Shape Memory Alloys
Smart Materials

These smart materials have a property that can be dramatically changed. Shape memory alloy (SMA) wires are an example of a smart material. These wires can be manipulated, bent and twisted while cold. Dip in hot water and - BANG - the shape memory alloy straightens with amazing force and speed.

The SMA in this activity you are using nitinol (Nickel Titanium Naval Ordinance Lab). Its reaction is called a solid state phase transformation.

What are phase transformations?
Nitinol has two phases
- High temperature form austenite
  - Very hard and rigid; tight cubic symmetry (how the atoms are packed)
- Low temperature form martensite
  - Less symmetric, more flexible
  - With pressure, atoms change position. This crystal phase allows the material to be deformed.

Martensite is 4.3% larger by volume.