

History of Atomic Theory



Around 400 BC, a Greek philosopher named Democritus suggested the first atomic theory, explaining that all things are "composed of minute, invisible, indestructible particles of pure matter which move about eternally in infinite empty." Although at that time there was no technology to research Democritus' theory of the atom, he was surprisingly accurate. After Democritus' discovery, new evidence would be found that would eventually lead to the modern atomic theory. John Dalton, J.J. Thompson, Ernest Rutherford, Niels Bohr, James Chadwick and Ernest Schrodinger each contributed greatly to the modern atomic theory by finding the actual evidence.



1803 – John Dalton, a British schoolmaster and chemist, made inferences in the 19th century that exhibited how atoms bond together in definite proportions. An example of one of the tests that he ran was measuring the proportions of hydrogen to oxygen in different amount of the substances. Because the ratios were the same, Dalton was able to say that atoms of different elements combine in whole number ratios. This theory, to go along with four other theories, made up what Dalton called the "Modern Atomic Theory." In this, Dalton stated five different theories that he believed were true of atoms. Included in these were two theories that stated atoms could not be divided or destroyed, a theory that stated different elements contain different chemical properties, and atoms of the same element contain the same chemical properties. Although the two theories that speculated atoms couldn't be divided were false, Dalton contributed greatly to the advances of atomic theory, and would greatly influence J.J. Thompson in his own.



1897 – J.J. Thompson was British scientist and the Cavendish Professor of Physics at the University of Cambridge. He is credited for discovering the electron and ended up contributing to more than the atomic theory. The television, computer, and radar are machines that he indirectly helped create. Thompson created a tube that had a positively charged anode on one side and a negatively charged cathode on the other side. Thompson then applied a magnet to the middle of the tube, equal distance from the cathode and anode, and discovered that negatively charged particles were emanating towards the positive magnetic field. From this, Thompson concluded that negatively charged particles, called electrons, were present in atoms. Thompson then created the Plum Pudding model, which suggested that electrons and protons were randomly placed throughout the atom. This theory wasn't correct, but led to the discovery of the nucleus, made by Ernest Rutherford.



1911 – Ernest Rutherford was born in New Zealand and was working at the University of Manchester in England when he carried an experiment in which alpha particles, which were actually stripped hydrogen atoms, were shot at a thin gold sheet. Rutherford determined where the deflections of the alpha particles would go. The results of the experiments were somewhat revolutionary; most of the alpha particles did not deflect off of the gold foil, and instead went straight through it. Only 1/1,000,000 particles were deflected straight back, and just a bit higher percentage were deflected in other angles. Based on these observations, in 1911 Rutherford proposed a revolutionary view of the [atom](#). He suggested that the [atom](#) consisted of a small, dense [core](#) of positively charged particles in the center (or [nucleus](#)) of the atom, surrounded by a swirling ring of [electrons](#).



1922 – Niels Bohr was a Danish scientist that worked with Rutherford. "Bohr Theory of the Atom" was the closest to the modern atomic theory, and it reemphasized the idea of electrons circling the nucleus. Bohr suggested that electrons orbited around the nucleus in seven different quantum levels, or shells. The evidence that Bohr used to build this theory was the measurement of the line spectrum emitted by hydrogen gas. Bohr determined that different energy levels could be found by using mathematical formulas, which measured the wavelengths of the different energy levels. Bohr went on to suggest that electrons would only occupy the lowest possible energy level on the respective level they were on. Furthermore, electrons would only move up a level (increasing energy) if the lower levels were full. Bohr's model was not entirely correct but it would lead to Schrodinger's idea of the modern atomic model.



1926 – Erwin Schrödinger, an Austrian physicist, viewed electrons as continuous clouds and introduced "wave mechanics" as a mathematical model of the atom. Schrödinger began to think about explaining the movement of an electron in an atom as a wave. While working at the University of Zürich, in 1926 he published his work, providing a theoretical basis for the atomic model that Niels Bohr had proposed based on laboratory evidence. The equation at the heart of his publication became known as Schrödinger's wave equation. Erwin Schrodinger developed the equation which is used today to understand atoms and molecules.

Scientists continue even today to make new discoveries pertaining to the atomic theory. As new evidence is introduced, new ideas and theories will be developed. Hopefully, in the years to come, the world will see more people like those who helped lead to the modern atomic theory, resulting in a better understanding of the nature of atoms.

Reading Assignment

Write one paragraph about **ONE** of the scientists that contributed to the development of our current view of atoms.

The paragraph must include:

- The name of the scientist
- When the contribution was made
- A personal fact about the scientist
- The main contribution/idea of the scientist to atomic theory.

WARNING!

If you copy sentences directly (identically) from the biographies of the scientists you will not be given **ANY** credits.