

You might think of tools as items workers carry in a belt or a tool box, things that help people complete plumbing or carpentry tasks, for example. Tools, however, have a much broader meaning. Tools are not just items you might buy at a hardware store. Any instrument used for doing work is a tool. A pen is a tool. A book is a tool. A computer is a tool. For the people who lived long, long ago, a simple bone or pebble hammer might have been a first tool. Early human *technologies*—inventions for solving problems—were generally made of stone, and the earliest tools made of stone are thought to be about 2.5 million years old.

The Ancient People of a German City

The various stages of humanity's development are given interesting names. *Homo habilis*, who lived in Africa, was named “handy man” because of the primitive tools found with hominin remains. Names sometimes relate to locations where the fossils are first found. This is the case for *Homo heidelbergensis*. *Homo* is the Latin word for *man*. Heidelberg is a city in what is now Germany. Remains of this species have also been located in Africa and in England.

This group of hominins made more complex tools than earlier humans. Their complex tools show that they developed the abilities to plan ahead, to remember steps in a process, and to solve problems. Archaeologists have found artifacts such as hammers, spears, cleavers, and hand axes. Using tools with such specific purposes as these strongly suggests that *Homo heidelbergensis* were hunters who butchered and cooked their kill.



A piece of flint before it has been worked into a tool.

Improvements in tools allowed humans to establish villages. Early shovels allowed people to plant crops, which meant that humans did not have to depend only on hunting and gathering for food. Instead of following herds, they could remain in one place and establish permanent homes. Axes, a basic tool developed hundreds of thousands of years before the first permanent settlements, gave some early humans a way to cut down trees to make structures out of wood.

Using an ax, a person could also hollow out a log to make a canoe. With canoes or skin-covered boats, humans could travel more easily and trade developed. This meant that each community no longer had to provide for every human

need. Instead, individuals and communities could specialize in specific jobs and producing certain goods and exchange those goods with other communities.

Really Useful Rocks

During the Stone Age, most tools were made of flint. This sedimentary rock can be chipped into different shapes and sizes. Sharpening the rock gives it a cutting edge. Early humans probably used stone hammers to chip at the flint and then trimmed the flint with a bone hammer. Arrowheads and knives were two common tools fashioned in this manner. Flint tools made it possible to create tools made of other raw materials. About 15,000 years ago, people were able to make needles from animal bones or antlers. Needles made it easier to sew clothing from animal skins.

Neanderthals, our closest extinct human relatives, used a second type of rock: obsidian. A kind of volcanic glass, obsidian is found near volcanoes. If rocks that are ejected from Earth during volcanic eruptions are mostly silica, a chemical compound known for its hardness—and if they cool fast enough—they harden into black glass. Early people valued obsidian because it is harder than flint. During the Stone Age, obsidian was used for knives and arrowheads. It keeps a sharp edge very well. In fact, some eye surgeons today use obsidian tools. Because obsidian occurs only in areas of volcanic activity, it is not available everywhere. As a result, obsidian became one of the earliest items traded between regions.

A Very Modern Tool

Some of the same tools our ancient ancestors used, such as axes and hammers, are still used today. We make them from different materials, but they still have a place in our civilization. Over time, we have invented many other technologies to solve problems and make life easier. Consider all the tools you use in your life, such as computers, cell phones, kitchen utensils, and countless others.

What technology do you think has changed contemporary life the most? That's a tough question to answer. Some might say computers or cell phones. For astronauts on the International Space Station (ISS), however, the answer is clear—humanoid (human-like) robots, or *robonauts*. Robonauts have been designed to take over dangerous or boring tasks as well as cleaning, which frees astronauts to carry out experiments.

The first humanoid robot in space, named R2, is simply a head, torso, and arms. The National Aeronautics and Space Administration (NASA) is still working on the legs. R2 made its first television appearance during the 2011 Super Bowl, and it has proven to be quite useful even without legs. On

Expedition 32, which lasted from July to November 2012, the robonaut first began using the same tools that human astronauts use.

One of R2's first jobs was to check air quality in the space station. Air quality has to be checked every 90 days in five different spaces. A gauge is used to perform this task. The gauge, however, is very sensitive to movement, and astronauts find it hard to hold perfectly still in zero gravity. R2 has no such problem. The gauge is also sensitive to other sources of air, such as human breath, so R2 is perfect for the job. R2 also changes filters and vacuums. R2 even maintains a Twitter account—with a little help from NASA folks on the ground!



This is a representation illustrating the International Space Station (ISS) in space.

After reading the passage, answer the following questions:

1. What advantage does obsidian have over flint for making tools?
 - A. It is found everywhere on earth.
 - B. It is harder than flint.
 - C. It can be chipped with stones.
 - D. It was valued as a form of money.

2. Which of the following *best* explains the importance of tools to early man?
 - A. Tools meant that they would never be hungry.
 - B. Tools helped them avoid natural disasters.
 - C. Tools made them into a more peaceful people.
 - D. Tools allowed them to plant crops and build homes.

3. Why was the robonaut R2 developed?
 - A. to show cooperation between nations on the ISS
 - B. to handle launches of spacecraft
 - C. to help with repetitive or dangerous tasks in space
 - D. to conduct experiments in gravity

4. Throughout the passage, a number of cause-effect relationships are discussed. Choose at least one of these and explain its importance. Provide details and evidence to support your answer.