

# Engineering in Their Environments



Often when talking to students about ancient artifacts we frame them as an old relic and nothing more, when in actuality many artifacts are remnants of the pinnacle eras of modern invention and engineering using only the natural resources people could find around them. Humans have been using technologically advanced tools for their survival needs for thousands of years. This 2-part activity gives students an opportunity to investigate how environments and natural resources influenced ancient engineering and see some of the many stone tools that helped humans survive for thousands of years.

Grade Level	3rd, 4th, Middle school
Activity Length	2 part activity: 20-30 minutes each (both activities do not need to be done)
Materials	Maps, visuals of lithic tools, provided background information

## Standards:

**UT SS Third Grade Standard I** Students will understand how geography influences community location and development.

**UT SS Fourth Grade Standard I** Students will understand the relationship between the physical geography in Utah and human life.

**UT Standard 1.1** Students will make evidence-based inferences about the complex ancient cultures in Utah after studying artifacts from the prehistoric era.



## Vocabulary:

**Structure-** Parts that compose a whole item or complex system.

**Function-** The purpose for which something is designed or exists.

**Archaeology-** The study of historic or prehistoric peoples cultures through the analysis of their artifacts, inscriptions, monuments, and other remains.

**Artifact-** Any object used, altered, and/or made by humans.

**Lithic-** Any artifact that is made of stone.

**Flintknapping-** The fracturing, reduction, and shaping of stone such as flint, chert, obsidian, to produce stone tools.

**Resources Provided:** (most resources found at: [www.nhmu.utah.edu/educators/toolsofthepast/resources](http://www.nhmu.utah.edu/educators/toolsofthepast/resources))

- Maps: Aboriginal Map, Utah's Habitats, Volcanic Tool Stone Sources
- 4 lithic tool models
- Website on Wildhorse Canyon Obsidian Quarry: [www.utahhumanities.org/stories/items/show/214](http://www.utahhumanities.org/stories/items/show/214)
- Lithic Tools Background sheet
- *We All Came from Stone*: Video clip of Flintknapper Greg Nunn shaping a projectile point.

## Background Information:

The ability to alter stones into lithic tools was such a paramount shift in human history that we attribute the name of the prehistoric periods of humanity to that process: "Stone Age." In fact, there's evidence that one of our well known oldest relatives, Lucy (*Australopithecus*), who lived ~3 million years ago, was using stone tools. Some stones were more preferred than others in the practice of knapping or stone reduction. Stones like chert, flint, and quartzite, were stronger stones so were used for tools because they lasted longer. Obsidian (a volcanic rock) was also a coveted resource all over the world as its glass-like structure helped it to break into sharper, finer points and edges.

The Stone Age, is divided into 3 eras: the Paleolithic (old stone), Mesolithic (middle stone), and Neolithic (new stone). The Paleolithic was the longest period, ending around the end of the last ice-age when large fauna (like the mammoth) began to go extinct. The Mesolithic, in comparison, lasted only ~2,000 years. This is when smaller projectile points began to be crafted for the smaller fauna being hunted.

The Neolithic, starting around 8,000 years ago, was a phase of transition for many peoples. Agriculture began to take root along with the domestication of animals. These trends not only added to the increased settling of larger villages and cities but it also introduced more polished and refined stone tools to the human toolkit. That is until metals began to be experimented with in a process called metallurgy. The Bronze Age arose in cultures around the world as people started working with heated copper to craft their tools. The appreciation of metallurgy and metal tools began to overshadow the long practiced art of knapping or stone reduction.



## Part 1: How did people interact with their environment?

(map resources found at: [www.nhmu.utah.edu/educators/toolsofthepast/resources](http://www.nhmu.utah.edu/educators/toolsofthepast/resources))

1. Ask students what engineering is. Why do humans develop technologies?
2. Show the map of the *Aboriginal Lands*. Have the students make observations. Have them identify the location their home is in and identify what tribal land they live on. Is it present or aboriginal lands?
3. Show the *Habitats of Utah* map. Again, give them time to share their observations. Have them identify where they live and what habitat they have more of in their area.
4. Humans have always relied on natural resources to help them solve problems and create tools. Explain natural resources. Ask them what kind of resources they have in the environment they live in. Make a list on the board of the resources they reference.
5. Emphasize that the indigenous people that have lived in your local area for thousands of years also relied on the resources around them. Refer them back to the large original territories on the first map.
8. Explaining basic survival needs of all living things (food, water, clean air, and shelter) ask what problems might keep people from surviving in a habitat or place. Write their ideas down and tell them to pick one of the problems and come up with a solution that utilizes the natural resources they listed. *(Examples: Clay pots to collect water. build a trap from plant fibers made into rope to catch small animals, shape a rock into an ax to cut wood for a shelter, etc.)*
6. Show the map of the *Obsidian Quarries* in Utah and the Website on *Wildhorse Canyon Obsidian Quarry*. Obsidian is a preferred material when making sharper tools. It's a volcanic rock that is fine grained and so glass-like, so breaks into fine points. Anthropologists have found obsidian being used all over Utah for thousands of years for tools like knives and projectile points. However, obsidian comes from volcanoes so can only be found where a past volcano erupted.
7. Ask how the few quarries of obsidian could've ended up all over Utah? Refer back to the territories maps and guide them to the idea of trade and the interaction of different groups of people impacting the natural resources people had access to. They could also address the migration of peoples, moving from one location to another for different resources or due to seasonal changes.

## Part 2: Tools as Solutions to Past Survival Needs

(Lithic tools found at: [www.nhmu.utah.edu/educators/toolsofthepast/resources](http://www.nhmu.utah.edu/educators/toolsofthepast/resources))

### Lesson Protocol:

1. Give the students the link to the lithic tools page (or share at the front of the room.) Explain that tools like these were used for thousands of years to help humans with specific tasks or problems.
2. Give the students time to record their observations of whichever tools you/they choose. Have them share out their observations and write a list on the board.



**3.** Often when observing something's structure we can get clues to what it's function might have been. Using their observations have your students make inferences about what the lithic tool might have been used for.

**4.** Ask if there's a need for more information. If they say yes, use the *Lithic's Tools Background* sheet (attached below) to provide them with the data Archaeologists have collected about the tools. Using the new information, have them make more guesses about what the tools may have been used for.

**5. But what are these tools?** After the students have come to conclusions share with them the conclusions Archaeologist made. It's alright if your students did not have the same ideas. Tell them that Archaeologist spend years researching thousands of lithic tools before they can easily identify structural clues that help them come to better inferences.

#### **Lithic Tool 1- Hammerstone**

This hammer was used to make other tools. It would be held in a hand and hit against a large chunk of rock to crack it into fragments that would be shaped into various other tools.

#### **Lithic Tool 2- Axe**

This axe would've been hafted (tied) to a wooden pole or stick at the divet that was etched out in the middle. The wooden handle would be attached with animal sinew or plant fiber twisted into rope and sometimes covered in pitch (boiled pine sap that becomes hard when cooled) to make it sturdier. because animal and plants decompose over time, often the axe head is the only part that Archaeologists find. The sharp edge is slightly longer than the blunt side to add to the balance of the tool.

#### **Lithic Tool 3- Drill**

Drills were useful tools for placing holes in leather, bone, wood and ceramic. Their long sharp ends and key like shape could be fastened to a long stick and rotated or simply held in the hand. Stone drills were often made of hard quartzite. Frequently, Archaeologists see holes in pieces of ceramic bowls that were likely made by stone drills. A hole was put on either side of a crack and this allowed a broken bowl or jar to be repaired by sewing the crack together using sinew or plant fiber.

#### **Lithic Tool 4- Projectile Point**

The narrow part of the stone between the notches is where it would have been hafted to a straight wooden arrow tip about 4-6 inches long. Hafting a projectile point was also done using animal sinew. The hafted arrow tip was then inserted into the end of a long, straight, lightweight shaft, usually made from a reed plant like phragmites. While this projectile point was small enough to be used with a bow, projectiles points through time have varied in size and heft (weight). When the fauna being hunted was larger, larger projectile points used at the tip of a spear was useful and easy to make. Atlatl's, or long sticks with a handle, were used with the spear to extend the length of their throw. (think a dog ball chucker but with a spear.) As fauna became smaller and as technologies improved so finer points could be made, bows began to take over the hunting world and points like this one were made.

**Optional Follow Up activity:** Show these tools side by side with a modern tool and have your students talk about what's similar or different. Emphasize the similarities. Even though materials have improved, some structures and technologies have stayed very similar because they are very successful at the function they were made for. Watch [\*We All Came from Stone\*](#) and ask your students what Greg Nunn means when he says, "Man alone, born from stone."



# Lithic Tools Background

To view these lithic tools go to: [www.nhmu.utah.edu/educators/toolsofthepast/resources](http://www.nhmu.utah.edu/educators/toolsofthepast/resources)

## Lithic Tool 1

*Excavated:* 1961 near Glen Canyon (northeast of Lake Powell)

*Age:* Unknown

*Alterations:* This stone may look like a blob but if you hold it in your hand it feels like it fits perfectly in your grip with a rounded nodule on one side. It is heavy and very hard and sturdy.

## Lithic Tool 2

*Excavated:* 1927 by the University of Utah Expedition to the Blanding area in southwest Utah.

*Age:* Archaeologists aren't certain how old it is but given the location it was found it could be anywhere from between 500-3000 years old.

*Alterations:* The maker chipped away at it (using a hammerstone) shaping the blunt end and the sharp cutting edge. The middle where it is narrow was also chipped and altered by the maker. Often these markings suggest it was attached to a wooden pole or stick, possibly with animal sinew or plant fiber.

*Other notes:* Because it was found in southern Utah, it could have been associated with foragers and farmers of the area; possibly the ancestral Puebloan. However, since its age is unknown, it could also predate these cultures.

## Lithic Tool 3

*Excavated:* 2004 from Emery County (Central Utah.) Discovered at the Natural History Museum of Utah's Archaeological site, Range Creek Canyon.

*Age:* 800-1300 AD

*Alterations:* It is made of a very strong and sturdy Quartzite rock. The maker made this stone into a key shape with an extremely long pointed tip. The opposite side has a hilt shape that is long enough to hold securely in your fingers.

*Other notes:* Due to its location this tool may belong to the Fremont who roamed Range Creek Canyon ~3,000 years ago.

## Lithic Tool 4

*Excavated:* 1968 from Hogup Cave in the Great Salt Lake Desert of Box Elder County.

*Age:* 800-1300 AD

*Alterations:* Small at 4 cm. The style the maker used is typical of what Archaeologists call a corner notch. This style has a deep history in the Great Basin.

*Other notes:* Hogup cave is unique because many artifacts left behind in Utah's harsh environment eventually break down and only harder more robust artifacts, like stone tools, remain. But this cave, protected from the environment, revealed a large cache of other artifacts, including many burned and broken animal bones and a large collection of child mocassins, made of bison leather and lined with fur. From all the cultural artifacts left behind, Archaeologists know they belonged to an ancient group generally called the Promontory Culture who hunted and gathered for survival.

