

# The Electronic Passport to Prehistory

## A long time ago

The term history means “his-story” and refers to the period that ended when humans learned how to read and write. The first writing we know of came from civilizations in Mesopotamia and Egypt about 5500 years ago. People lived for thousands of years before this, but little changed from generation to generation. People lived as nomads. Nomads are people who have no permanent home. Men hunted animals and women gathered wild plants. When there were no more animals to hunt or plants to gather, they moved to a new place.

Society developed when people began to do individual jobs. This is called the “division of labor.”

When people do only one job, they usually choose a job they enjoy and do well. Further, when you do the same job over and over, you learn to do it very well. The division of labor caused people to depend on one another and eventually led to advanced civilizations.

Eventually, people learned how to write. Writing allowed people to pass their knowledge onto others. Sir Isaac Newton once said, “If I have seen further than others, it is because I have stood on the shoulders of giants.” Sir Isaac believed that his accomplishments were possible because he learned from the people who came before him. Instant worldwide communication is one reason why our society is rapidly changing as we reach the new millenium.

In the last two hundred years, scientists have concluded that humans have only lived on the earth for a short period of the earth’s history. They believe the

earth is about 4.6 billion years old. This estimate is based on radiometric age-dating. Certain objects emit energy; this is called radioactivity. Over time, the radioactivity causes the objects to decay. If an object has a half-life of one million years, half of the element causing radioactivity will decay over a period of one million years.



Radiometric age-dating is not precise, but it does provide us with a vague estimate of the age of the earth.

## Millions & billions & more

We sometimes describe 1,100 as eleven hundred instead of one thousand, one hundred because it is easier to say. Just as 800 is  $8 \times 100$ , 1,100 is  $11 \times 100$ .

A million is a thousand, thousand or  $1000 \times 1000$ . A billion is a thousand million and a trillion is a thousand billion.

Scientists tell us the earth is 4.6 billion years old. That means it is 4,600,000,000 years old. We can also say that the earth is 4,600 million years old.

If you wanted to count to 4.6 billion and each number took you one second to recite, you would be busy for 145.76 years, not including bathroom breaks.

thousand  $10^3$  or 1,000  
million  $10^6$  or 1,000,000  
billion  $10^9$  or 1,000,000,000  
trillion  $10^{12}$  or 1,000,000,000,000  
quadrillion  $10^{15}$  or 1,000,000,000,000,000  
quintillion  $10^{18}$  or 1,000,000,000,000,000,000  
sextillion  $10^{21}$  or 1,000,000,000,000,000,000,000  
septillion  $10^{24}$  or 1,000,000,000,000,000,000,000,000  
octillion  $10^{27}$  or 1,000,000,000,000,000,000,000,000,000  
nontillion  $10^{30}$  or 1,000,000,000,000,000,000,000,000,000,000  
decillion  $10^{33}$  or 1,000,000,000,000,000,000,000,000,000,000,000  
undecillion  $10^{36}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000  
duodecillion  $10^{39}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000  
tredecillion  $0^{42}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000  
quattuordecillion  $0^{45}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000  
quidecillion  $0^{48}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000  
sexdecillion  $0^{51}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000  
septendecillion  $0^{54}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000  
octadecillion  $0^{57}$  or 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000  
novemdecillion  $0^{60}$  or 1,000  
vigintillion  $0^{63}$  or 1,000

## Technology

Technology is the tools and skills used to build things. Today we live in a world with amazing machines, but we can trace our modern tools to rocks. Early humans used stone tools, and those tools were the first technology. “Stone Age” humans used rocks as weapons, to break open things and to sharpen softer objects.

About six thousand years ago, people slowly began to unlock the secrets of metals. They learned to smelt, or refine metal, by heating particular types of rocks. Copper was probably the first metal smelted, followed by tin, lead, and silver.

Metal has many uses. You could mold metal into different shapes. Metal also conducted heat. Metal pans allowed people to cook meat and destroy harmful bacteria. Wood burns when heated and most rocks do not hold heat well.

Iron was the most important metal to early cultures. People used the knowledge of iron to conquer others. The discovery of iron made it possible for the advancement of many civilizations in different parts of the world.

## Theories

Most of what we study is based on facts, but scientists have to make educated guesses about prehistory. We call these guesses theories. Theories about prehistory often change as we make new discoveries about the past.

Many cultures and religious faiths have creation stories. Some—but not all—Christians believe that God<sup>1</sup> created the earth about six thousand years ago in six days, as explained in the Book of Genesis. They do not share the view of prehistory held by most scientists.

Scientists are not positive their theories are correct. Theories frequently change as we make new discoveries. Almost everything we know about prehistory is based on what we have learned in the last two hundred years. It is quite possible that the theories presented in 1999 will be very different from what we will discover in the future.

## Charles Darwin

Charles Darwin was born in England on February 12, 1809—the same day as Abraham Lincoln. He planned to become a doctor like his father, but decided against medicine after witnessing several operations performed without anesthesia. Darwin studied to become a minister, but he was not happy. At the age of 22, Darwin convinced his family to allow him to travel as an unpaid “naturalist” on a five-year journey aboard the *HMS Beagle*.

The *Beagle* set sail on December 27, 1831 to study the West Coast of South America and several Pacific islands. Darwin’s job was to study the geology and biology of the lands. During the course of the voyage, Darwin observed an enormous number of plant and animal species, and discovered many fossils. Darwin took careful notes on



everything he observed. Those notes later provided the basis of his theories. Darwin returned home in 1836 and developed a reputation as one of England’s leading biologists.

Darwin concluded that species evolved over long periods due to what he called natural selection. There may be differences in the offspring of an organism. These differences are called mutations. We generally think of mutations as harmful, such as birth defects, but a mutation is simply an alteration of the genetic information of an

organism. Some mutations are good. A child might be taller or stronger than his or her parents.

Darwin’s theory suggested that organisms evolved to fit their environment based on natural selection. If a mutation was good, the organism lived and contributed the mutation to the gene pool of its offspring. If the mutation was bad, the organism was more likely to die before contributing to the gene pool. Over billions of years, these mutations slowly produced the world we know today.

According to the theory of evolution, organisms have adapted to their environment. Lizards are green because if they were any other color they could be easy spotted and eaten. Humans eventually developed from less intelligent species through natural selection. If bigger animals were around, a purple dinosaur would have a tough time staying alive in a green forest.

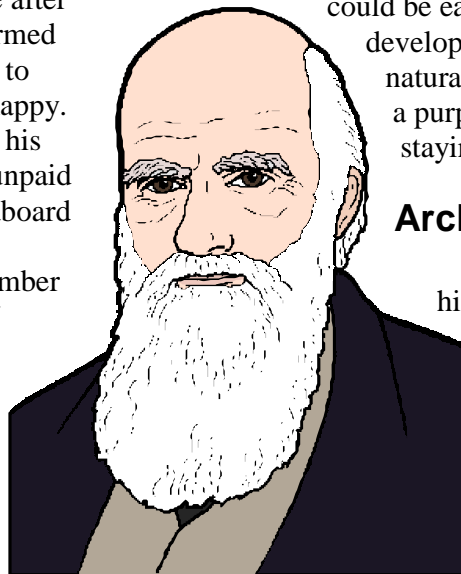
## Archaeology

Archaeologists are scientists who study history. They often study fossils. Fossils are the remains of prehistoric plants or animals that somehow managed to be preserved for thousands of years. We have many unanswered questions because very few fossils have survived.

Some fossils become petrified, which means they turn to stone.

Petrifaction occurs when rivers and streams carry dissolved minerals to the porous parts of bones, shells or wood. The minerals eventually crystallize and settle, filling the pores.

Archaeologists are like police detectives. They search for clues left behind by people, animals, and things. Archaeologists use those clues to make educated guesses about the past. What we know



<sup>1</sup> In most instances you will notice that god is spelled with a small g. This is out of respect for the different beliefs of people. In this instance, God is spelled with a capital letter because Christians—like Jews and Muslims—believe in a one all powerful deity. Hindus, Buddhists, animists, and other religious faiths do not believe in a single god.

about prehistory changes over time as archaeologists uncover new clues. We don't know what archaeologists will discover in the future. If the past is any guide, what we think we know about prehistory will change as we learn more about the past.

## Lucy

Don Johanson changed a great deal of what we know about the evolution when he uncovered the oldest hominid in the fossil record. A hominid is the family of mankind and their ancestors. Johansen nicknamed his find "Lucy," after "Lucy in the Sky with Diamonds," a song by the Beatles.

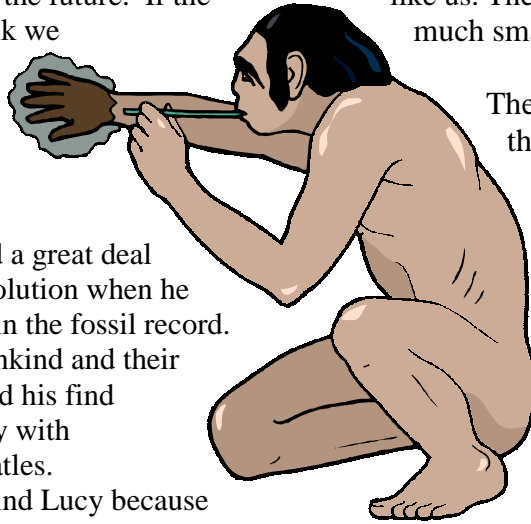
Johansen was able to find Lucy because of a lucky occurrence that was not very lucky for Lucy. Lucy apparently became entangled while walking near stream about three million years ago. She fell into the water and drowned. Her body sank into the mud and her flesh slowly decomposed. Minerals from the water slowly replaced the calcium in her bones. In time, the swampy marshland turned to desert. In 1974, Johansen happened to be in the exact spot of East Africa where rainwater washed away the dirt from the now long dried lake, and brought Lucy's remains to the surface.

Lucy's brain was about one-third the size of the brain of a human, but Lucy had a human like characteristic: her knee could lock, so she could stand up straight. Other apes did not have a locking knee, so they could not stand for long periods of time. Johansen deduced that the locking knee gave Lucy and others like her an advantage over other apes.

Until Johanson's find, archaeologists believed that apes grew smarter, then learned to walk upright. We now know that hominid brains grew larger only after they gained a small advantage over other animals. This is an example of how scientific theories change over time.

## Evolution

Archaeologists studied fossils and observed the close similarities between humans and apes. They concluded that we must have shared a common ancestor. Starting with the modern human skull, we



can trace our family tree back millions of years. As we travel back in time, our ancestors looked less and less like us. They begin to resemble African apes with much smaller brains.

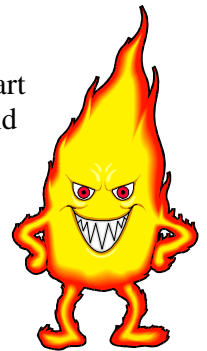
Our earliest ancestors were vegetarians. They did not eat meat. Scientists believe that humans began to eat meat when the climate where they lived began to change. There was less vegetation, and the hominids were not physically suited to compete with larger animals for the remaining plants. They became scavengers, eating the meat of dead animals. The protein in the meat made their brains larger and caused a greater hunger for meat.

About one million years ago, a hominid called *homo erectus* was more intelligent than the other animals, but there was a price to pay for having such a large brain. Getting a big *Homo erectus* brain though a pelvis would be impossible, so natural selection favored offspring whose brains continue to grow after birth. A newborn human is small enough to make the birth process possible, but their brains continue to grow after they are born. Other animals have almost fully developed brains and are active and independent shortly after they are born. Human infants, because of their brain growth, are almost as helpless as if they were still in the womb. This is because the human brain almost triples in size during the first year. The helplessness of infant children require a family structure to support this long period of dependency.

## Fire

About one million years ago, hominids began to leave East Africa. Scientists believe one reason our ancestors were able to leave their environment was fire.

Fire changed almost every part of their lives. It provided warmth and light, and a way to cook food. It scared away larger animals. Fire also provided a place for hominids to gather to gather and form a community. The ability to control fire allowed the hominids to leave Africa and roam the rest of the world.



## Neanderthals

In 1856, quarrymen made an exciting discovery in a cave in the Neander Valley, near Dusseldorf, Germany. They found the remains humans who were very different from us. Scientists later learned that "Neanderthal" humans inhabited Europe and parts of Asia and North Africa from about 125,000 to about 40,000 years ago.

Fossils indicate that Neanderthals looked somewhat like humans, but they had heavy ridges above their eyes. Their skulls were larger than modern humans, indicating that they had bigger brains. Bones in the throats of Neanderthal fossils led archaeologists to believe that their verbal communication probably consisted only of grunts. They apparently could not use words they way we do today.

Neanderthals lived side-by-side in many places with modern humans, then apparently became extinct. The mystery of what happened to the Neanderthals still puzzles scientists today. There are many theories to explain what happened, but nobody knows what caused the extinction of the Neanderthals.

## Abraham Maslow

Most early psychologists studied people who had psychological problems, but Abraham Maslow studied successful people. Maslow decided that people want to be happy and loving, but they have particular needs that they must meet before they can act unselfishly.

Maslow said that most people want more than they have. Once a person met their most basic needs, they would develop higher needs. Maslow said, "As one desire is satisfied, another pops up in its place." Maslow created a hierarchy of needs with five levels:

- **Physiological needs.** Biological necessities such as food, water,

### How do you spell that?

Neanderthal is also commonly spelled Neandertal. The word derives from the Neander Valley near Düsseldorf, Germany. The pronunciation (and consequently the spelling) of the word depends on your dialect. Most English speaking people feel more comfortable pronouncing the *th* sound, but if you ask about Neanderthals in Germany, you'll definitely sound like a foreigner!

and oxygen. These needs are the strongest because a person would die if they were not met.

- **Safety needs.** People feel unsafe during emergencies, or times of disorder like rioting. Children more commonly do not have this need met when they feel afraid.

- **Love and belonging needs.** The need to escape loneliness and alienation, to give and receive love, and a sense of belonging.

- **Esteem needs.** The need to feel valuable, to have self-respect and the respect of others. If a person does not fulfil their esteem needs, they feel inferior, weak, helpless, and worthless.

- **Self-actualization needs.** Maslow taught that a very small group of people reach a level called self-actualization, where all of their needs are met. Maslow described self-actualization as a person's finding their "calling."



He said, "a musician must make music, an artist must paint, and a poet must write."

Many people confuse self-actualization with fame or fortune, but often this is not the case. While wealthy or celebrated people might reach self-actualization, many psychologists believe that most people who have reached the highest level of happiness are unknown beyond their circle of family and friends.

Societies develop when people reach a particular level in Maslow's hierarchy. Once people meet their physiological needs and they feel safe, they begin to develop a culture and an advanced civilization.

