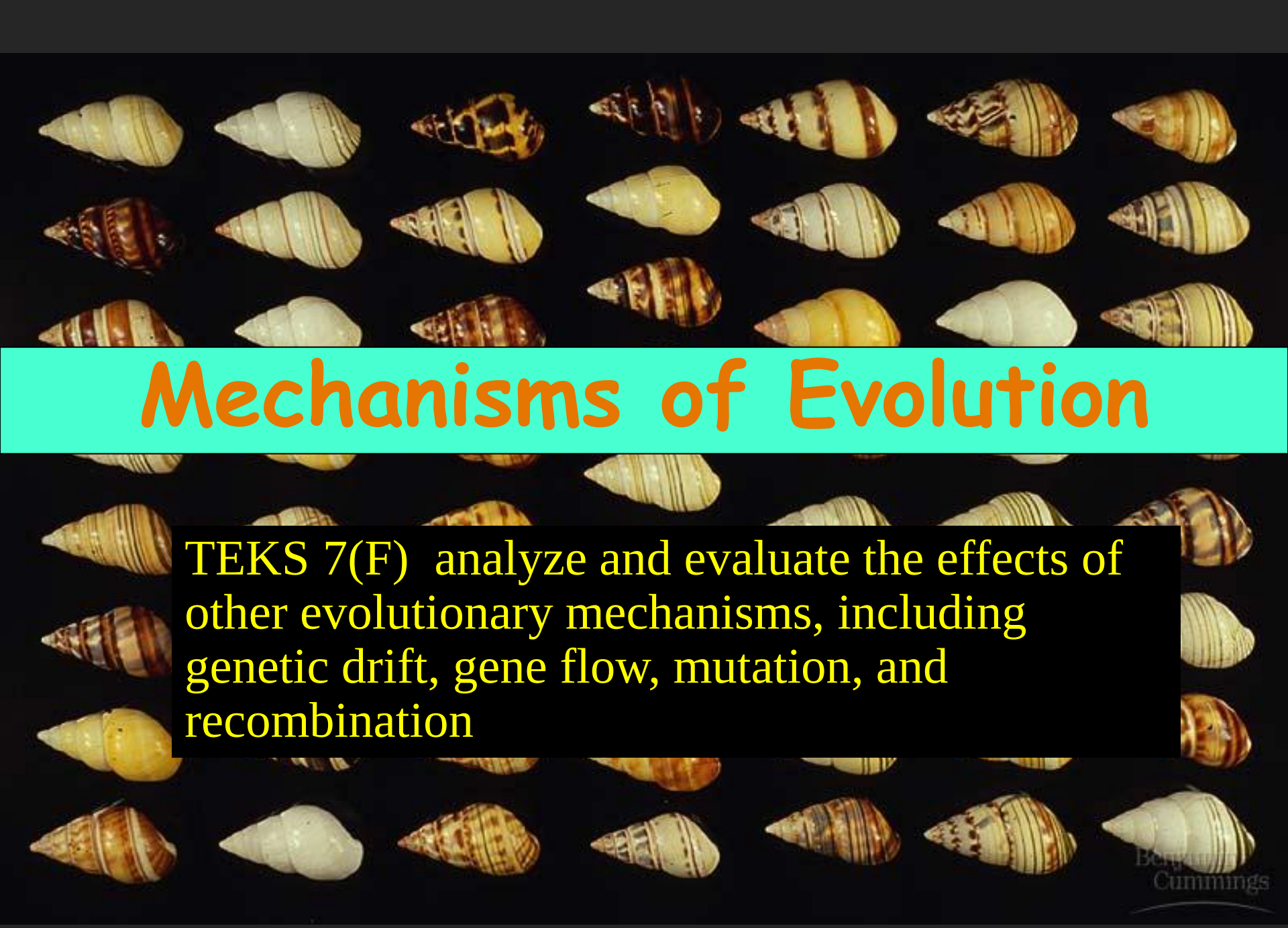


Mechanisms of Evolution

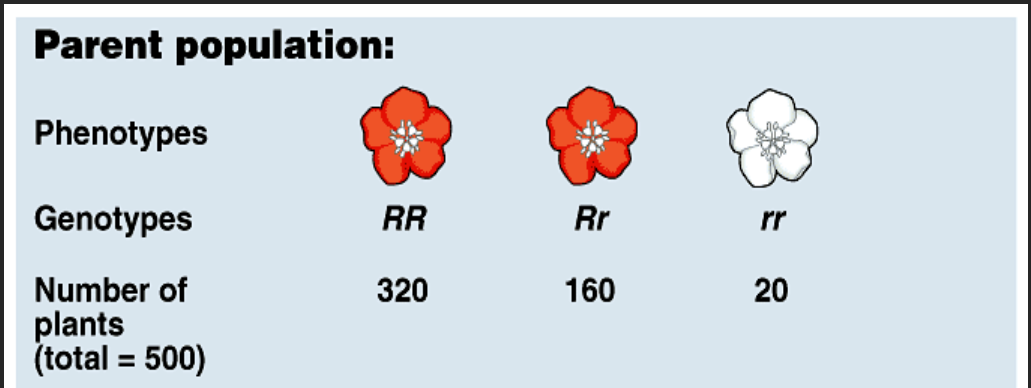
TEKS 7(F) analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination

Evolution is….

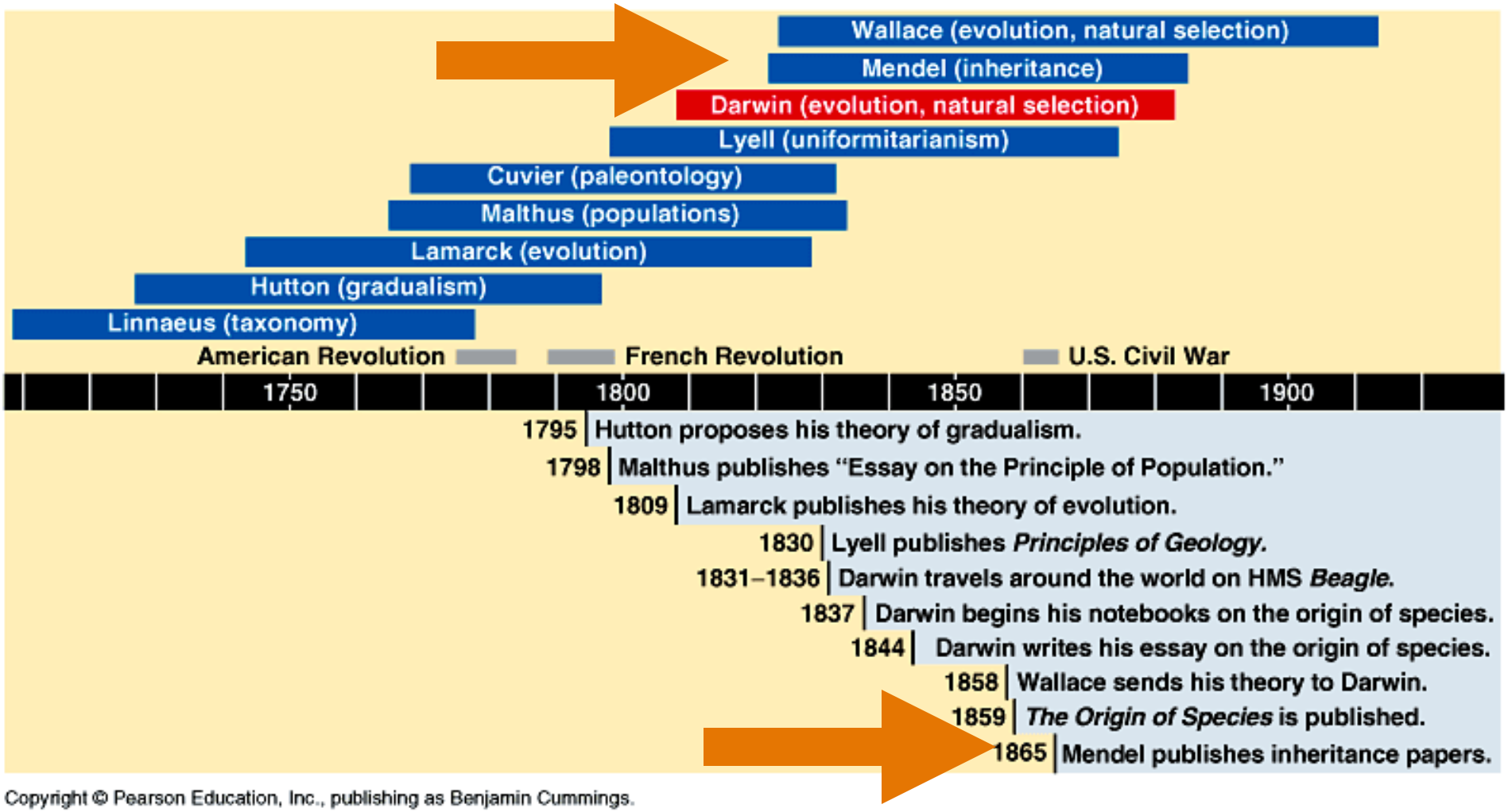
- For Darwin (1859): Evolution is gradual change of heritable traits in a population across generations, eventually generating species over time.

- For the Modern Evolutionary Synthesis (early 20th c.): Evolution is a change in allele frequency over time.

What's an example of an allele?



Modern Evolution Synthesis Discoveries



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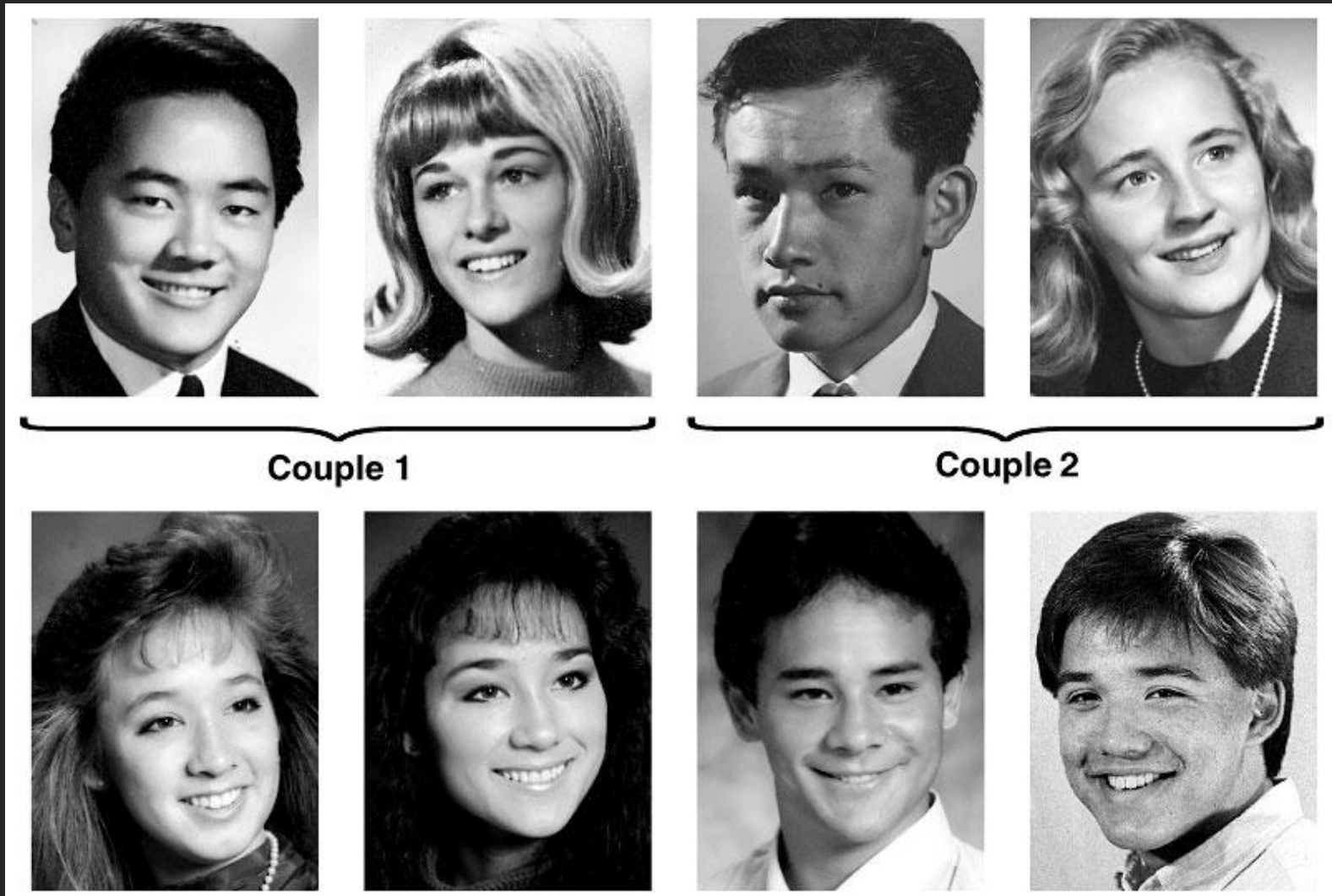
Population Genetics - Terms

- **Population:** Localized group of individuals of the same species
- **Species:** Group of populations whose individuals can potentially interbreed
- **Gene Pool:** Total aggregate of genes in a population at one time
- **Allele:** an alternative form of a gene
- **Homozygous:** have identical alleles for a given trait (dominant or recessive) (e.g. AA or aa in a diploid)
- **Heterozygous:** have >1 different alleles for a given trait (e.g. Aa or aA in a diploid)

Why aren't all individuals of one species identical?

Genetic Diversity

Why aren't all individuals of one species identical?



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Genetic Diversity

Sources of diversity include:

1. Natural selection
2. Genetic Drift
3. Gene Flow
4. Recombination of Genes
5. Mutations
6. Sexual reproduction

These are the 4 main mechanisms of Evolution.

-All can cause a change in allele frequency but to be evolution the change must be in the <u>population</u>.

Natural Selection

- Produces changes in populations like:

1. Adaptation – trait that gives advantage
2. Behavior – action that gives adva
3. Extinction – all species die
4. Speciation – new species forms

Another term for Natural Selection is survival of the fittest.

CHECKPOINT

Which change is most likely an adaptation due to natural selection?

a. A bird loses a leg after being attacked by a raccoon

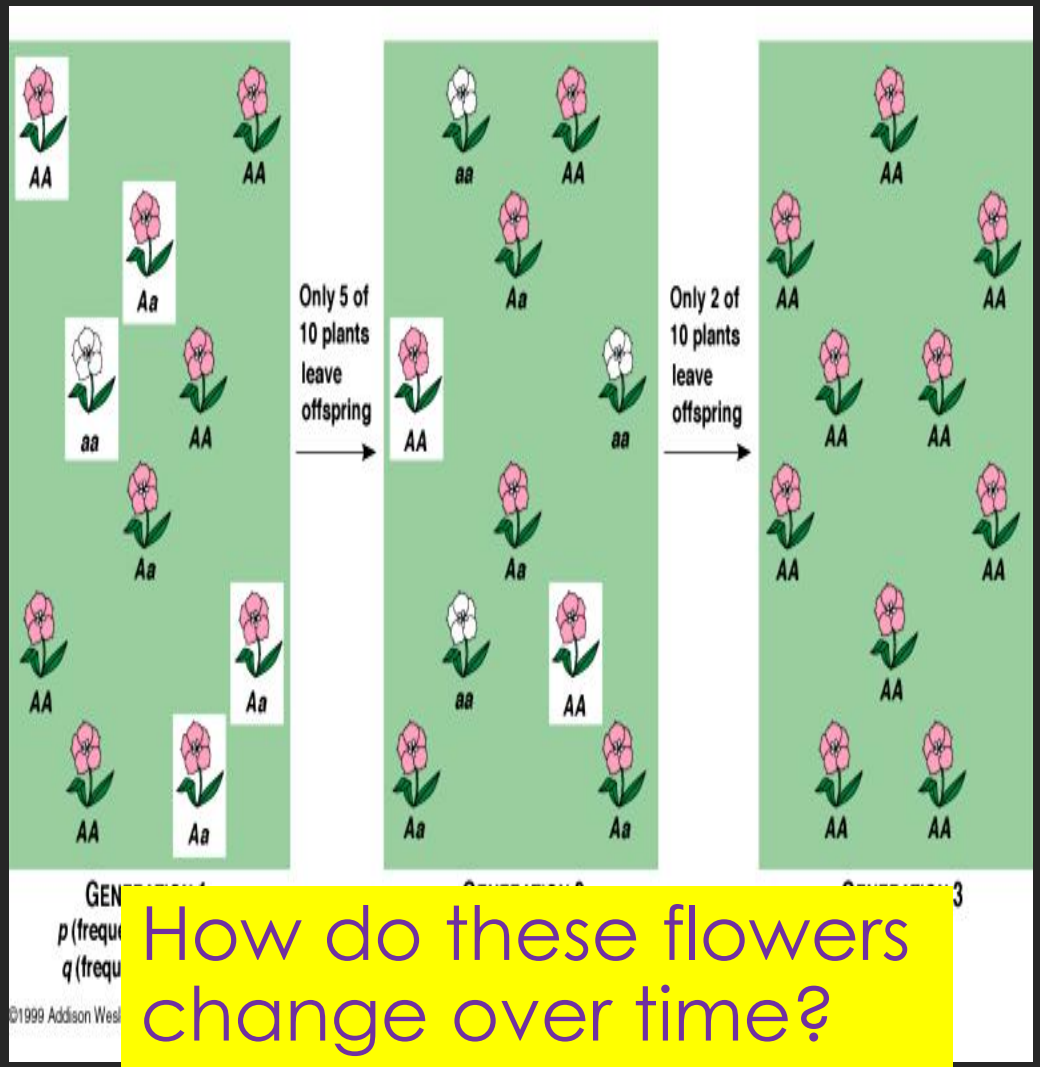
b. An arctic fox's coat changes to white at the onset of winter

c. A mutation in an orange plant causes the orange to develop without seeds.

d. A dog learns to open a gate in a fence

Genetic Drift

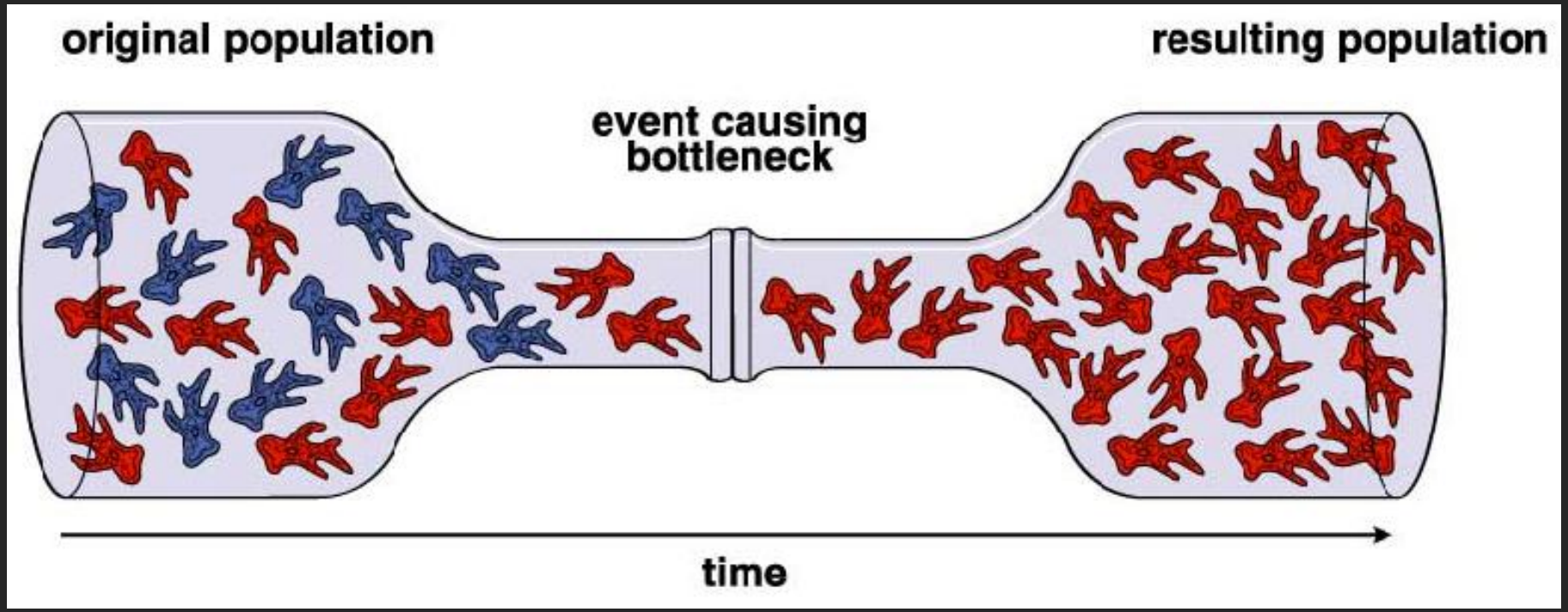
- Random change in allele frequencies from generation to generation.
- Also called sampling error or blind luck.
- Drift occurs in every population and every generation.



How do these flowers change over time?

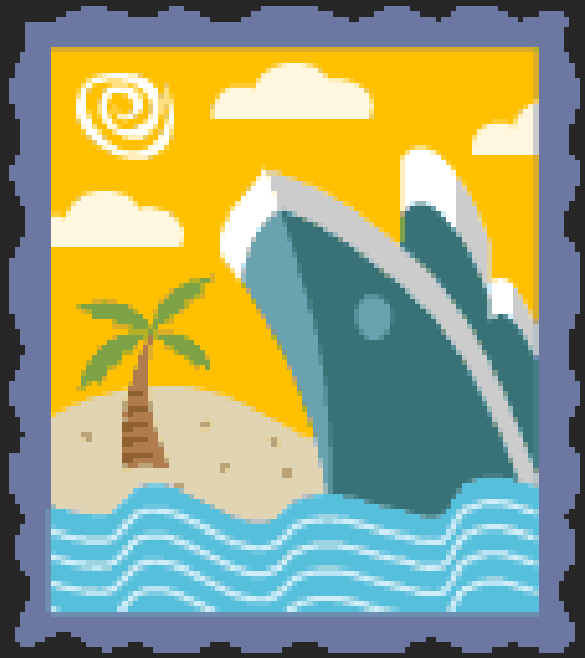
Genetic Drift - Bottleneck

- A bottleneck effect is a sudden reduction in the number of alleles in a population.
- This causes a change in allele frequencies.

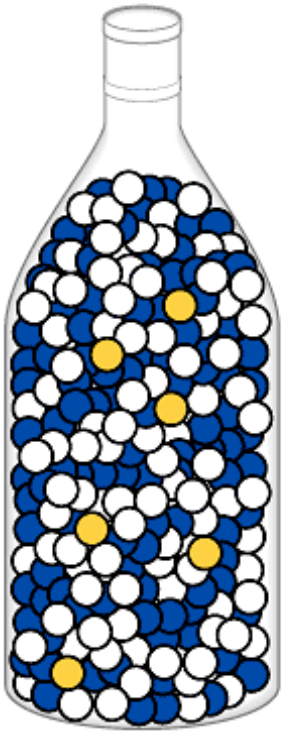


Genetic Drift – The founder effect

- A <u>founder event</u> is when a few individuals immigrate to a new area and establishes a new population.
- The smaller the new population the more likely the allelic frequencies will differ from the original population.



- The founder effect is an example of a population bottle neck



- Mainland
- population

•The founder effect is an example of a population bottle neck

•Mainland

•population

•Colonists from the mainland colonize an island

•The founder effect is an example of a population bottle neck

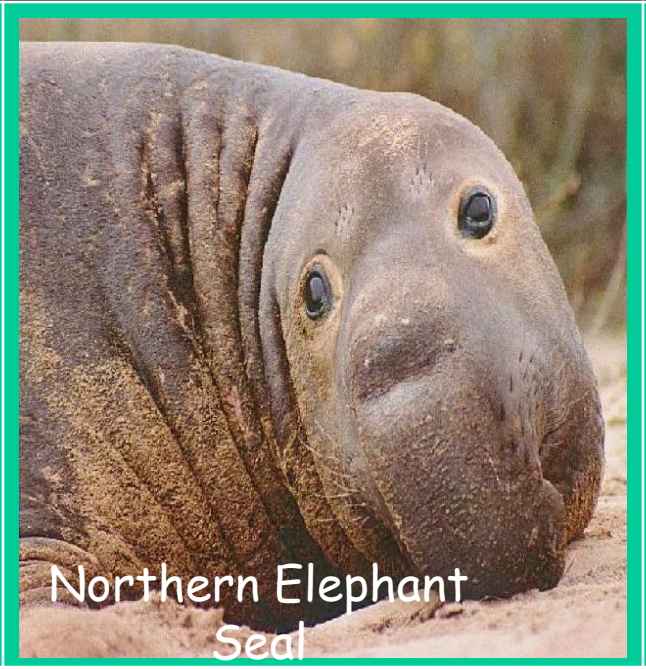
•Mainland
•population

•Colonists from the mainland colonize an island

•Island gene pool is not as variable
•as the mainland's

Genetic Drift Examples

Cheetahs, which are so closely related to each other that skin graft from one cheetah to another do not prov immune responses, t suggesting an extre population bottlene the past.



Reduced to 20 individuals in 1896.
Now 30,000 individuals

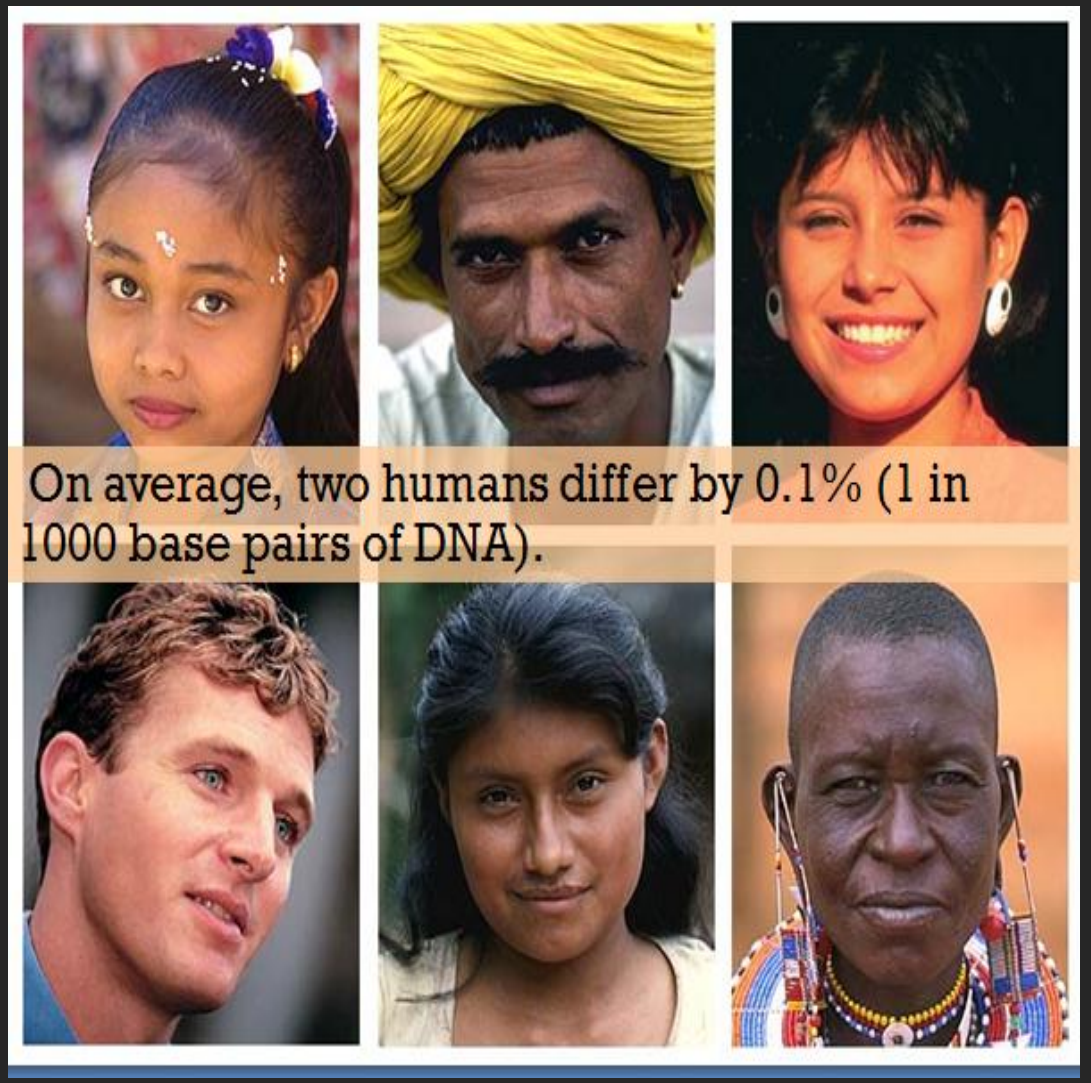
What kind of events could cause a major loss of individuals in a population?

Year	American bison (est)
Before 1492	60,000,000
1890	750
2000	360,000

verhunting almost caused extinction, now has begun to recover.

Gene Flow

- Movement of alleles from one population to another.
- Occurs when individuals leave one population, join another and breed.
- Example "Race"



Gene Flow

- Gene flow can also be called gene migration.
- Female Hamadryas baboons leave their birth group and migrate to a different one, promoting gene flow and maintaining healthy and diverse gene pools.

•http://www.evoedu.com/geneflow.html

CHECKPOINT

A key concept in the modern theory of evolution explains

1 how new organs arise according to the needs of an organism

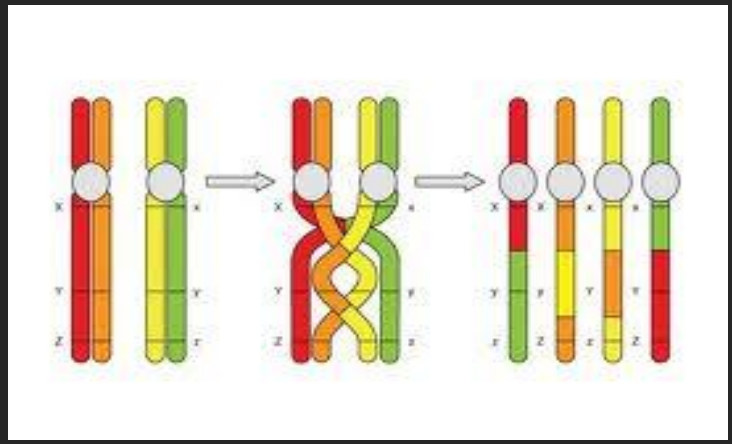
2 how variations occur within a species

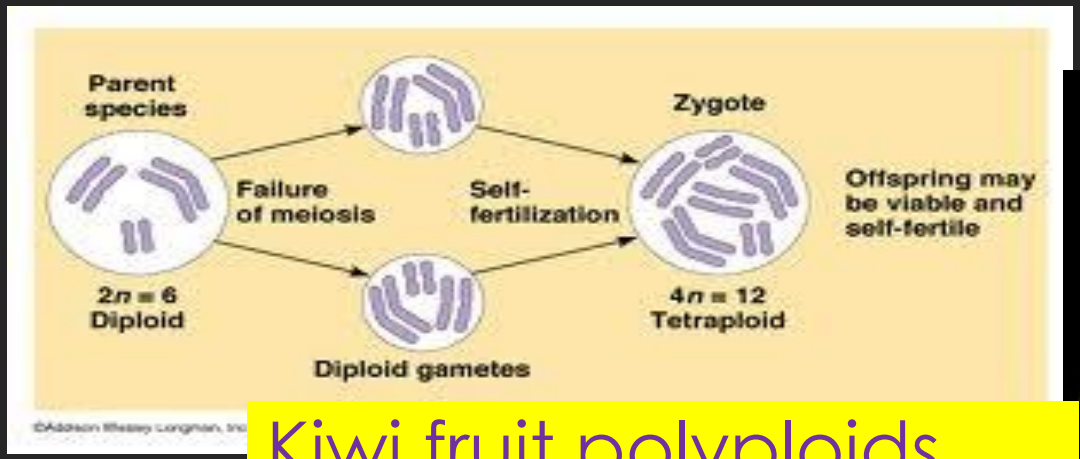
3 the continued increase in the human population

4 the presence of asexual reproduction within a species

Genetic Recombination

- New genes and new organisms can be created through genetic recombination.
- Meiosis - Crossing Over
- Independent Assortment
- Polyploidy – 2N to 4N



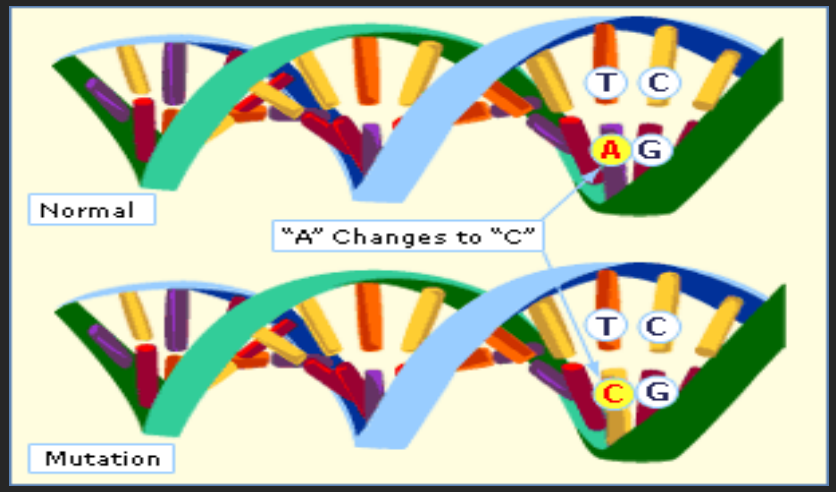


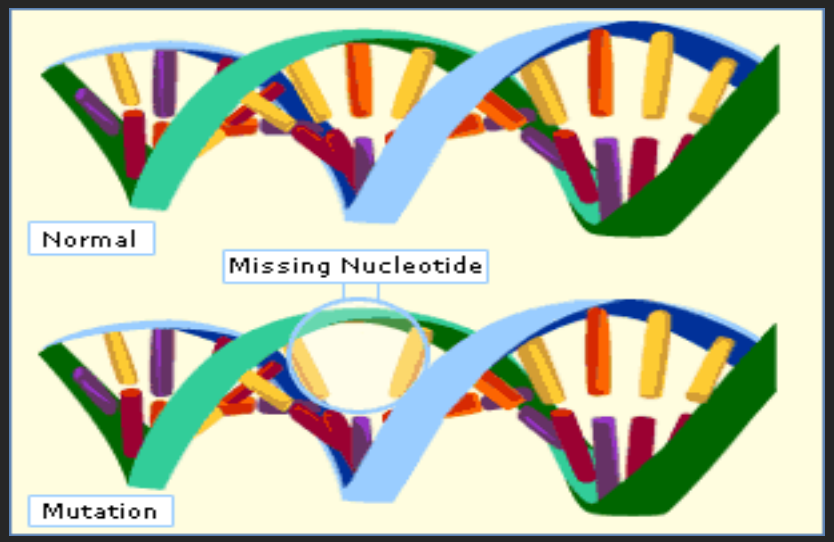
Kiwi fruit polyploids

Mutation

- Most evolutionary forces (selection, drift, gene flow) cause a loss of diversity over time.
- Mutations restore the genetic diversity.

What type of mutations are these?





Sexual Reproduction

- Mating changes allelic frequencies these ways:

1. Inbreeding
2. Sexual Selection
3. Artificial Selection

CHECKPOINT

On the Galápagos Islands, finches adapted to different food sources by changes in their beak structure. What most likely resulted from the finches' beak structure adaptations?

A. a decreased predation on finches

B. an increased species diversity of finches

C. an increased competition among finches

D. a decreased reproductive rate in finches

Any Questions?

NEXT: Work with a partner
to answer the analysis
portion of your notes.