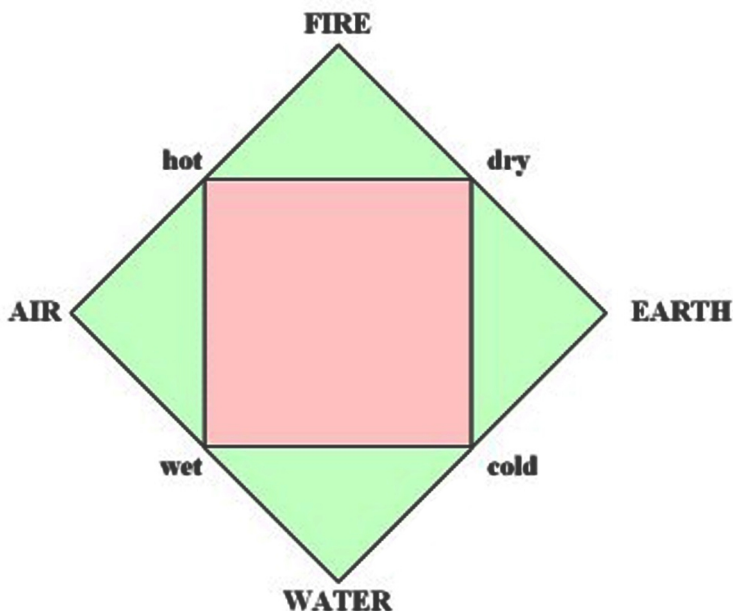


Chapter 3

The Story of the Atom



Aristotle, and other Greek philosophers, did not believe atoms existed. They believed matter was made up of four elements: Fire, Earth, Water and Air. Their model of the four elements looked like the image above.

The story of radioactivity must be told by going all the way back, thousands of years, to the first philosophers and scientists who wondered about the nature of the material world. These early scientists did not have the tools that Becquerel and Roentgen had. However, they did have two essential pieces of equipment: their eyes and their minds.

Remarkably, early scientists did have ideas about the atom.

Democritus



1628 painting by Hendrik der Brugghen; copyright expired

It was a pretty good thing that Democritus could laugh, because a lot of important people thought his ideas were a little nutty. These people included Aristotle and Plato; Plato wanted to burn the books Democritus had written, every one of them.

These ideas arose in many cultures, one of them ancient Greece.

Democritus was a philosopher and scientist born about 2500 years ago in Thrace. He was curious about the world around him. More importantly, he questioned ideas other people had about the nature of matter. In fact, he laughed at other people. He did this so often that people called him *The Laughing Philosopher*. Paintings of Democritus often show him laughing, as he is doing in the portrait on the following page.

As it turned out, Democritus' idea of the material world was more accurate than the ideas other famous philosophers held. Democritus believed that physical things were made up of atoms--small, unbreakable and constant bits of matter. He believed these small parts moved around in space, sometimes joining together, sometimes not.

It turns out that, in a way, Democritus was correct. A more accurate notion about the nature of atoms would not get much clearer until the early 1800s. That was when a scientist named John Dalton noticed a pattern in the way gasses combined. He observed that when they came together and separated it was always in the same proportion. He realized that there was nothing accidental about this pattern.

From his observations Dalton concluded that each gas was made up of an essential particle, which he called an atom. He had read the work of Democritus and although Dalton's idea of the atom was a little different from the ancient philosopher's idea, still the word served its purpose.

It was curious that Dalton turned to the writings of Democritus because, in a way, he was a little bit like the ancient philosopher. Dalton also was someone that few people would have expected to grow up and be a famous

scientist. He was very poor as a child. He wanted to attend a formal school but his family could not afford it.

Friends Meeting House in Fairfield, UK



Photo by Humphrey Bolton; Creative Commons Share-Alike 2.0 Attribution license

Dalton attended a Quaker Meeting House that probably looked a lot like the one above. It was in a neighboring community and was built in 1689, about twenty years before Dalton's Quaker Meeting House was built.

Dalton went instead to a local Quaker school. He made the most of the opportunity. At the age of twelve he became a teacher at the school.

Dalton's ambition and desire to learn served him well. By the time he was twenty-six he had become a math and philosophy teacher at Manchester's New College, where he was allowed to use the laboratory. That's all Dalton needed to pursue his ideas. He went on to discover a number of scientific principles. Some of these described the nature of the atom.

After much investigation, Dalton came up with a list of elements that he believed occurred in nature. He assigned each of the elements a weight. He also figured out which atoms combined, or joined together, to create chemical combinations.

For example, Dalton observed that water was made up of hydrogen and oxygen. When hydrogen and oxygen atoms came together to form water, neither one lost or gained weight. If the hydrogen and oxygen atoms broke apart, each atom maintained the same weight as it had been before.

Dalton's discoveries about the atom laid the foundation for other scientists' work. He is considered the founder of modern atomic science.

John Dalton



A picture of John Dalton, by Charles Turner. Library of Congress, public domain