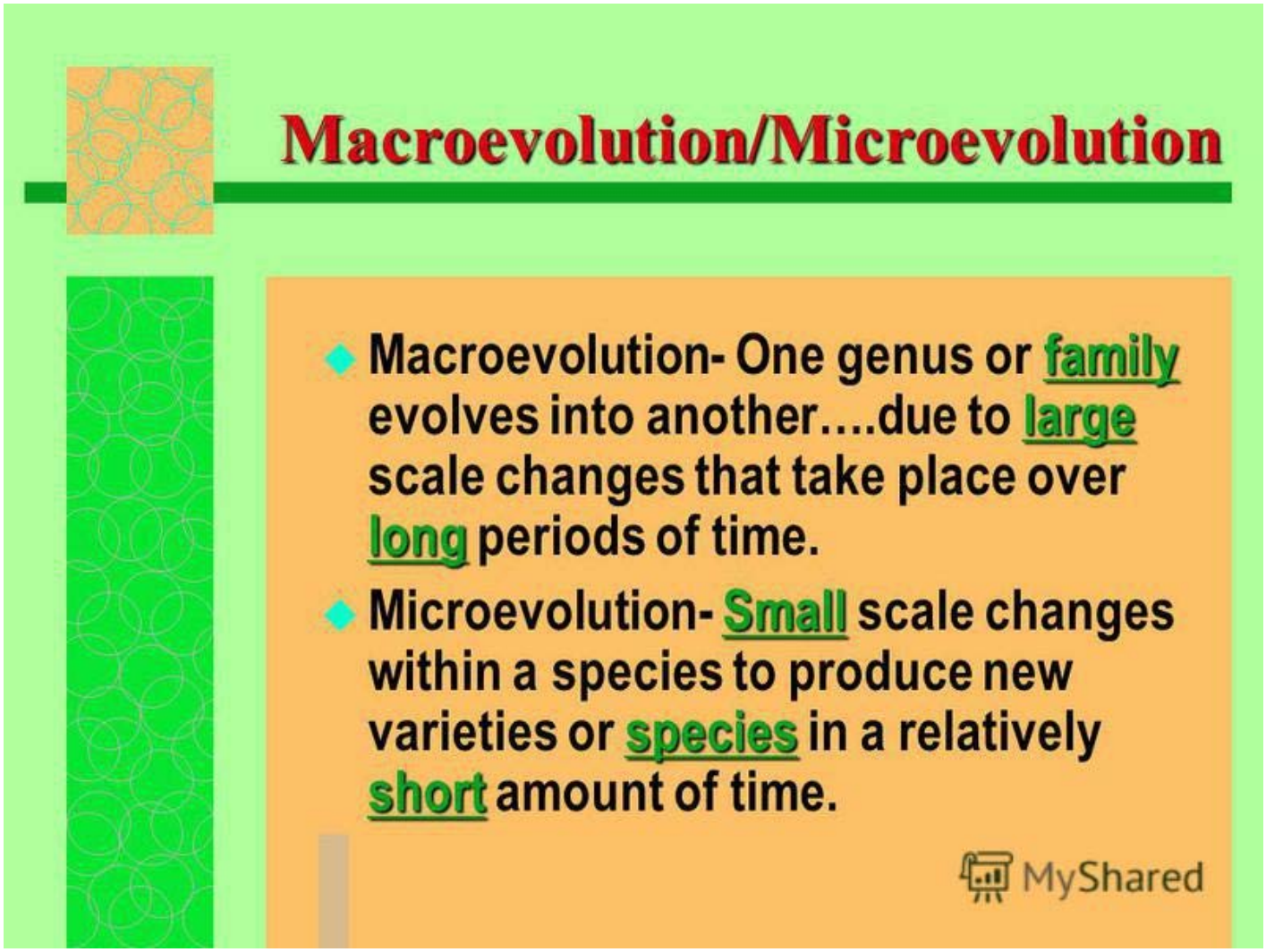
12. Definitions

Convergent Evolution	Divergent Evolution
Different ancestor	Common ancestor
Converge to produce analogous structures	Diverge to produce homologous structures
Species appearance becomes more similar over time	Species appearance becomes more different over time
Species are unrelated (genetically different)	Species are closely related (share genetic homology)
Example: Wings in insects, birds and bats	Example: Pentadactyl limb structure (vertebrates)





13. Evolutionary Types



Hardy-Weinberg

14.

Heterozygous (Aa)

$$p^2 + 2pq + q^2 = 1$$

Homozygous dominant (AA) Homozygous recessive (aa)

The Equations

$p + q = 1$

$p^2 + 2pq + q^2 = 1$

- A gene has two alleles, A and a
- The frequency of allele A is represented by p
- The frequency of allele a is represented by q
- The frequency of genotype AA = p^2
- The frequency of genotype aa = q^2
- The frequency of genotype Aa = 2pq

15.

- Dominant allele = 35%

  P = 35 % = 0.35

  Q = 1-P

  Q = 65 % = 0.65

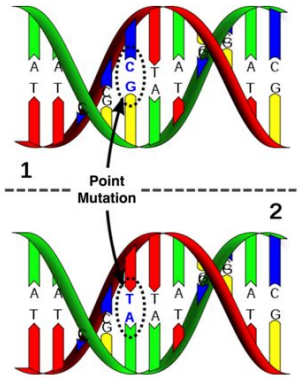
- Genotype Frequencies
- P^2 = .123 = 12.3% of pop
- Q^2 = .422 = 42.2% of pop
- 2pq = .455 = 45.5% of pop

Mutations

16.

Mutations

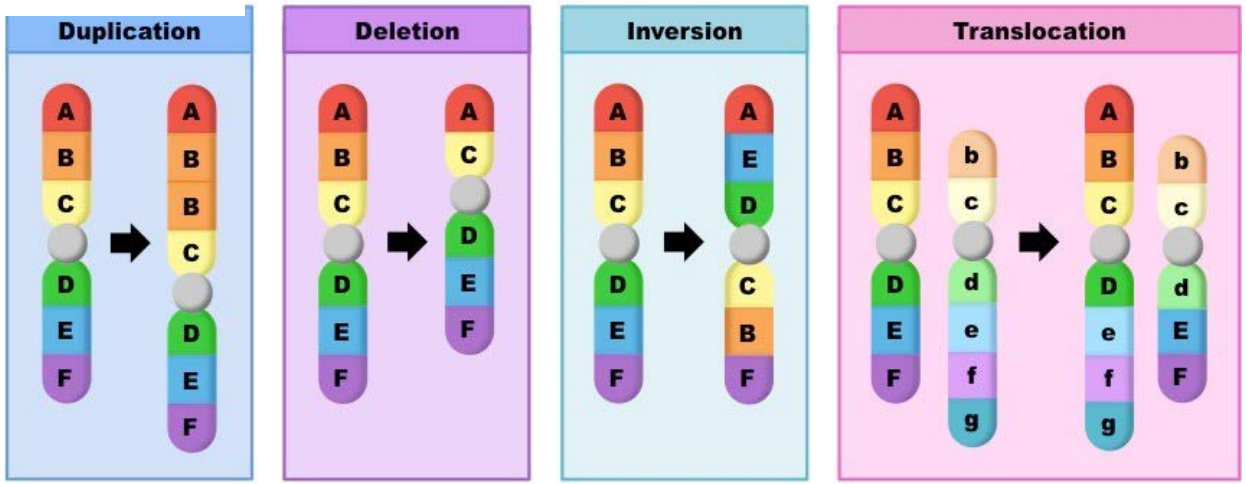
- Any unpredictable change in the structure or amount of DNA of an organism is called a **mutation**.
- Most mutations occur in **somatic (body) cells** and are not passed from one generation to the next.
- Only those mutations which occur in the formation of **gametes** can be inherited.



17

Point Mutations
Frame Shift
Misssense
Nonsense
Insertion

16. D



18. Reproductive Barriers

Reproductive Barriers

- Any **mechanism** that **impedes** two species from producing **fertile and/or viable hybrid offspring**.
- **Two barriers:**
  1. **Pre-zygotic barriers**
  2. **Post-zygotic barriers**

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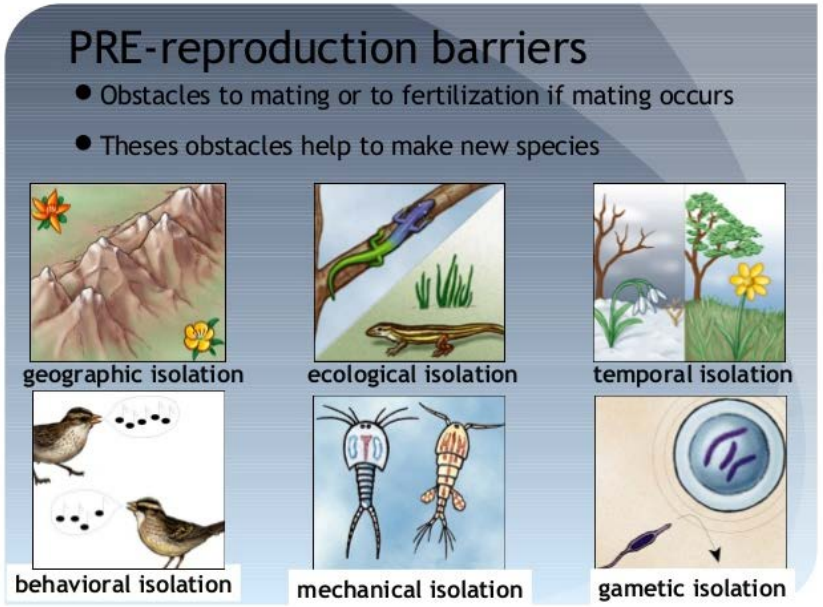
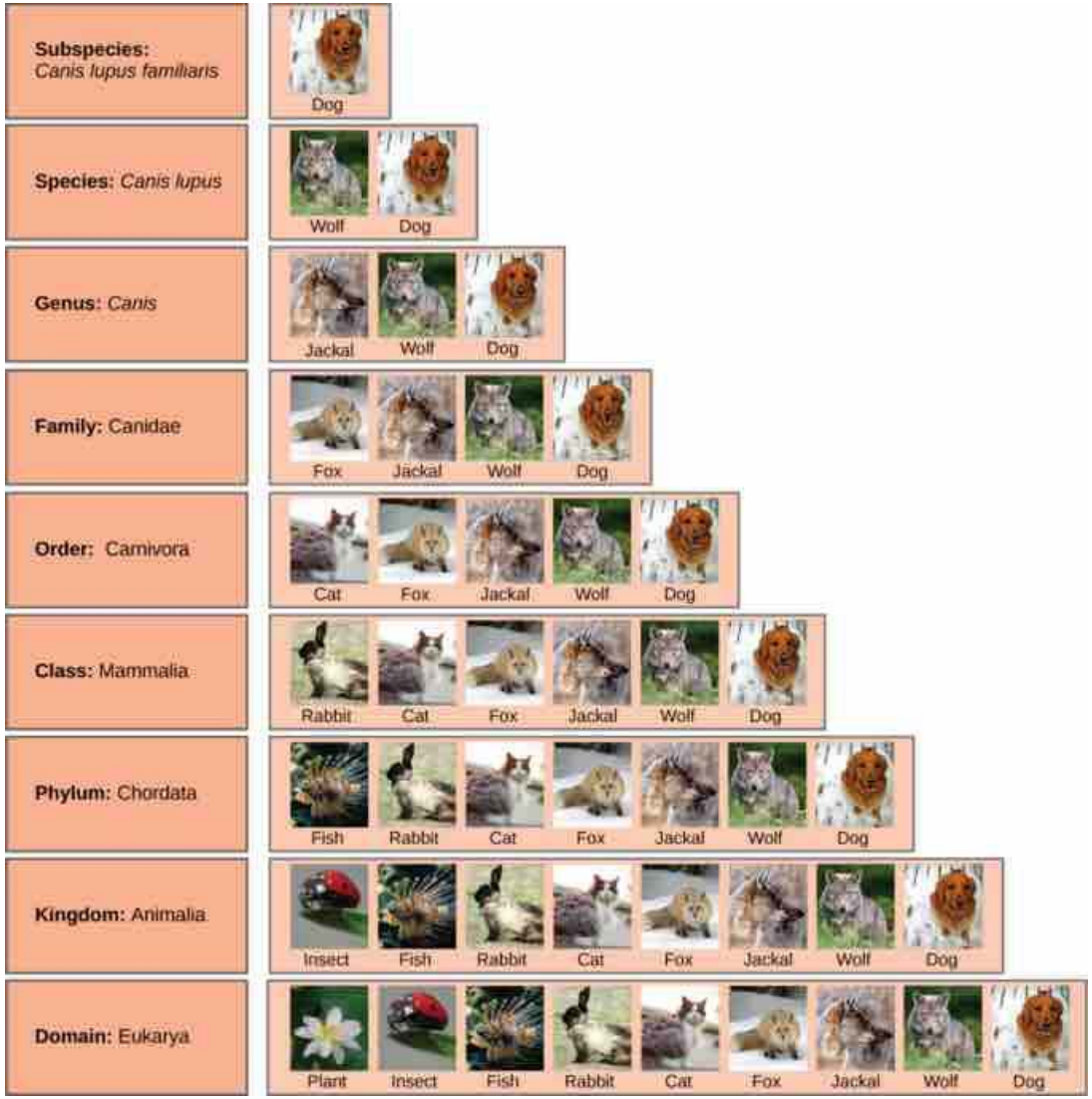


Post-zygotic Barriers

- Prevent hybrid offspring from developing into a viable, fertile adult
  1. Reduced hybrid viability
  2. Reduced hybrid fertility
  3. Hybrid breakdown

19. Taxonomy

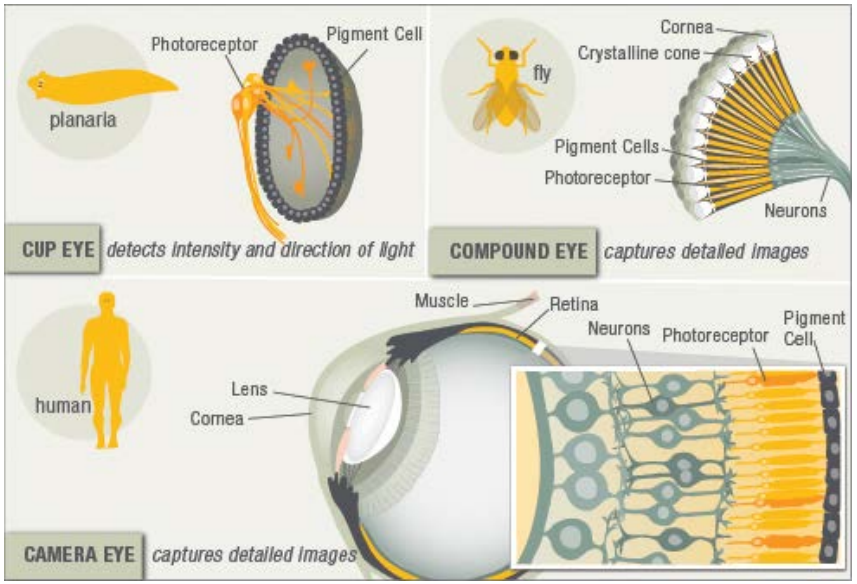


19. D

20. Clade Unique Characteristics

Evolutionary Novelties

- Most novel biological structures evolve in many stages from previously existing structures
- Complex eyes have evolved from simple photosensitive cells independently many times
- Exaptations are structures that evolve in one context but become co-opted for a different function
- Natural selection can only improve a structure in the context of its current utility



Wings
Hair
Eyes