

## The Science of Monuments

### The Science Behind it . . .

#### ***Do monuments last forever?***

In order to last over time, most outdoor monuments are built out of either stone or metal. A famous stone monument is the Washington monument, built out of more than 36,000 stones and weighing over 100,000 tons. A famous metal monument is the Statue of Liberty, the internal structure is built out of cast iron and stainless steel covered by a copper 'skin', about the thickness of two pennies. The Statue of Liberty was originally brown like a penny, and over a 30-year period the copper oxidized turning the statue green. Oxidation is the loss of electrons, when an object is exposed to water and air.

In addition to oxidation, stone and metal monuments may become either discolored or may start to deteriorate through a process called biodeterioration. Biodeterioration can be defined as "any undesirable change in a material brought about by the vital activities of organisms" (Allsopp 2011).

The organisms may be bacteria, fungi, algae, and lichens. These organisms can grow in the cracks and pores of stones, causing damage over time. Monuments can also be damaged by other environmental factors like pollution. With periodic preservation and appropriate cleaning and care, most monuments will endure time and the environmental elements.

#### ***Materials***

- ⇒ Small plastic bricks or wooden blocks of various sizes (20-30 per youth)
- ⇒ 3 x 5 card (1 per youth)
- ⇒ Markers or crayons (to share)

#### **Making and Exploring Further**

Make activities encourage problem solving through trial and error, allowing for individual creativity and experimentation. Youth will ignite their curiosity and expand their critical thinking skills as they move from the planned and guided activity to an open exploration of different materials and methods.

- ⇒ Encourage youth to use alternate building supplies such as clay, stones, or a variety of recycled materials.
- ⇒ Encourage youth to use marshmallows and toothpicks as building materials.
- ⇒ Encourage youth to develop a flyer or commercial, telling others about their monument.

#### ***Sources***

- ⇒ Copper Development Association: [www.copper.org/education/liberty](http://www.copper.org/education/liberty)
- ⇒ Library of Congress: *Introduction to Biodeterioration*: <http://catdir.loc.gov/catdir/samples/cam041/2003060350.pdf>
- ⇒ National Park Service: [www.nps.gov/stli/faqs.htm](http://www.nps.gov/stli/faqs.htm)
- ⇒ National Park Service: [www.nps.gov/wamo/faqs.htm](http://www.nps.gov/wamo/faqs.htm)
- ⇒ US Geological Survey: [www.usgs.gov/blogs/features/usgs\\_top\\_story/building-stones-of-our-nations-capital/](http://www.usgs.gov/blogs/features/usgs_top_story/building-stones-of-our-nations-capital/)
- ⇒ US Geological Survey: <http://water.usgs.gov/edu/acidrain.html>

[www.ext.vt.edu/topics/4h-youth/makers](http://www.ext.vt.edu/topics/4h-youth/makers)

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