

# The history of the atomic model by charlie ehinger

[Science](#), [Physics](#)



Humans have been wondering what everything is made of since the Greeks, are those particles jagged triangles, balls, or clouds of even smaller particles? In this essay I am going to dive deep into the different models which existed before our modern model, and what made them obsolete and why they were huge achievements of their time. The ancient GreeksIt was the ancient Greeks during about 460 – 370 bc who first theorized about the existence of tiny building blocks.

The idea has today come to be called atomism. The main part of this theory was that the atoms were thought to have different shapes and sizes, some like hooks, and some like eyes. The main reason that atoms were believed to exist during this time is because nothing can be divided infinitely, there has to, at some point be some particle which can no longer be divided. The main person who discovered or philosophized about this was Democraticus and his teacher Leucippus. Because Democritus and Leucippus did not have any way of proving the existence of atoms, the theory was mostly abandoned for other explanations. John Dalton model / solid sphere modelThe next progress made to the atomic model was made by John Dalton in the 1800s. Daltons theorized like the greeks that there must exist some particles which cannot be divided, He thought that atoms were solid spheres. Using his experiments on gasses as the starting point for his theory he made five statements about atoms which were published in 1805. These five different points were: Atoms of the same element are identical, all pure elements are made up of small invisible spheres, different elements can be told apart from their atomic weight, Atoms unite to form chemical compounds, atoms can't be created or destroyed.

Some of these are still true as of today. The model itself is however very inaccurate, but this is because both the electron, protons, and neutrons had not yet been discovered. One major thing that Dalton however discovered is that all elements come in ratios of whole numbers, for example  $\text{H}_2\text{O}$ , instead of  $\text{H}_2$ . 1325530. The plum modelThe Plum model was invented or made up soon after the discovery of the electron but before the discovery of the nucleus and proton, which rendered John Dalton's model obsolete (Dalton's model didn't have electrons, protons or neutrons). The model was invented by J. J Thomson in 1904. Thomson knew that if electrons had a negative charge then there must be something positive in the atom to even out the charges. J. J Thomson wrote three solutions to even out the charges, however, the one that he thought was the most plausible was that the electrons of an atom existed in a 'pool' of positivity. Thomson's student Rutherford continued to experiment using thin sheets of gold with his own students. In the experiment alpha particles which only have two neutrons and two protons (it has no electrons so it is very positively charged) were shot at a thin gold sheet.

According to Thomson's model, (if it was correct) the particles should go right through since the weak 'soup' of the positive energy would be too weak to repel the alpha particles. In the experiment many of the particles did go right through, but some of them bounced right off, some bouncing right back at the source of the alpha particles. Since two positives repel each other it was concluded that there must be a strong positive charge in the middle of the atom instead of a weaker positive charge being a 'pool' around the electrons, it was also concluded that atoms are for the most part

consisted of empty space. In 1911 Rutherford made his own model in which there was a small positively charged core which held the majority of the atom's mass. The Bohr-Rutherford model or just the Bohr model for short was invented in 1913, it is commonly used to teach children and students the basics to the atomic structure and quantum mechanics.

Using the results that Rutherford had gotten, Niels Bohr predicted where the electrons are orbiting the protons. One flaw with this model is that it depicts the electrons in a predictable manner, and as we have learned to know since then you can only find an area where electrons might be located (Heisenberg's uncertainty theorem). The Bohr model also couldn't display the different energy levels, this may be because the different energy levels (s, p, d, f) had not been discovered yet. Bohr's model is very good at showing and predicting the energy levels of one electron systems, however it starts to fold as more electrons are added. Heisenberg's uncertainty theorem / principle This theorem was discovered by Werner Heisenberg in 1927. The Heisenberg theorem states that the more you know about a particle's momentum the more difficult it becomes to measure its exact position, therefore the Bohr model becomes obsolete, as the Bohr model displays both where the electrons are located but also where they are going/ orbiting.

Shrödingers cloud model or quantum model. Based on the uncertainty theorem Shrödinger came up with the next modern model the quantum or cloud model. Because of The uncertainty, theorem the cloud or quantum model does not have exact places or positions for its electrons. The quantum model instead has orbitals and energy levels. In each energy level 1, 2, 3, 4

resides a number of different types of orbitals s, p, d and f. There are different numbers of each of these orbitals on each level. For example hydrogen only has as orbital with one electron in it (there can be two electrons per orbital).