KEY CONCEPT
Evolution occurs in patterns.
Evolution through natural selection is not random.

- Natural selection can have direction.
- The effects of natural selection add up over time.

**FIGURE 11.14 PATTERNs IN NATURAL SELECTION**

In this hypothetical population, green body color is favored by natural selection. With each generation, alleles associated with green body color increase in frequency. Over time, more and more individuals in the population will have the advantageous phenotype.
Convergent evolution describes evolution toward similar traits in unrelated species.
11.6 Patterns in Evolution

- Divergent evolution describes evolution toward different traits in closely related species.
Species can shape each other over time.

- Two or more species can evolve together through coevolution.
  - evolutionary paths become connected
  - species evolve in response to changes in each other
11.6 Patterns in Evolution

- Coevolution can occur in beneficial relationships.
• Coevolution can occur in competitive relationships, sometimes called evolutionary.
Species can become extinct.

- Extinction is the elimination of a species from Earth.
- Background extinctions occur continuously at a very low rate.
  - occur at roughly the same rate as speciation
  - usually affects a few species in a small area
  - caused by local changes in environment
11.6 Patterns in Evolution

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• Mass extinctions are rare but much more intense.
  – destroy many species at global level
  – thought to be caused by catastrophic events
  – at least five mass extinctions in last 600 million years
Speciation often occurs in patterns.

- A pattern of punctuated equilibrium exists in the fossil record.
  - theory proposed by Eldredge and Gould in 1972
  - episodes of speciation occur suddenly in geologic time
  - followed by long periods of little evolutionary change
  - revised Darwin’s idea that species arose through gradual transformations
11.6 Patterns in Evolution

- Many species evolve from one species during adaptive radiation.
  - ancestral species diversifies into many descendent species
  - descendent species usually adapted to wide range of environments