Evolution 2

Adaptation

- Beak size and shape changed in populations of medium ground finch and cactus finch over 30 years
- Changes in size and shape were correlated with weather and seed availability

Adaptation

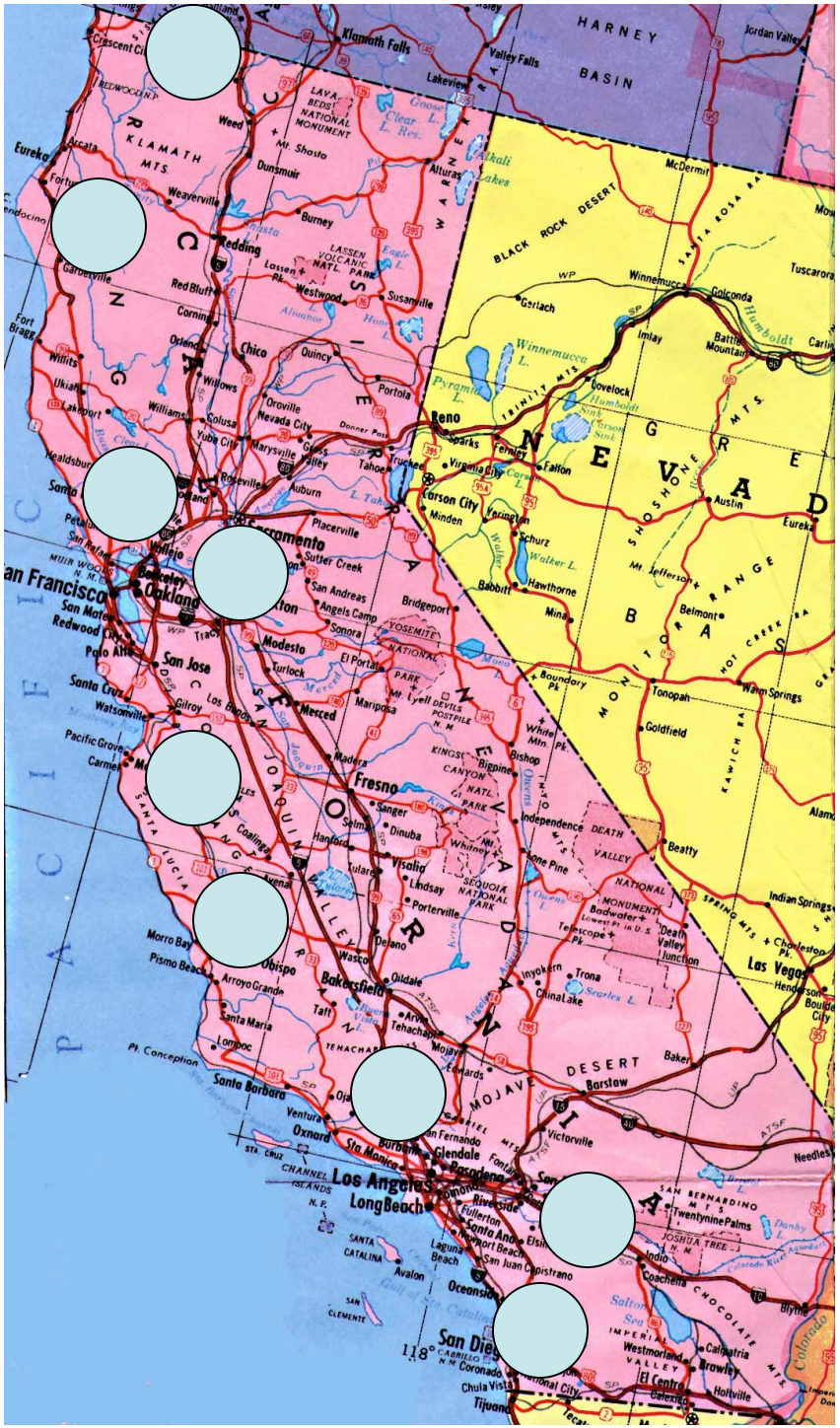
Process: the changes caused by natural selection leading to a greater fit between the **population** and its environment across generations

Trait: a trait that confers higher **fitness** on individuals that have it compared to individuals with any alternative trait

Population

- A group of organisms of the same species that:
  - Occupy a particular geographic region
  - Are substantially more likely to mate with each other than with members of other populations

Wrentit Distribution in California

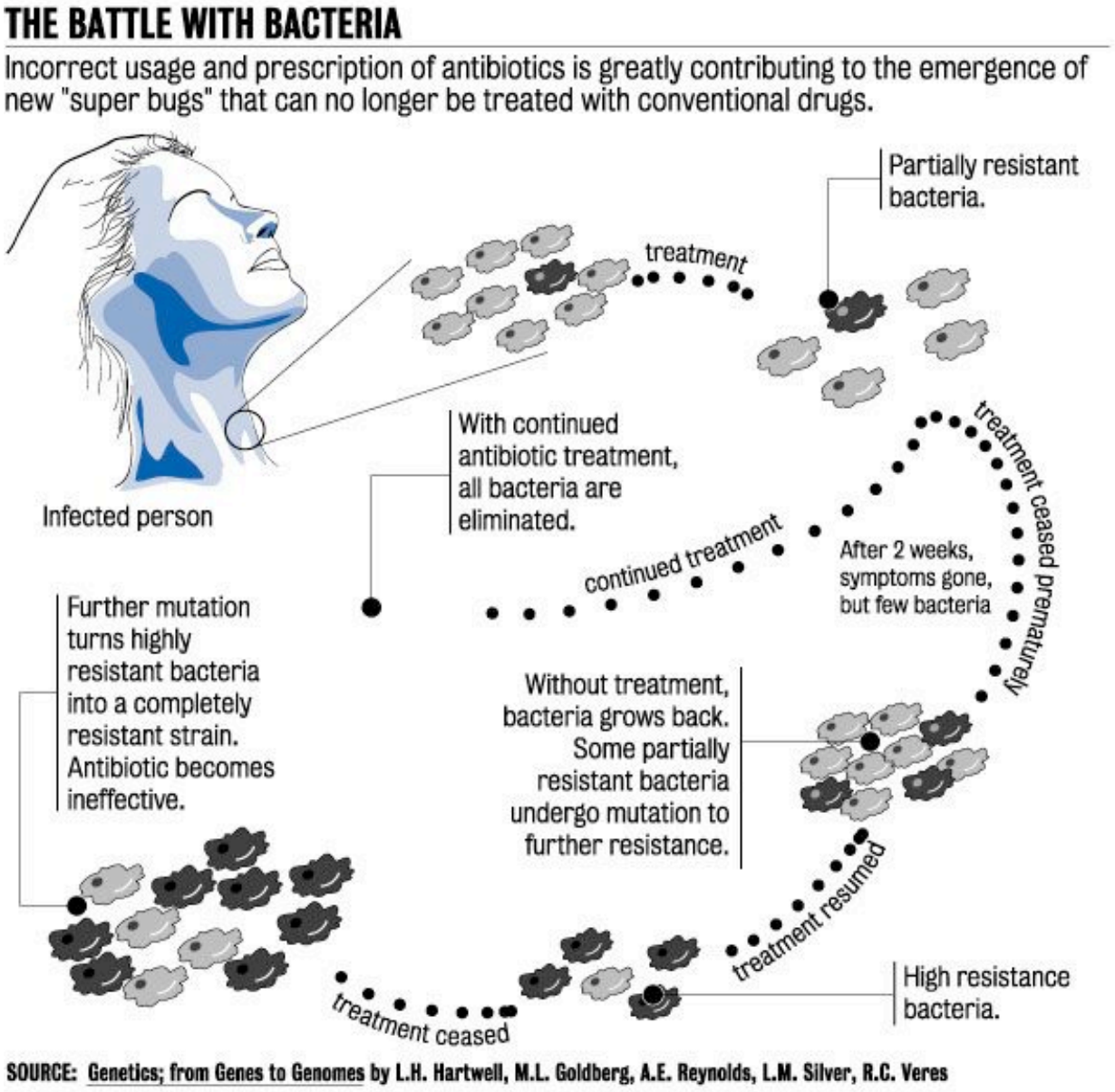


- Wrentit Distribution
  - Population centers

Fitness

- The relative amount of **genetic information** contributed by an individual to the next generation
  - Usually measured in terms of reproductive success relative to the population average
  - Very fit if you produce more than average

Disease evolution



Disease evolution

- **Selection** acts on bacteria
  - Individuals with good adaptations (resistance) survive to reproduce
  - Individuals without those adaptations don't survive
- Population evolves
  - Future generations carry traits of those that survived to reproduce

Disease evolution

- Change in resistance
- Also change in **virulence**
  - Relative ability to cause a disease
  - High virulence = dangerous
- Virulence may be a function of environment
  - Selection on the disease
    - By the host (immune response, etc)
    - By the vectors (water, mosquito, contact)

Disease evolution

- **Vectors**
  - Rhinoviruses- Common cold
  - Passed by contact
  - Selection for milder forms of the cold
    - Severe symptoms result in less mobility
    - Restricts contact
      - No reproduction!

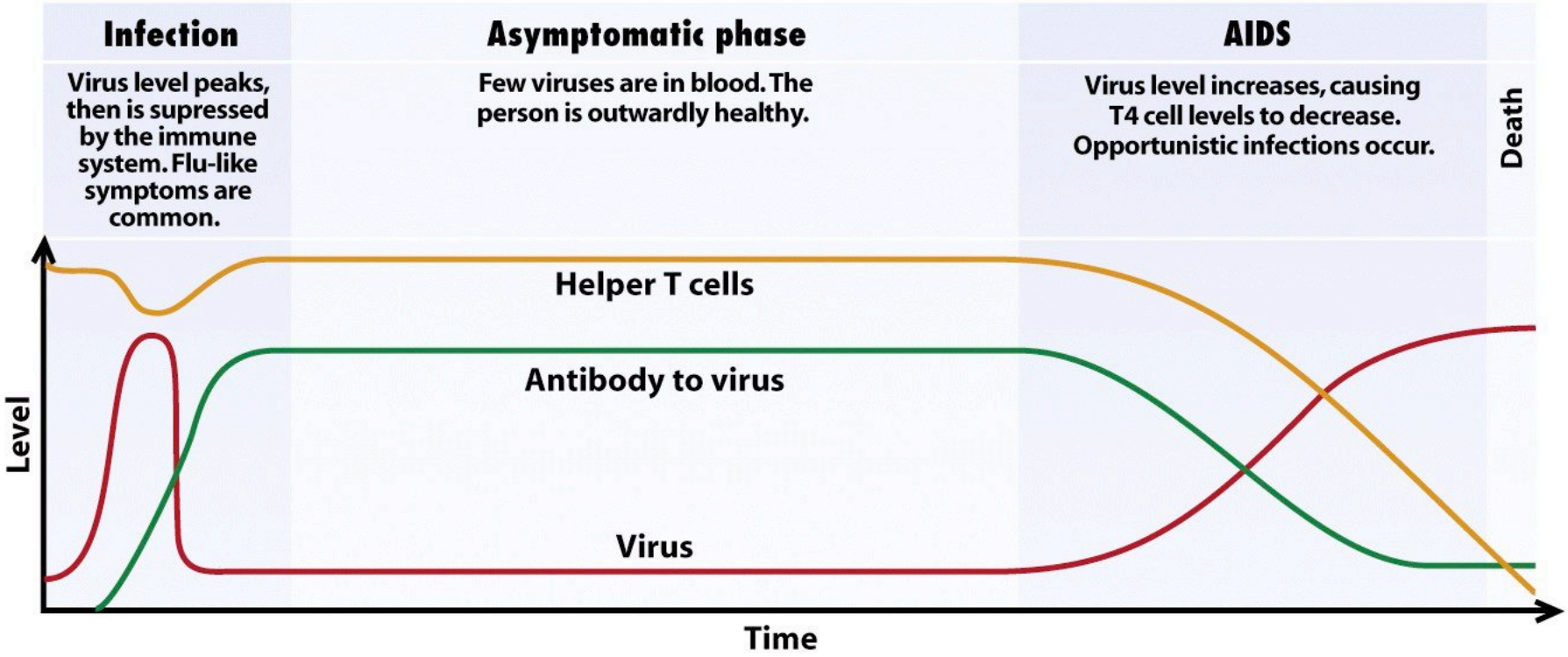
Disease evolution

- Selection by the host
  - HIV is virus that attacks host's immune system (T4 or helper T cells)
    - T cells function to eliminate cells infected by other disease organisms
  - HIV is recognized by B cells
    - Cells naturally produced by immune system to recognize (and help eliminate) most foreign bodies

Which of the following statements BEST describes how selection is acting on rhinoviruses?

1. Rhinoviruses don't want the species to go extinct, so they reduce their rates of reproduction so that everyone benefits.
2. Rhinoviruses with rapid rates of reproduction become different diseases.
3. Rhinoviruses that reproduce rapidly don't get their offspring passed to a new host and are eliminated from the population.
4. Rhinoviruses are not under selection.

Disease evolution



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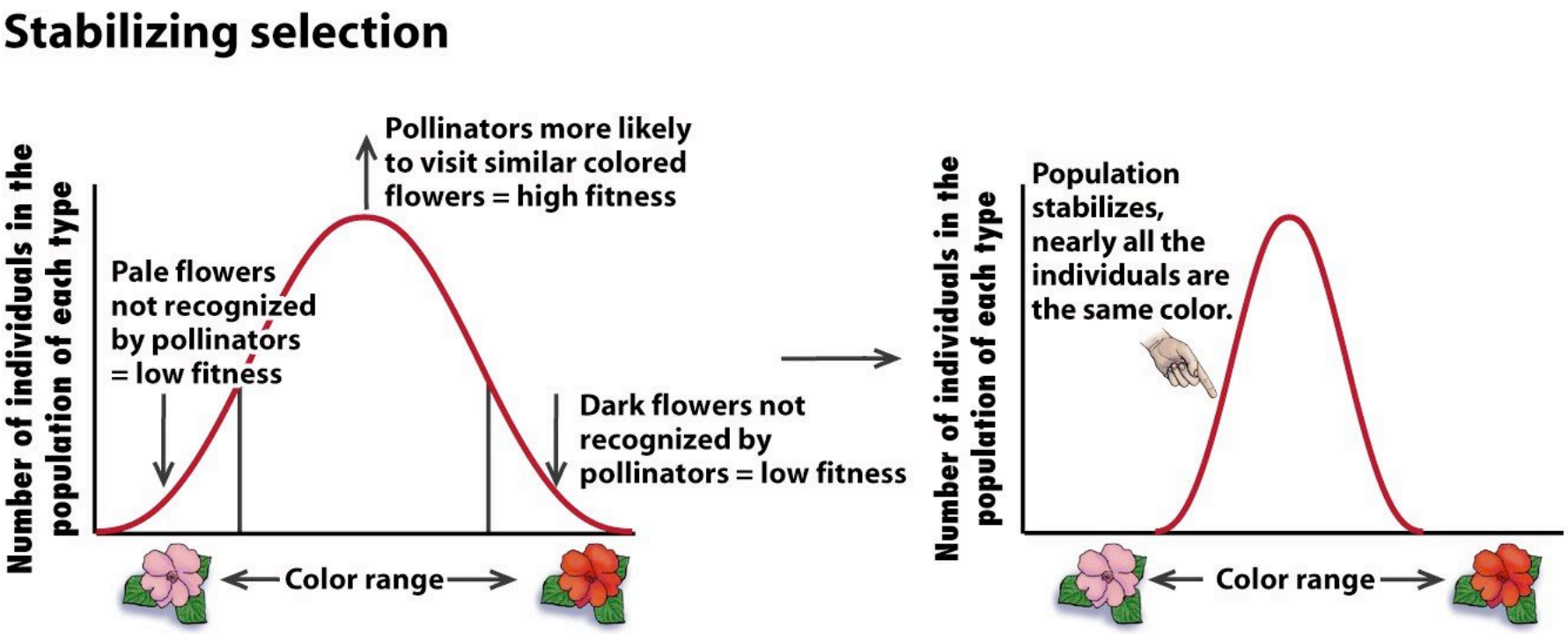
Why do levels decrease?

Why do levels decrease?

Selection and the environment

- Natural selection is a function of the current environment
  - As environments change, so do populations
  - There is no single, best set of traits
    - If environment changes, may result in change in population characteristics
    - May result in creation of new groups

How can populations change?



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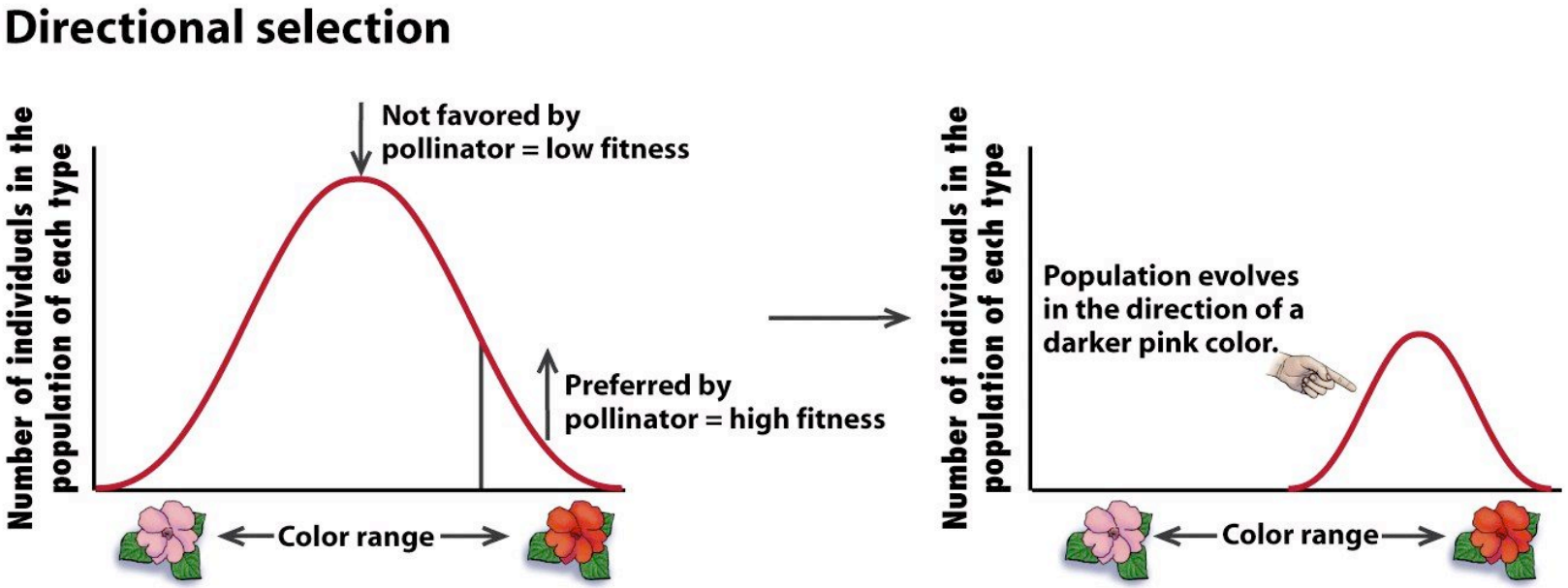
How can populations change?



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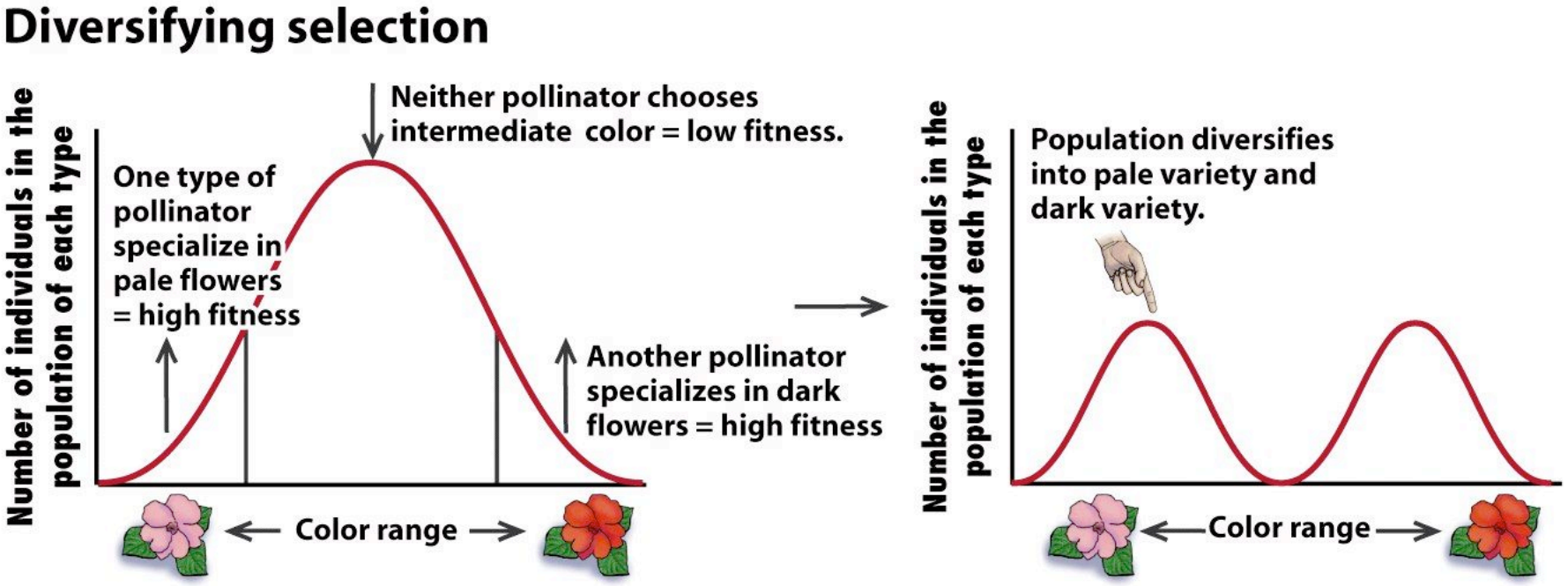
How can populations change?



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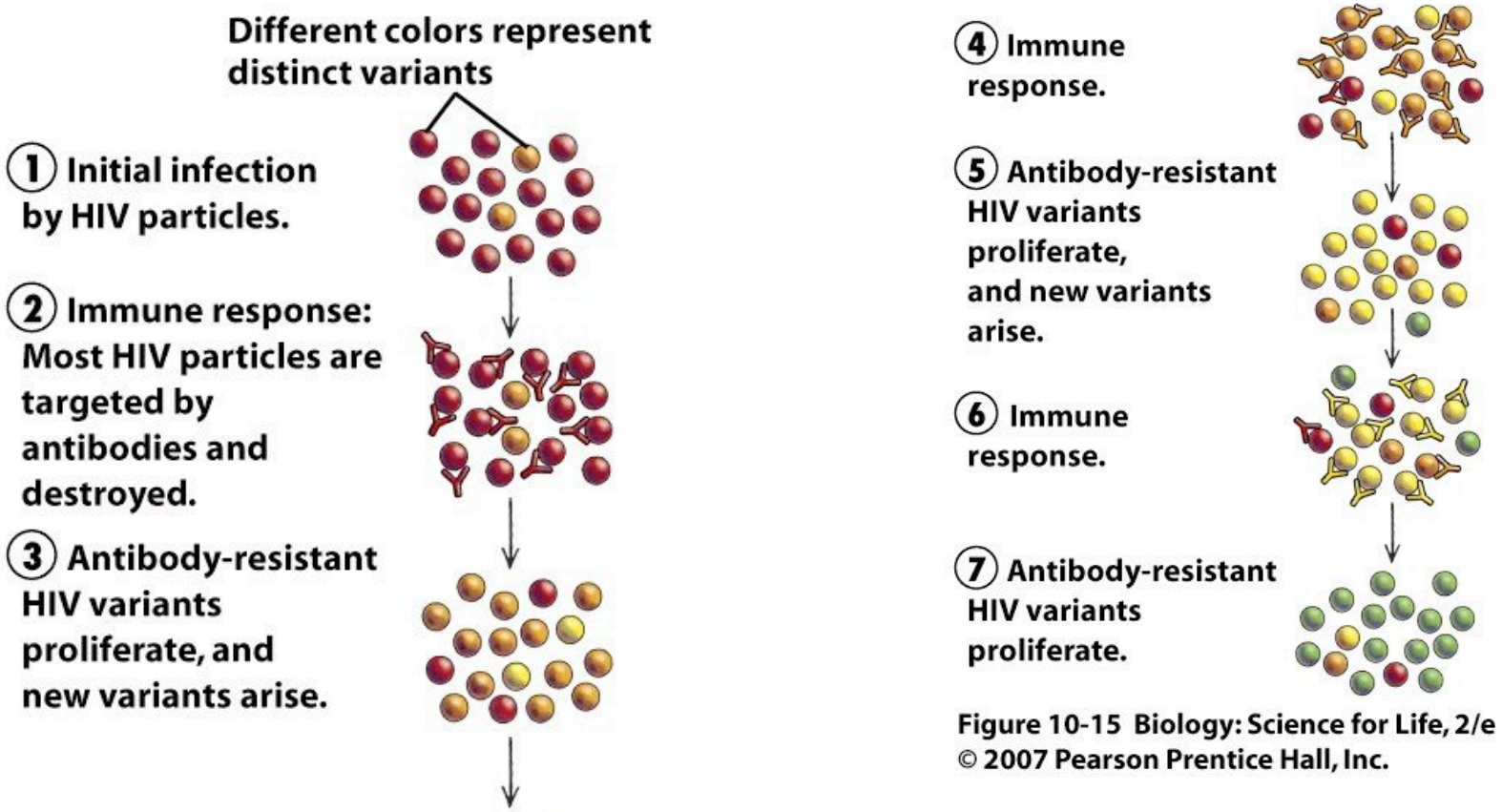
How can populations change?



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