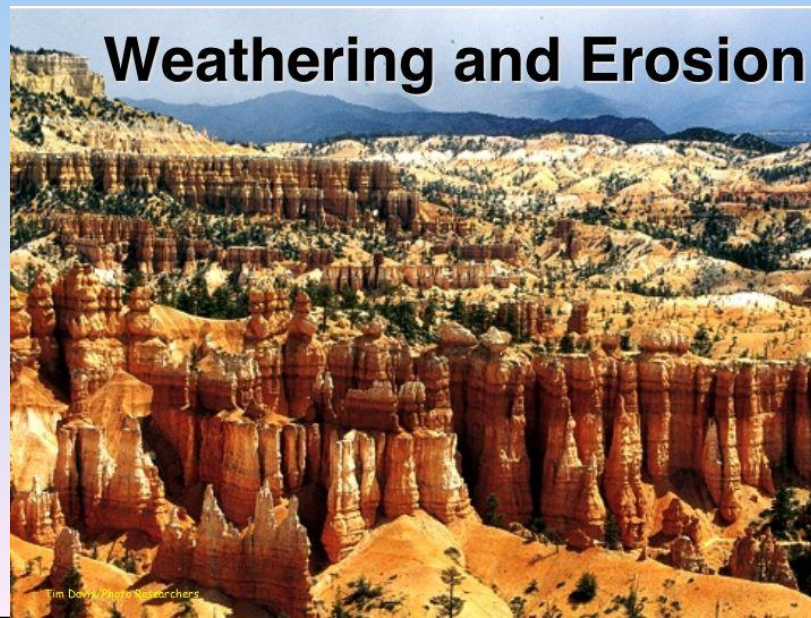


Chapter **Weathering**

5.1

You will be able to...

- *Define mechanical weathering*
- *Explain chemical weathering*
- *Identify the factors that affect the rate of weathering.*

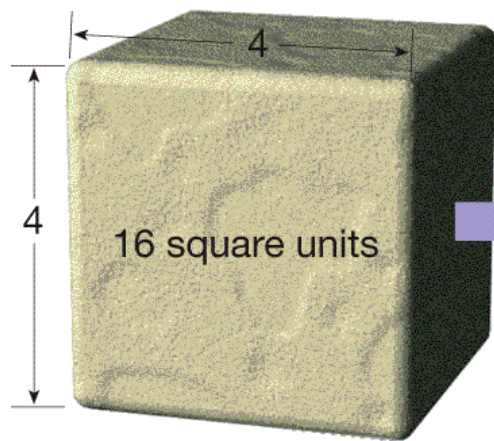


5.1 Mechanical Weathering

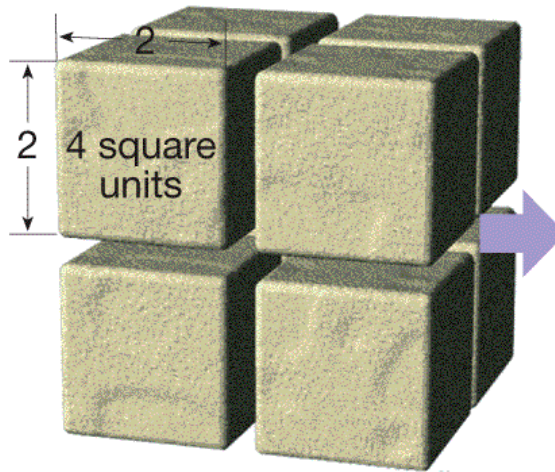
- ◆ **Mechanical weathering** occurs when physical forces break rock into smaller and smaller pieces without changing the rock's mineral composition.
- ◆ Break rock into smaller pieces by ice, plants, animals, gravity, running water, and wind.



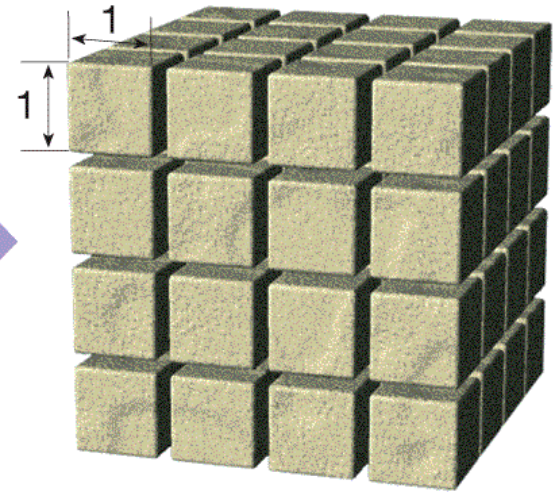
Increase in Surface Area by Mechanical Weathering



$$\begin{array}{l} 16 \text{ square units} \times \\ 6 \text{ sides} \times \\ 1 \text{ cube} = \\ \hline 96 \text{ square units} \end{array}$$



$$\begin{array}{l} 4 \text{ square units} \times \\ 6 \text{ sides} \times \\ 8 \text{ cubes} = \\ \hline 192 \text{ square units} \end{array}$$



$$\begin{array}{l} 1 \text{ square unit} \times \\ 6 \text{ sides} \times \\ 64 \text{ cubes} = \\ \hline 384 \text{ square units} \end{array}$$

5.1 Mechanical Weathering

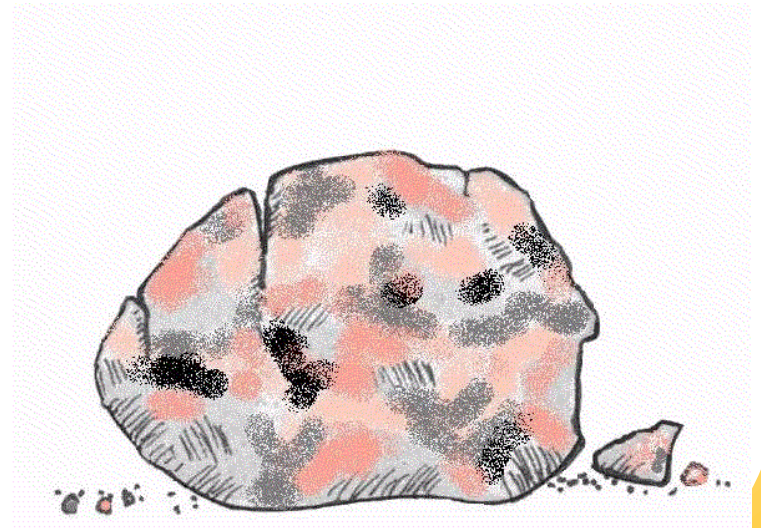
1. Frost wedging (1 of 2)

- Water enters spaces in the rock and freezes
- Water expands when it freezes and breaks the rock apart.

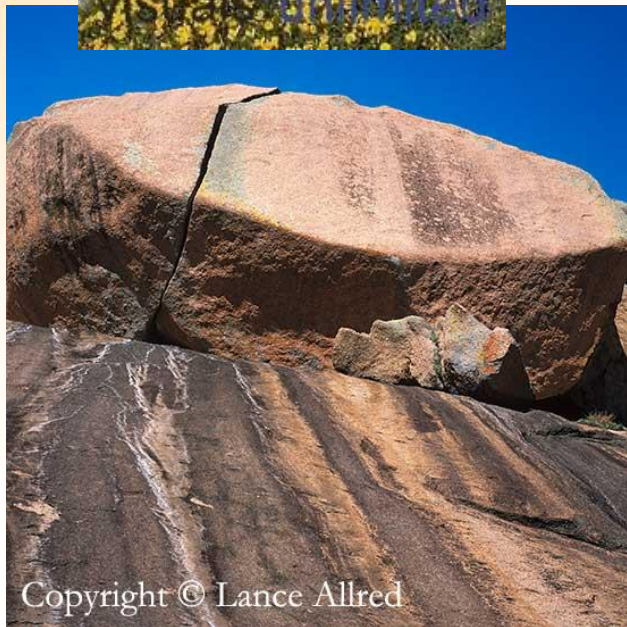


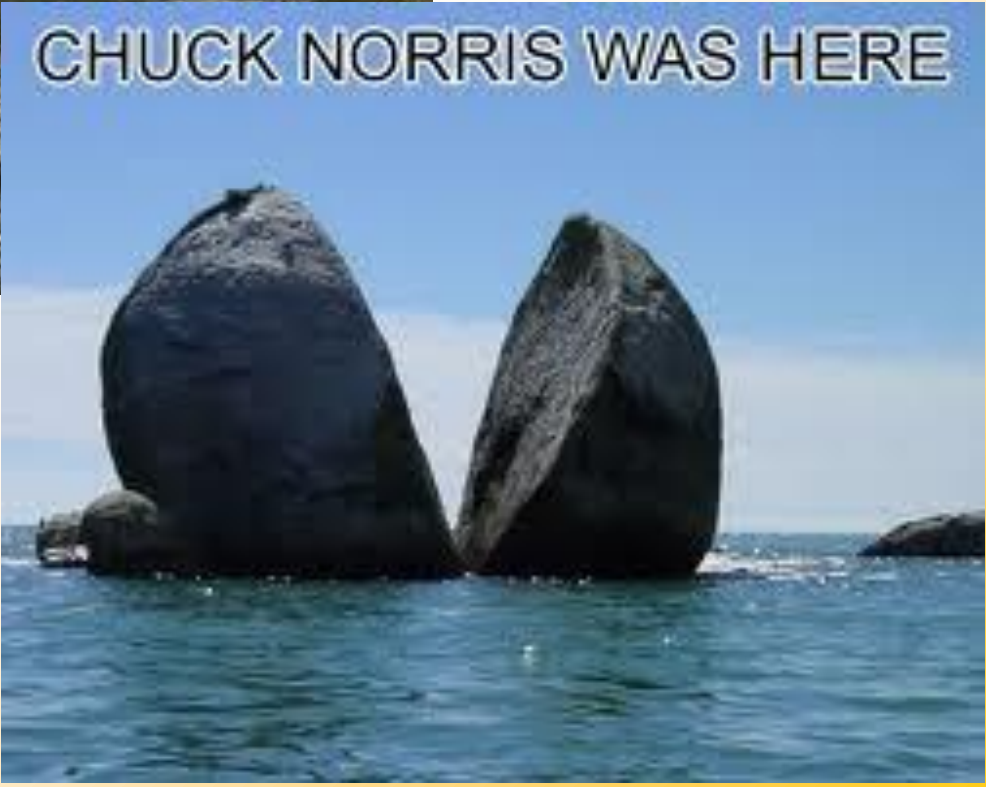
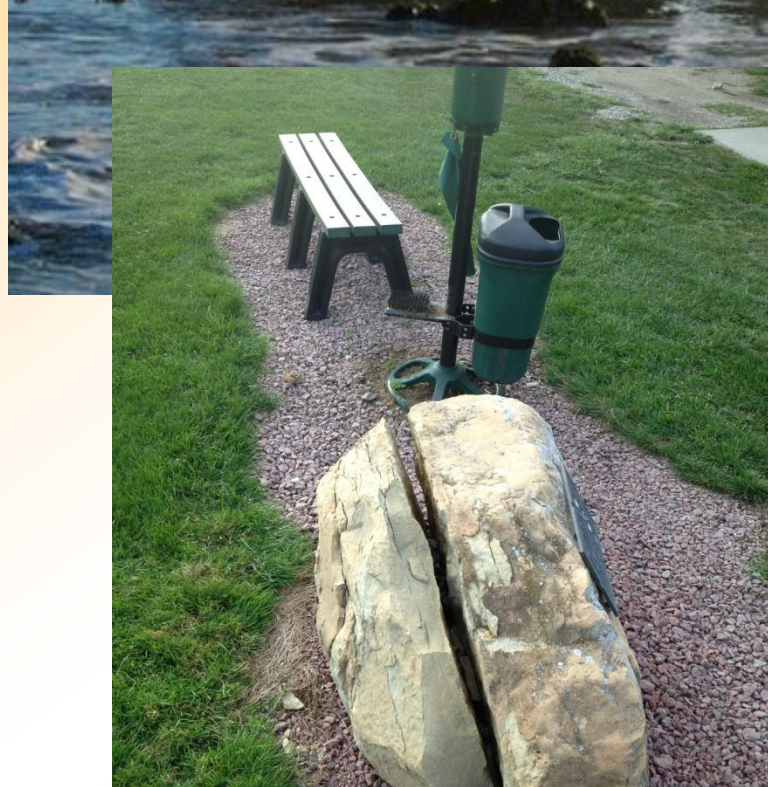
Figure 3 Frost Wedging Rainwater entered cracks in this boulder. Each time the water froze, it expanded. Eventually, the boulder split.

Weathering, Soil, and Mass Movements



Frost or Ice Wedging







5.1 Mechanical Weathering

1. Frost or Ice Wedging (2 of 2)

- Rock that are wedged loose may tumble into large piles called **talus**
 - *Which typically form at the base of steep, rocky cliffs.*

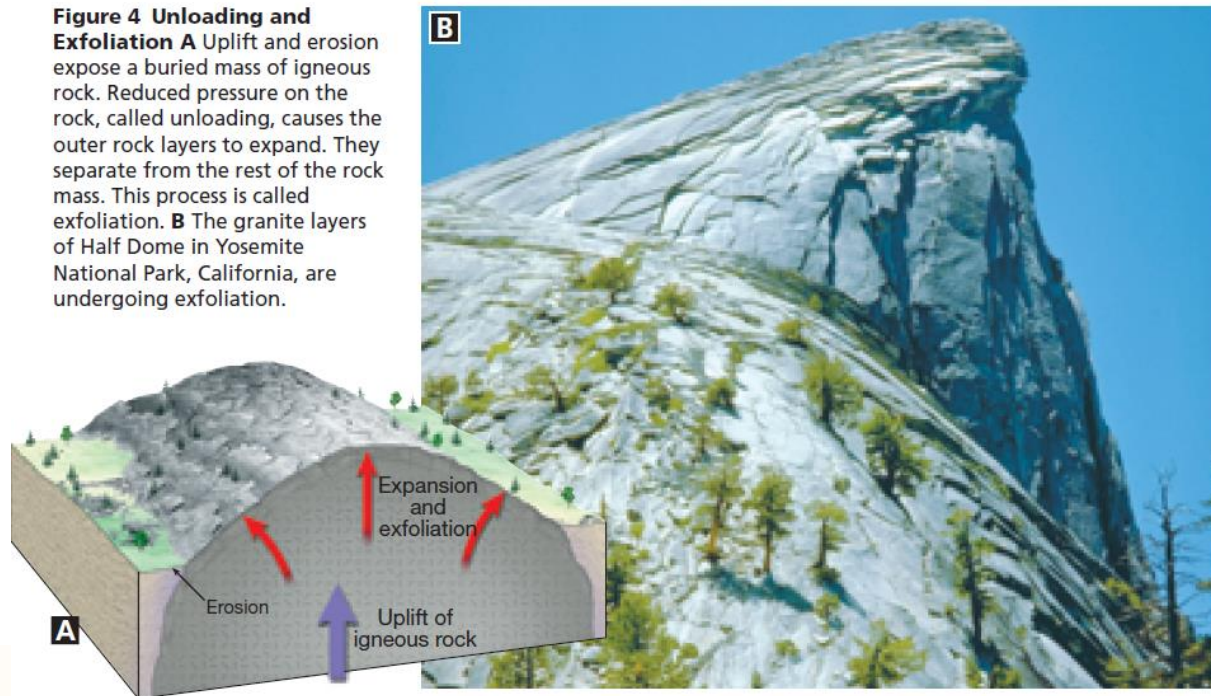


5.1 Mechanical Weathering

2. Unloading

- Reduced pressure on igneous rock causes it to expand and allows slabs of outer rock to break off in layers in a process called **exfoliation**.

Figure 4 Unloading and Exfoliation **A** Uplift and erosion expose a buried mass of igneous rock. Reduced pressure on the rock, called unloading, causes the outer rock layers to expand. They separate from the rest of the rock mass. This process is called exfoliation. **B** The granite layers of Half Dome in Yosemite National Park, California, are undergoing exfoliation.



5.1 Mechanical Weathering

3. Biological activity

- The activity of organisms, including plants, burrowing animals, and humans, can also cause mechanical weathering.

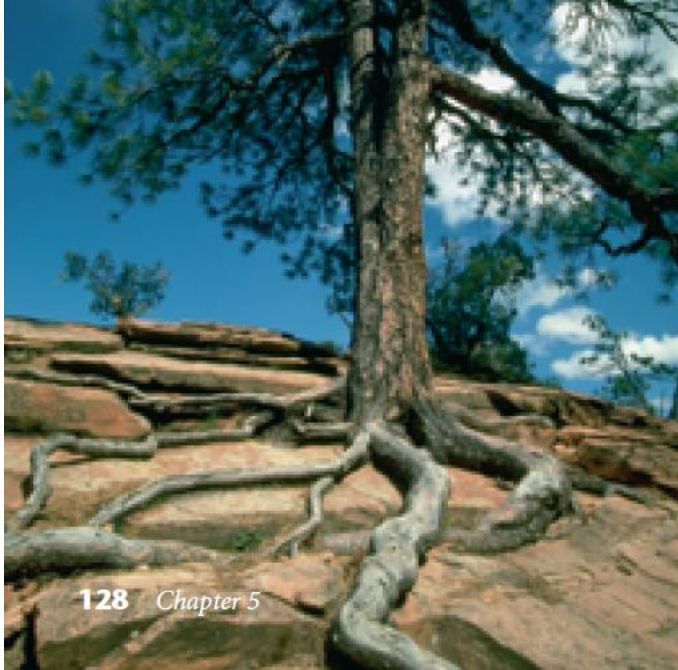
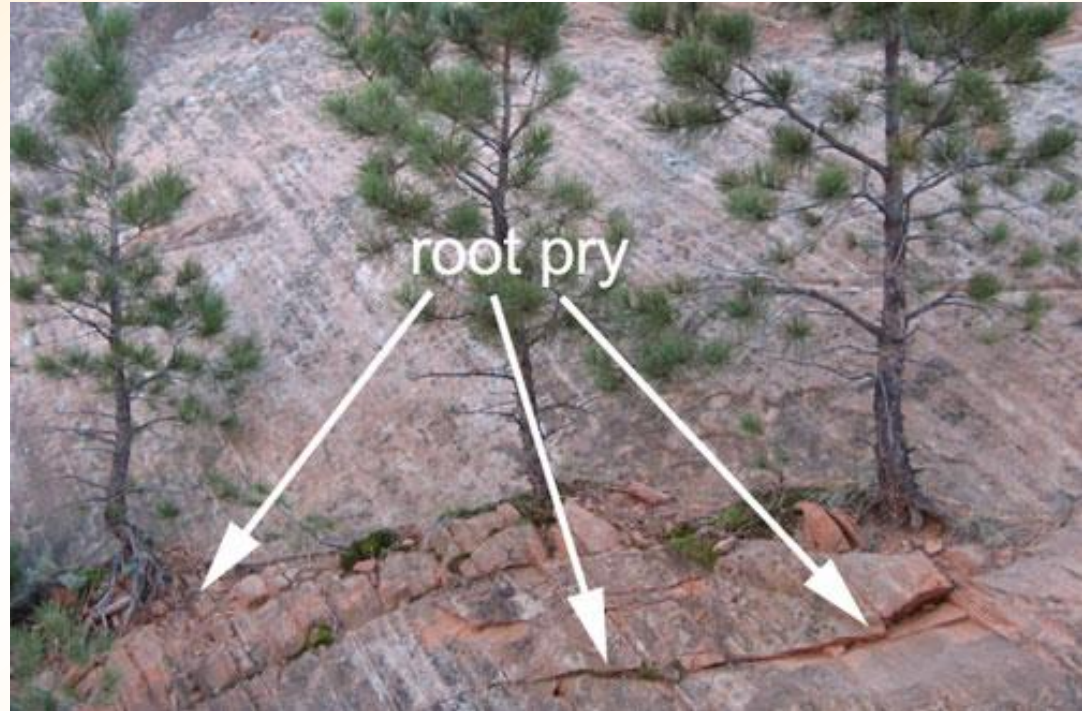


Figure 5 The roots of this tree are causing mechanical weathering by widening the cracks in the rock.



Biological activity



Biological activity

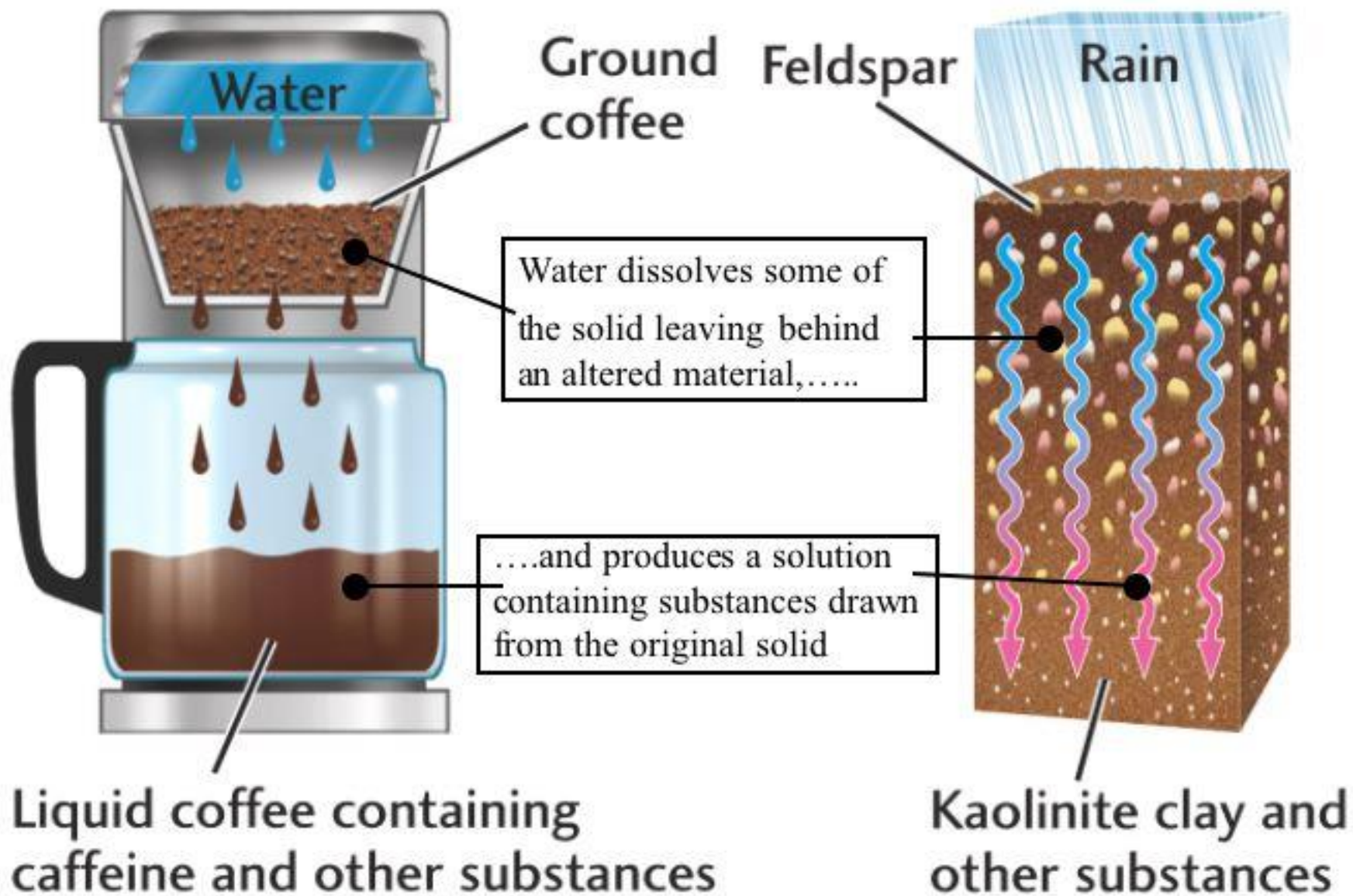


5.1 Chemical Weathering

- ◆ **Chemical weathering** is the transformation of rock into one or more new compounds.
 - Water is the most important agent of chemical weathering.



Figure 6 **A** Oxygen reacted with the iron in these barrels, forming iron oxide, or rust. **B** This granite gravestone, placed in 1868, shows little evidence of chemical weathering. **C** The inscription date (1872) on this marble gravestone is nearly illegible due to chemical weathering.



5.1 Chemical Weathering

◆ Spheroidal Weathering

- Corners of rocks chemically weather more rapidly
- Causes the corners and edges of rock to be more rounded



Figure 8 Spheroidal Weathering **A** The edges of these granite rocks in California's Joshua Tree National Monument were rounded through spheroidal weathering. **B** Spheroidal weathering has caused the outer layers of this rock to loosen and separate.

5.1 Rate of Weathering

- ◆ Two other factors affecting the rate of weathering are rock characteristics and climate.

1. Rock characteristics

- Mineral composition (*type of rock and minerals*)
- Physical features such as cracks



Figure 6 **A** Oxygen reacted with the iron in these barrels, forming iron oxide, or rust. **B** This granite gravestone, placed in 1868, shows little evidence of chemical weathering. **C** The inscription date (1872) on this marble gravestone is nearly illegible due to chemical weathering.

5.1 Rate of Weathering

2. Climate



Figure 9 These boldly sculpted pinnacles in Bryce Canyon National Park show differential weathering. **Drawing Conclusions** In which parts of these formations is weathering happening most rapidly?

- Temperature and moisture are the most crucial factors.
- Chemical weathering is most effective in areas with high temperatures and abundant moisture.



Chapter **Weathering**

5.1

You will be able to...

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- *Explain chemical weathering*
- *Identify the factors that affect the rate of weathering.*

