

Phenomenon: Frost Wedging

This simple demonstration can be used as a phenomenon at the beginning of a unit on physical (mechanical) weathering of rocks. This easy demonstration can be used to activate student thinking about how physical processes may change rocks at the Earth's surface. Frost wedging is a physical process where rocks can be broken into smaller pieces and is caused by repeated cycles of freezing and thawing. Water has the unique property of expanding (~9%) when it freezes. The expansion of ice is why ice floats in liquid water. At the Earth's surface, liquid water works its way into cracks in rock, and upon freezing, expands and enlarges these openings. After many freeze-thaw cycles, the rock is broken into angular fragments as seen in the top figure. Frost wedging is an especially efficient process in mountainous regions where there is a large seasonal and/or daily change in temperature.



hays.outcrop.org/images/weathering/press4e/figure-07-12.jpg

In this classroom activity, plaster of Paris is a model for rock and a small water balloon is a model for water within a fracture in a rock. Mix water and plaster of Paris (according to the label directions) and half fill a 12 oz. plastic cup with the plaster. Put a small water balloon (~1 inch diameter) in the center of the cup and fill the rest of the cup with plaster. Make sure that the plaster completely encapsulates the water balloon and that it is not exposed to the side of the cup. After the plaster sets, remove it from the cup. As an experimental control, it is useful to prepare another cup of plaster without a water balloon.



After the plaster has dried (one or more days), put both pieces of plaster into a freezer. As the water balloon freezes, it expands and cracks the plaster. In the figure, the piece of plaster on the left does not contain a water balloon and did not fracture when put in the freezer. On the right, the plaster contains a water balloon that fractured when it was frozen. Using a control in this activity, demonstrates that the plaster fractures because of the expansion of the water balloon when it freezes and not just because the plaster was put in the freezer.