

# Ancient Science



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Typically, when we think of scientist, we often think of people in white lab coats either surrounded by chemicals and test tubes or sitting with a stopwatch in hand recording data onto a computer, or perhaps even perched in a tree watching and taking notes about the family of chimpanzees playing on the jungle floor. Science is defined as knowledge about the physical and natural world that is derived from observation and experimentation. So, would you expect that there were scientist living in the times of the Romans? What about the Egyptians? There were. In fact, there were even cavemen who could be considered scientist!

When a scientist encounters a problem, he or she will use the scientific method to *investigate* it. Unfortunately, we don't always find the answer to the problem.

The scientific method consists of:

- Defining a problem-What is it that we are trying to figure out?
- Forming a hypothesis- A possible answer to the problem, a guess based on your background research.
- Making observations and doing experiments

- Analyzing data- What do your observations and experiments tell you?
- Drawing conclusions- What have you learned through your observations and experiments? Do you need to change your hypothesis?
- Communicating data- Share with others what you have learned!

You may find that you use the scientific method without even thinking about it! For example, I had a dog who would often bark at people that he knew as well as strangers (the problem). I guessed that it was possibly because he was afraid of them (hypothesis). Over several days I noticed that he was only barking at boys and men (observation and analysis). Although I did not have an answer to my problem, I was able to conclude that my dog was afraid of boys and men (conclusion).

Can you think of a time that you have used the scientific method without realizing it? Write about it!

Problem:

Hypothesis:

Observations and Experiments:

Analysis of Data:

Conclusion:

Now, lets travel back in time to see how different civilizations used the Scientific Method to solve some of their problems!

## Early Man

What sort of problems could the hunter-gathers of the Stone Age possibly have had? Well, plenty! Without a supermarket down the road they spent a great deal of time getting food for their families. During the spring, summer and fall months they could gather berries, nuts and other edible plants to eat or store for the winter. They would hunt for wild animals not only to eat but also for their skins to use as clothing and shelter as well as using their bones for decoration and tools. With this need to hunt came a problem: How can we improve the technology they hunted with? They were hunting with bows and arrows using arrowheads made out of stone.

Looking at these two points (arrowheads) see if you can answer these questions.



What are some of the similarities?

What are some differences?

Which point do you believe to be the one developed to help improve hunting and why?

Draw a point that you would use for hunting. What would make your point different and how would it be better than the ones shown above?

## Ancient Greece

Aristotle, a scientist from Ancient Greece, developed a system to organize living things that is similar to the one used today. His problem: How to organize all living things? Through observation he concluded that he could divide living things into two groups-Plants and Animals. He then divided each of these into smaller groups. Animals were classified by whether they were land, water, or air animals. Plants were divided into herbs, shrubs or trees. Later, an 18<sup>th</sup> century Swedish botanist named Carolus Linnaeus developed the classification system we use today of kingdom, class, order, genus and species.



How would you organize these objects? Cut out the words below and see how many *different* ways you can organize them. The possibilities seem endless!

Scissors	Tires	Computer
Kitchen gloves	Shirt	Doll
Sponges	Pen	TV
Dog	Pencil	Coin
Plate	Pool	Ball
Horse	Fan	Paper

Another Greek scientist, Archimedes, had a problem of wanting to raise water from a river to use on dry fields. What he discovered was that by using a spiral he could move the water from a low area to an area higher up. Let's make our own Archimedes' Screw to see how it works. You will need a plastic soda or water bottle, tape, and aquarium tubing. You will also need some water with food coloring in it and two bowls.

1. Wrap the tube around the bottle from top to bottom.
2. Cut a strip of tape a bit longer than the length of the bottle and tape the wrapped tube to the bottle. Do this again on the other side.
3. Now place the bowls side by side and put one end of the bottle and tubing into the bowl with the colored water.



4. Twist the bottle, making sure that the top of the bottle is over the empty bowl. As you do this you will see the water go up the tube and into the empty bowl.

The water screw has also been used to remove water from the bottom of boats or, using two screws going in opposite directions, it can also move vehicles across sand and snow!

## Ancient Rome

When you think of Rome, structures such as the Colosseum, aqueducts, and roadways often come to mind. The Romans were incredible architects and engineers. In fact, much of what they invented is still in use today! Take a walk down the sidewalk or across a bridge and notice the concrete structures under your feet. The Romans developed a stronger, reinforced concrete by adding volcanic ash, sand and bronze rods to it. As a way to help support this heavy concrete in structures such as aqueducts, the Romans would use arches-often several on top of one another. These arches were able to support more weight and span greater distances than a horizontal beam, allowing the Romans to transport water from the mountains to the citizens below.

As with concrete, the Romans would sometimes take an idea and change or improve upon it to help them with a problem they had. Although the Greeks had designed a waterwheel, it really didn't do anything other than go around. It looked interesting but the Romans thought that they could use it to help them do work. Let's make a waterwheel and see what work it can do.

You will need 8 plastic spoons, a large Styrofoam ball, a bamboo skewer, 2 straws, string, a bolt and some glue.

1. Push the handle ends of the spoons into the Styrofoam ball, making sure they follow a line around the ball and are equal distance from each other. The bowls of the spoons should also be facing the same direction.
2. Push the skewer through the center of the ball and glue it so that if the spoons are vertical the skewer would be horizontal.
3. Take the straws and place them over the skewer-one on each side.
4. Now, while holding onto the straws, place the spoons under the flow of water in a sink. The spoons should catch the running water and turn the Styrofoam ball. This makes a water wheel similar to ones used by the Greeks. However, we want to make this water wheel serve some kind of function. How can we use the string and bolt to show that the water wheel is capable of doing work?

5. Tie the bolt to the string and the other end of the string to the skewer on the water wheel. Add a drop of glue where the knot and skewer meet and allow it to dry. When the water wheel is placed under the stream of water what happens? Can you alter the experiment any to show other possibilities?

Water wheels, such as the one you just made, would have lined the banks of rivers and would have been used to grind grain into flour, move saw blades in saw mills and even generate power. Some of the larger mills would have six or more wheels in a line along the riverbanks-now that is a lot of power! So, by experimenting with the water wheel the Romans were able to make some of their work easier.

## Ancient China

Which ancient culture discovered things such as silk, gunpowder, ice cream and magnetic compasses? They were all developed by the Chinese. In fact, did you know that one of the first calculators was made in China over 2000 years ago? It was the abacus, a device made of wood that held beads which slid on metal rods and helped keep count. It could add, subtract, multiply and divide as well as work more complicated math problems!

I'm sure that you have heard of other cultures writing on papyrus, a type of paper made of out reeds, or even on parchment a very stiff paper made from sheep or goat skin. It was the Chinese who developed paper that closely resembles what we use today. Let's see what it would look like!

You will need a piece of screen (old window screen works well), tape, scrap paper, old towel, news paper and piece of cardboard. You will also need a potato masher or blender, a bowl of water, a clean dry towel and a plastic dishwashing tub.

1. Tear the scrap paper into small pieces and put them into a bowl of water. Leave them in the water to soak overnight. In the morning mash the paper up using the potato masher or blender. This pulp should look like oatmeal.
2. Fill the dish tub half way up with cold water and add the pulp.
3. Make your screen by cutting out a rectangular opening a little smaller than the size of your screen in the middle of your cardboard. Tape the piece of screen to the middle of it.
4. Holding onto the sides of the screen, slide it into tub, allowing the mixture to make a layer on top of the screen, and lift straight up.
5. Once the water stops dripping, turn the screen over onto a towel that has been placed on layers of newspapers. You may have to remove the paper from the screen by gently peeling it off.
6. Carefully press a dry towel onto the paper to remove the excess water.



7. Leave your new paper to dry for at least six hours.

Try adding different things to your paper pulp-petals, food coloring, larger pieces of comics, whatever you think would be interesting and see how it comes out.

So as you can see, scientist come from all over the world and many different time periods. They can be the caveman experimenting with paints on a cave wall or your two year old brother figuring out how to get the box of candy. Continue to look around and see how many things that we use every day were developed by scientist from long ago!

## Timeline of Invention from Wikipedia.org

9th millennium BC

8700 BC: Metalworking (copper pendant in Iraq)

8500 BC: Agriculture in the Fertile Crescent

8th millennium BC

Animal husbandry in the Middle East

7th millennium BC

6200 BC: Map in Çatalhöyük

Cloth woven from flax fiber

Wine in Jiahu, China

6th millennium BC

Irrigation in the Fertile Crescent

Ploughs in Mesopotamia

5th millennium BC

Beer in Sumer

4th millennium BC

3800s BC: Engineered roadway in England

3500 BC: Plywood in Egypt

3500 BC: Writing in Sumer

3500 BC: Carts in Sumer

Bronze by the Maikops

Silk in China

Cement in Egypt

River boats in Egypt

3rd millennium BC

2800 BC: Soap in Babylonia

sledges - Scandinavia

the use of yeast for leavened bread

2nd millennium BC

Alphabet in Egypt

Glass in Egypt

Rubber in Mesoamerica

Spoked wheel chariot in the Middle East

Water clock in Egypt

Bells in China

1st millennium BC

Arch in Rome

600s BC: Coinage in Lydia

400s BC: Catapult in Syracuse

300s BC: Compass in China.

300s BC: Screw: Archytas

200s BC: Crossbow in China  
200s BC: Compound pulley: Archimedes  
200s BC: Odometer: Archimedes?  
150s BC: Astrolabe: Hipparchus  
100s BC: Parchment in Pergamon  
1st century BC: Glassblowing in Syria  
87 BC: Clockwork (the Antikythera mechanism)

1st millennium

1st century: Stern mounted rudder in China  
105: Paper: Cai Lun  
132: Rudimentary Seismometer: Zhang Heng  
200s: Wheelbarrow: Zhuge Liang  
200s: Horseshoes in Germany  
300s: Stirrup in China  
600: Mouldboard plough in Eastern Europe  
600s: Windmill in Persia  
673: Greek fire: Kallinikos  
800s: Gunpowder in China  
852: Parachute: Armen Firman  
Woodblock printing in China  
Porcelain in China  
Spinning wheel in China or India