Speciation

Speciation

- In order for speciation to occur:
  - 1. Isolation of the gene pools of sub-groups or populations
    - May be geographic or behavioral
  - 2. Some evolutionary change in one or both populations
    - As a result of differential selection or mutation
  - 3. The evolution of reproductive isolation preventing any future gene flow

Speciation

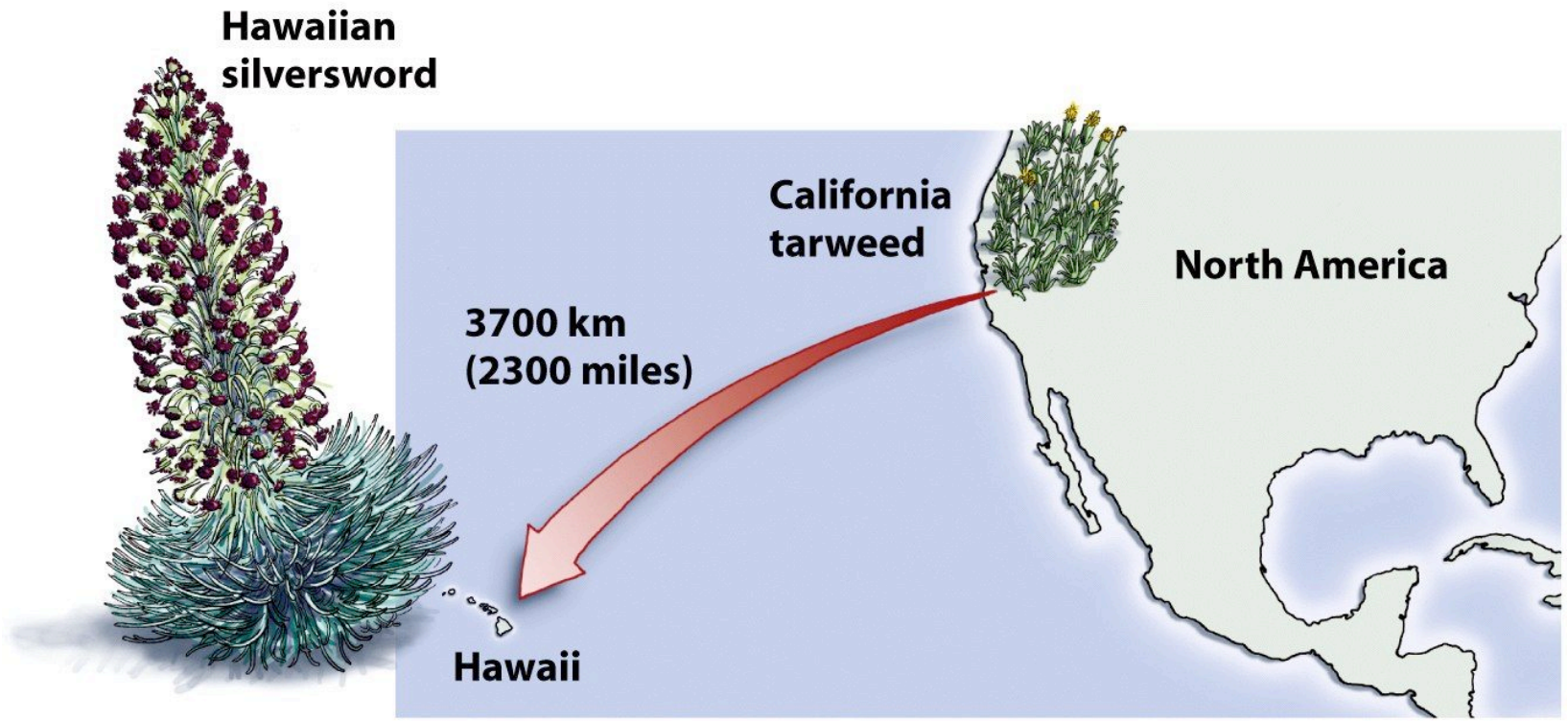


Figure 11-5 Biology: Science for Life, 2/e

Speciation

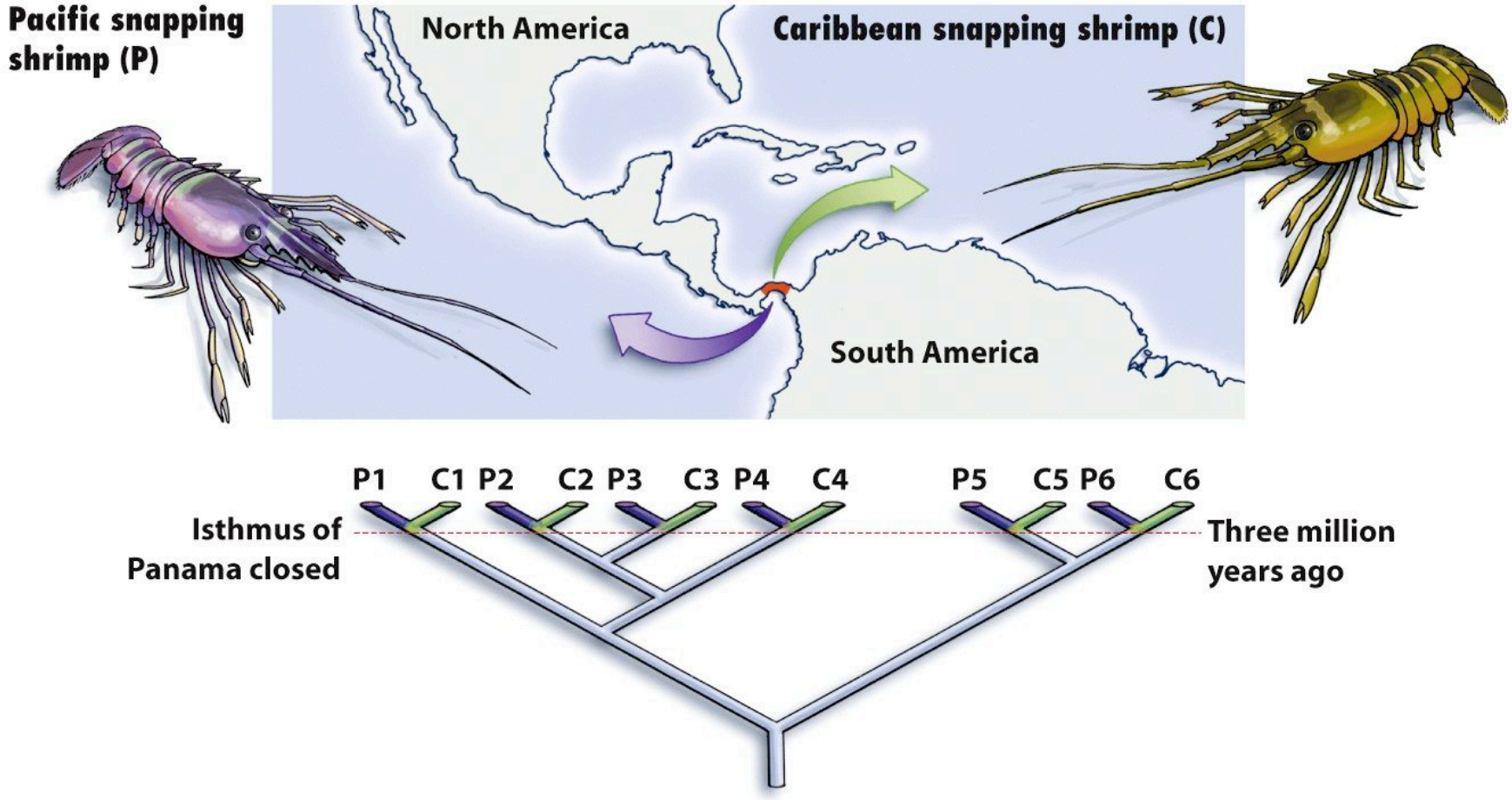
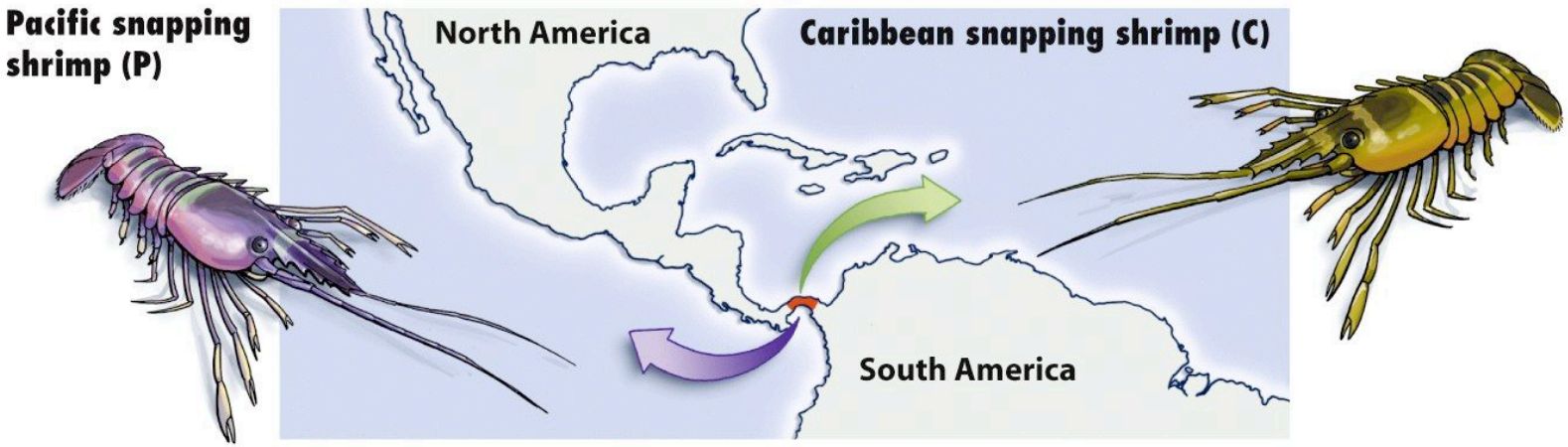


Figure 11-7 Biology: Science for Life, 2/e

Speciation

- Separation by a geographic barrier
  - Isolates and allows for local adaptation
  - Allopatric speciation
    - Geographic isolation



Speciation

- Separation without geographic isolation
  - Different sets of adaptations that result in isolation of gene pools
  - Sympatric speciation
    - Genetic isolation without geographic isolation

Speciation

- Sympatric speciation
  - Can also result from polyploidy
    - Sometimes two different species produce a hybrid that can become a new species
    - More common in plants
      - Because plants can self-fertilize!

Polyploidy

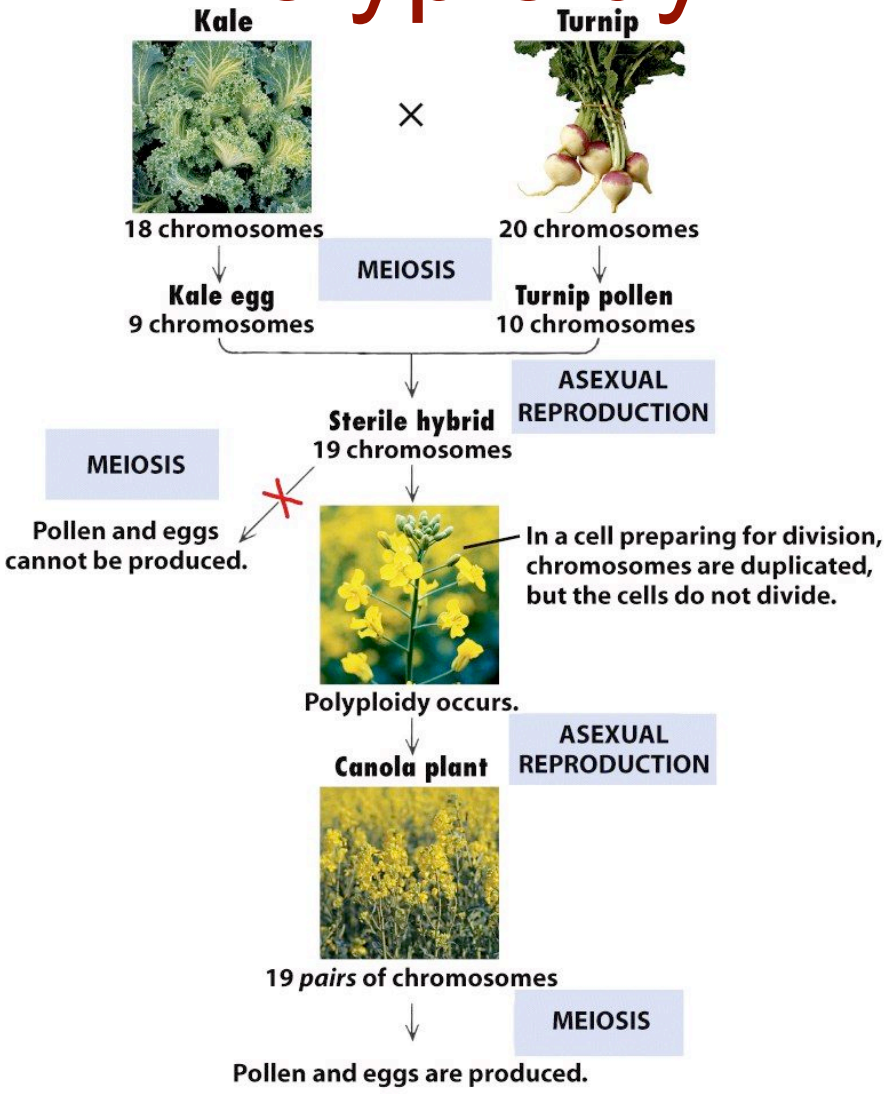


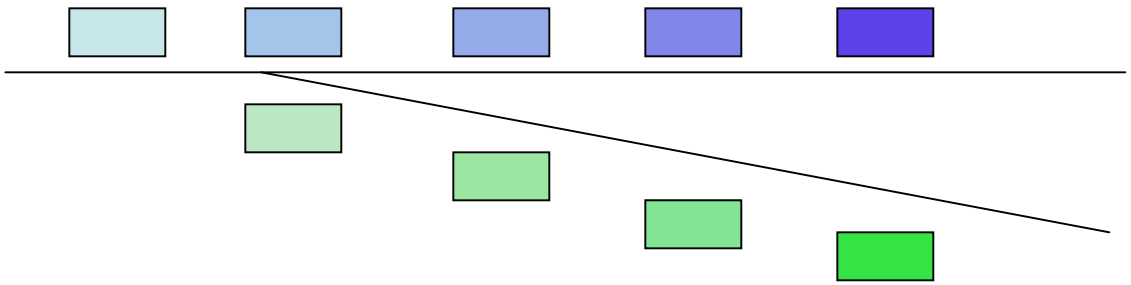
Figure 11-9 Biology: Science for Life, 2/e

Rates of speciation

- In order for speciation to occur, must get reproductive isolation
  - Two models to describe the rate at which speciation occurs
    - 1. Gradualism
    - 2. Punctuated equilibrium

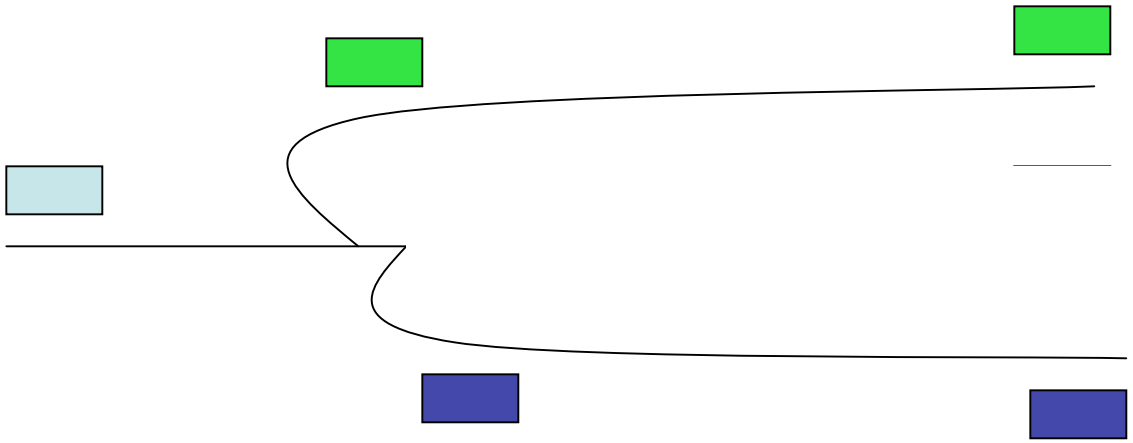
Rates of speciation

- 2 models of the rate of speciation
  - 1. Gradualism
    - 2 types
    - Gradual divergence of a new lineage
    - Gradual change within a lineage



Rates of speciation

- 2. Punctuated equilibrium
  - Due to large environmental shifts, divergences occur abruptly, with relatively little or no change at other times



Speciation

- How do we study speciation?
  - Morphological differences
    - Modern species
    - Fossil species
  - Genetic differences
    - Allele differences within and between populations

Speciation

- If two populations of organisms are different species, then we expect _____ levels of morphological or genetic variation between the populations than within the population.

Speciation and genes

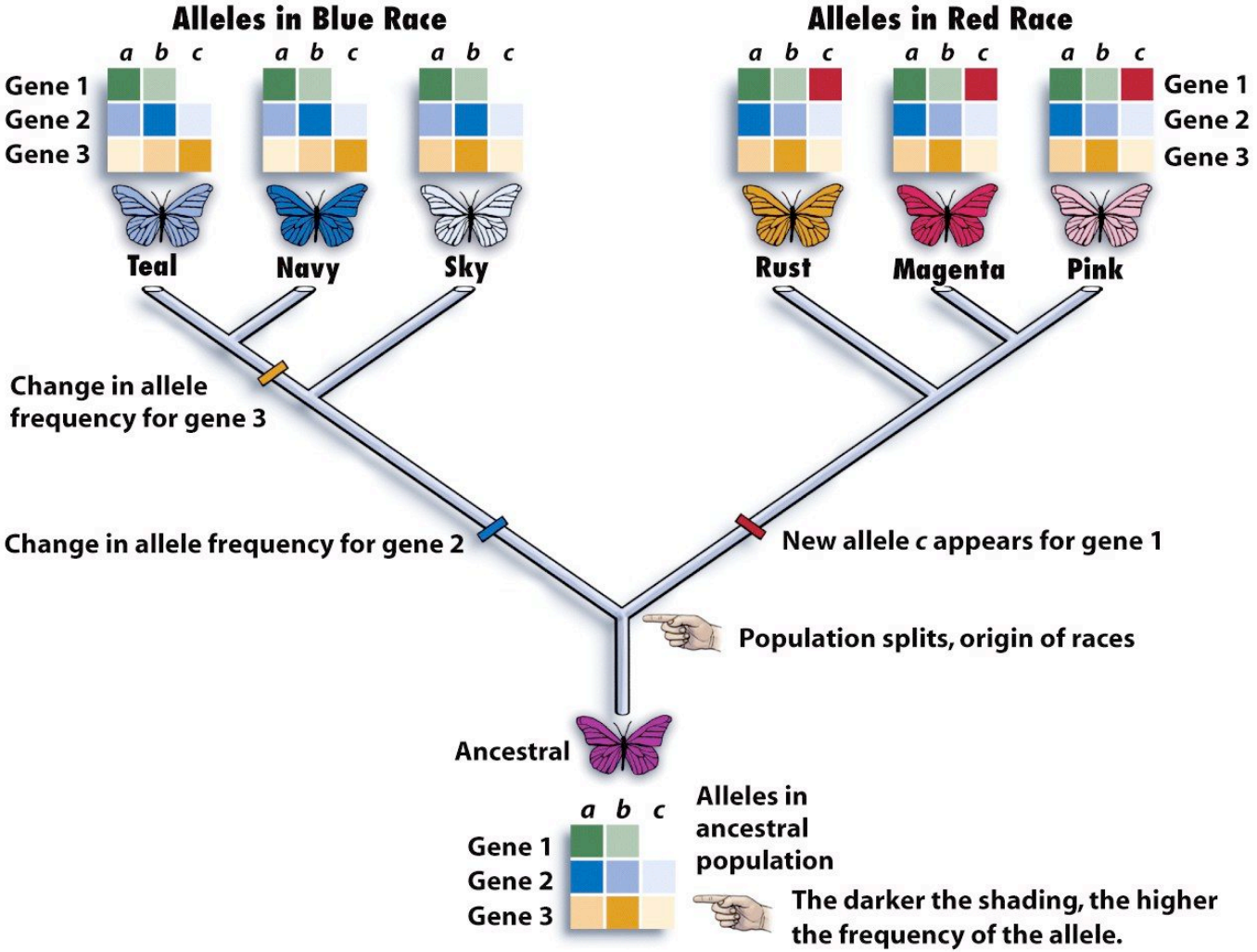
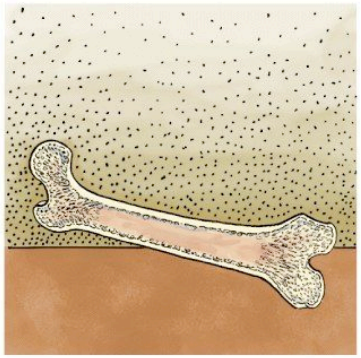


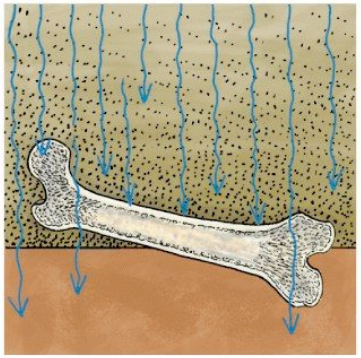
Figure 11-16 Biology: Science for Life, 2/e

Speciation and fossils

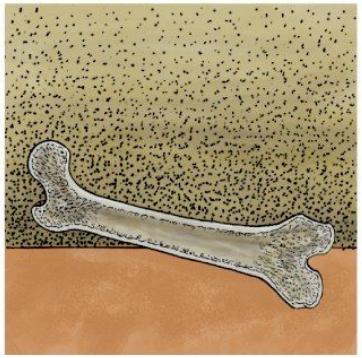
- What are fossils?
  - Remains of living organisms
    - Left as casts or as rocks



1. An organism is rapidly buried in water, mud, sand, or volcanic ash. The tissues begin to decompose very slowly.



2. Water seeping through the sediment picks up minerals from the soil and deposits them in the spaces left by the decaying tissue.



3. After thousands of years, most or all of the original tissue is replaced by very hard minerals, resulting in a rock model of the original bone.

4. When erosion or human disturbance removes the overlying sediment, the fossil is exposed (as shown here looking from above).

Figure 9-21 Biology: Science for Life, 2/e

Speciation and fossils

- What are fossils?
  - Dying organisms may get covered in sediment. As sediment hardens, organism decays but leaves imprint in sediment.

Speciation and fossils

- Can use sediment layers to estimate age of fossils

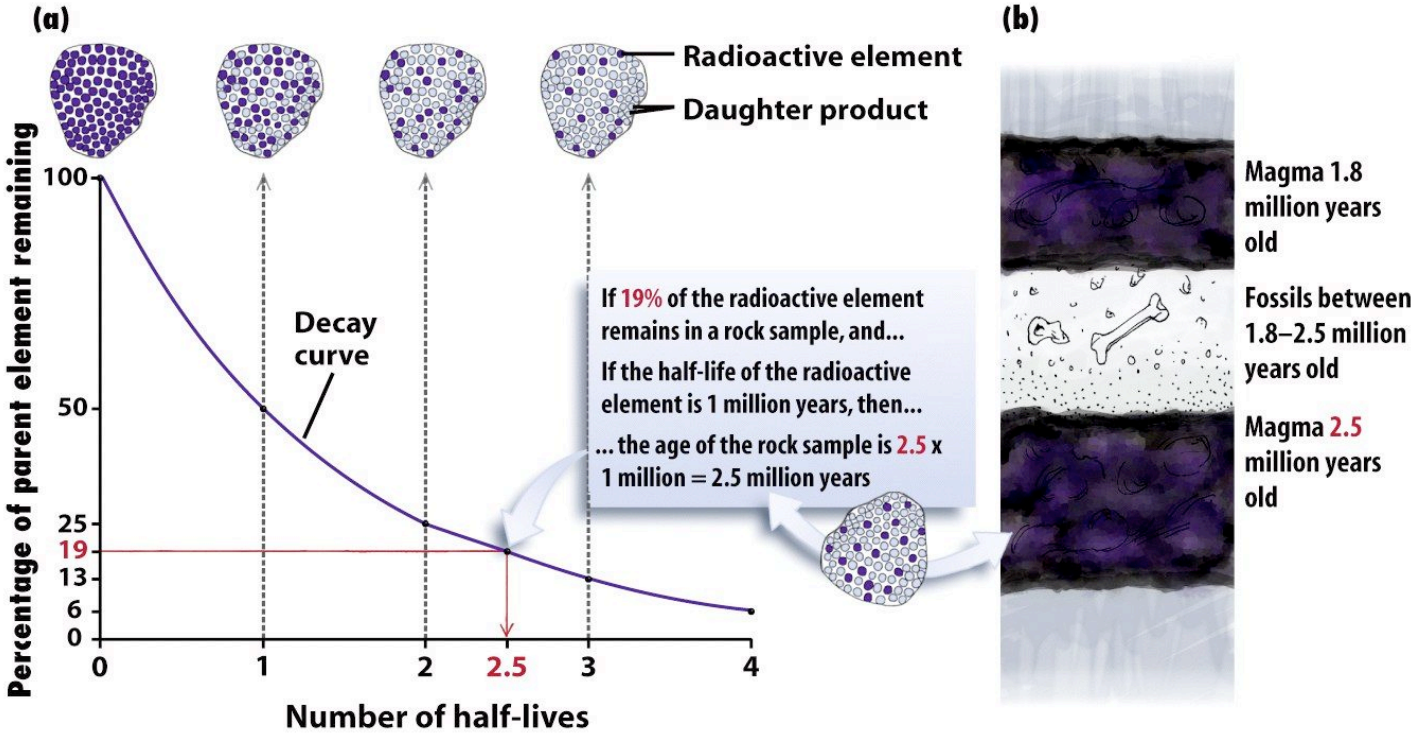


Figure 9-24 Biology: Science for Life, 2/e