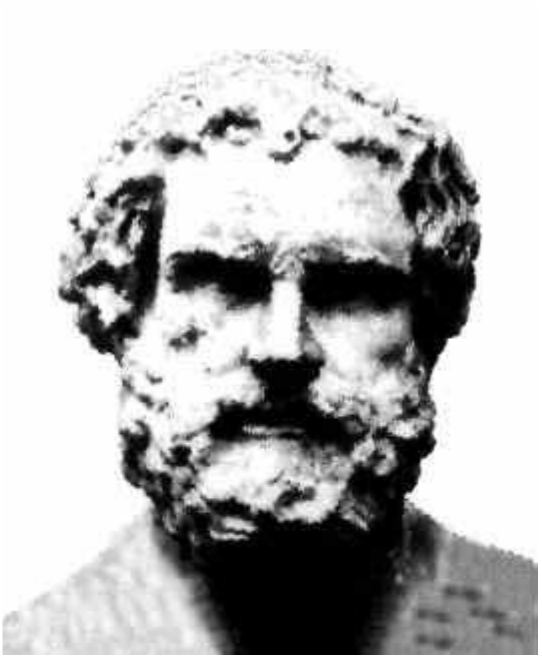
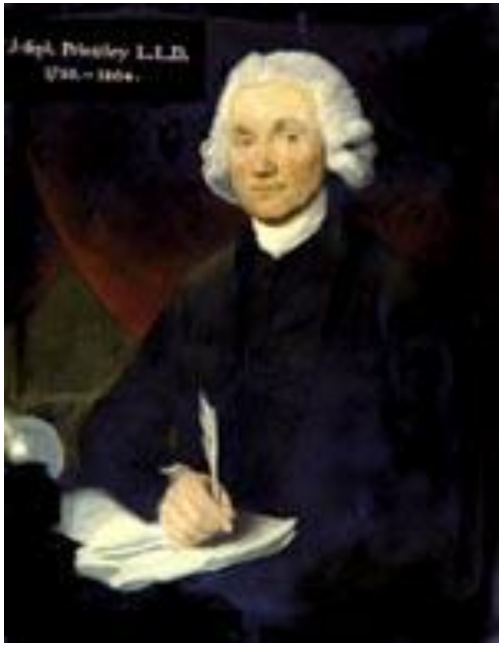


Democritus (460-370 BC) First proposed the existence of an ultimate particle. Used the word "atomos" to describe this particle.

Aristotle (384-322 BC) was a proponent of the continuum. He believed in the four elements of air, earth, water and fire. Aristotle felt that regardless of the number of times you cut a form of matter in half, you would always have a smaller piece of that matter. This view held sway for 2000 years primarily because Aristotle was the tutor of Alexander the Great.

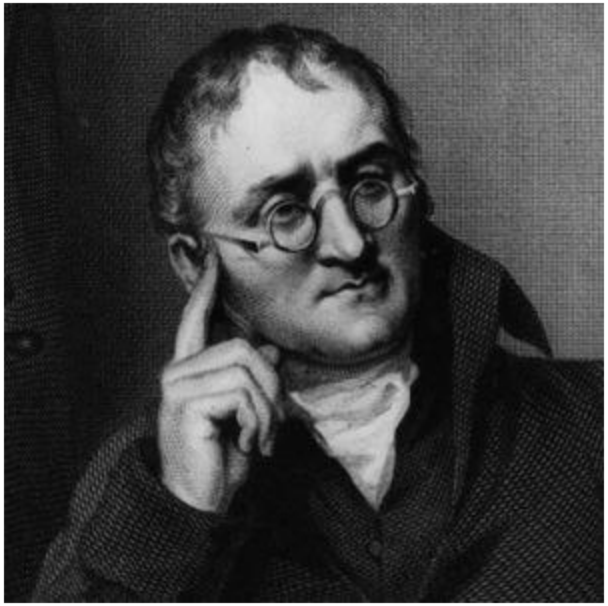
Johann Becher (1635-1682) and Georg Stahl (1660-1734) developed the Phlogiston theory which dominated chemistry between 1670 and 1790. Basically, when something burned, it lost phlogiston to the air (after all, you could see the phlogiston leaving) A problem with the theory was that burning of metals resulted in an increase in the mass. This problem was solved by assigning negative mass to phlogiston.



Joseph Priestly (1733-1804) discovered oxygen (which he called "dephlogisticated air") in 1774. Priestly was an ardent phlogistonist until his dying day. Priestly was also an early anti-war activist who favored both the American and French Revolutions. He was shipped to the U.S. in 1791 where he lived a quiet life in Pennsylvania. His house was used as a starting point for the American Chemical Society in 1876. The Priestly Medal is the highest award given by to an American chemist by the Society.

Antoine Lavoisier (1743-1794) was the first person to make good use of the balance. He was an excellent experimenter. After a visit with Priestly in 1774, he began careful study of the burning process. He proposed the Combustion Theory which was based on sound mass measurements. He named oxygen. He also proposed the Law of Conversation of Mass which represents the beginning of modern chemistry. To support his work, Lavoisier was associated with a tax-collecting firm and was married to the daughter of the one of the firm's executives. Some people believe that Madame Lavoisier was every bit as good a scientist as her husband. Unfortunately, this relationship with the tax firm led to Lavoisier's beheading at the guillotine in 1794.

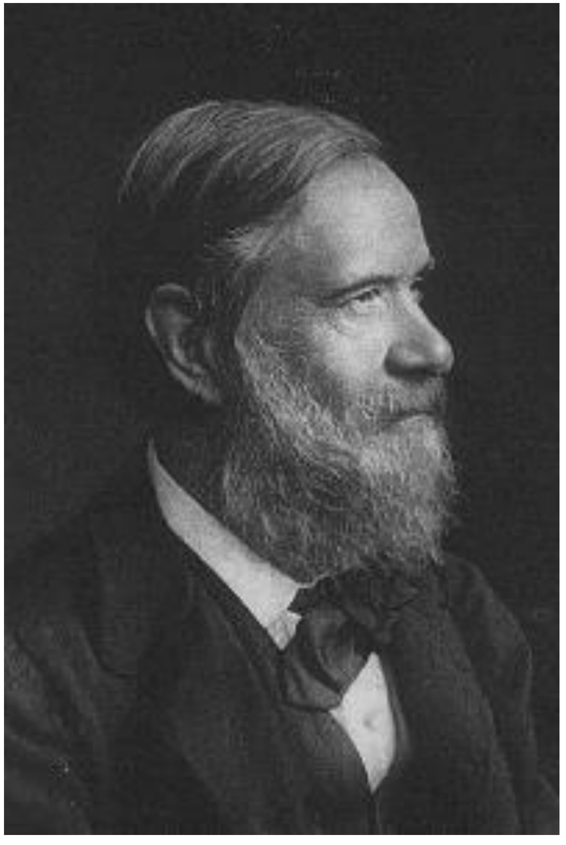
Joseph Proust (1754-1826) proposed the Law of Constant Composition in 1799. This law was very radical at the time and was hotly contested by Claude Berthollet (1748-1822).



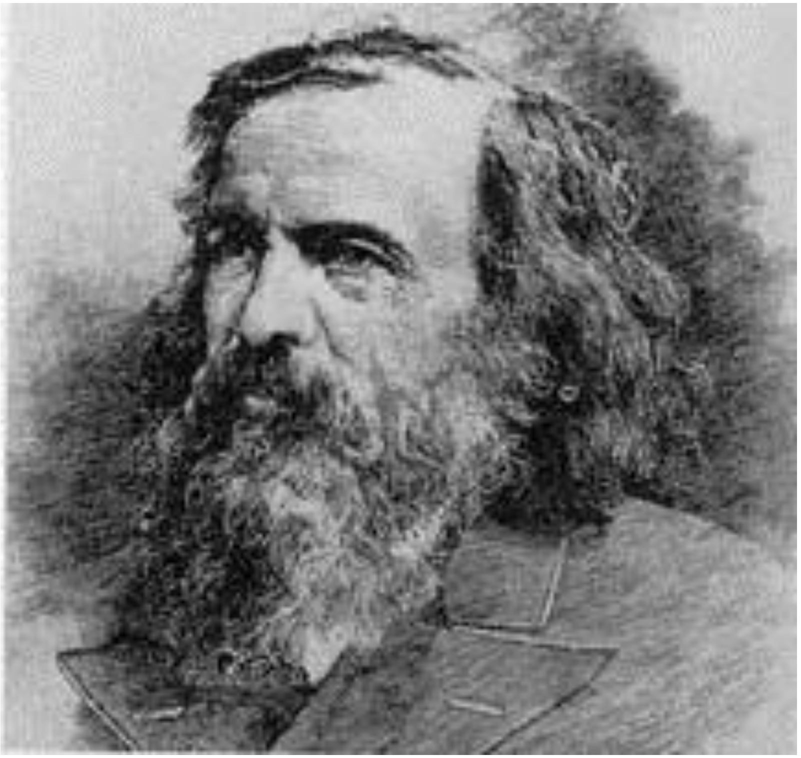
John Dalton (1776-1844) proposed the Law of Multiple Proportions. This law led directly to the proposal of the Atomic Theory in 1803. He also developed the concept of the mole and proposed a system of symbols to represent atoms of different elements. (The symbols currently used were developed by J.J. Berzelius(1779-1848)). Dalton recognized the existence of atoms of elements and that compounds formed from the union of these atoms. He therefore assumed that simplest ratios would be used in nature and came up with a formula for water of HO. He then assigned a relative atomic weight of one to hydrogen and developed a relative atomic weight scale from percent composition data and assumed atomic ratios. Today we would refer to these as equivalent masses. John Dalton also discovered color blindness, an affliction from which he suffered. He determined that five percent of the male population and less than one-tenth percent of the female population was color blind.

Joseph Gay-Lussac (1778-1850) announced the Law of Combining Volumes in 1808. He showed that at the same temperature and pressure, two volumes of hydrogen gas reacted with one volume of oxygen gas to produce two volumes of water (as a gas).

Amadeo Avogadro (1776-1856) proposed what is now known as Avogadro's Hypothesis in 1811. The hypothesis states that at the same temperature and pressure, equal volumes of gases contain the same number of molecules or atoms. When this is combined with Gay-Lussac's Law of Combining Volumes, the only possible formulas for hydrogen, oxygen and water are H_2, O_2 and H_2O, respectively. The solution to the atomic weight problem was at hand in 1811. However, Avogadro's Hypothesis was a radical statement at the time and was not widely accepted until fifty years later.



Stanislao Cannizzaro (1826-1910), in 1860 at the Karlsruhe Conference, proposed that Avogadro's Hypothesis be accepted and the implications used for a period of five years. At the end of this five year period, a new conference would be called to discuss any problems that might develop; this second conference was never called.



Dimitri Mendeleev (1834-1907) proposed the periodic law and developed the first periodic table in 1869. Mendeleev's table was arranged according to increasing atomic weight and left holes for elements that were yet to be discovered.

J. J. Thomson (1856-1940) identified the negatively charged electron in the cathode ray tube in 1897. He deduced that the electron was a component of all matter and calculated the charge to mass ratio for the electron.

$$e/m = -1.76 \times 10^{8} \text{ coulombs/g}$$

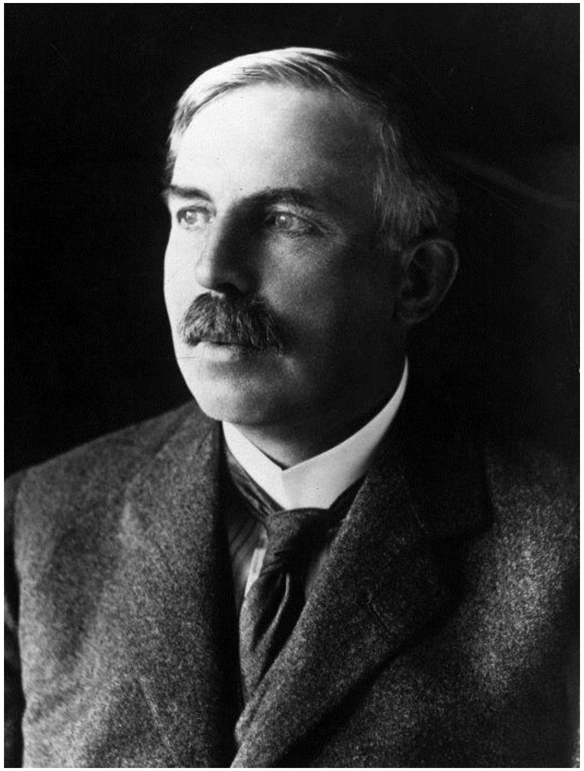
Thomson and others also studied the positive rays in the cathode ray tube and discovered that the charge to mass ratio depended on filling gas in the tube. The largest charge to mass ratio (smallest mass) occurred when hydrogen was the filling gas. This particle was later identified as the proton.

$$e/m = +9.58 \times 10^{4} \text{ coulombs/g}$$

Thomson proposed the "plum pudding" model of the atom. In this model, the volume of the atom is composed primarily of the more massive (thus larger) positive portion (the plum pudding). The smaller electrons (actually, raisins in the plum pudding) are dispersed throughout the positive mass to maintain charge neutrality.

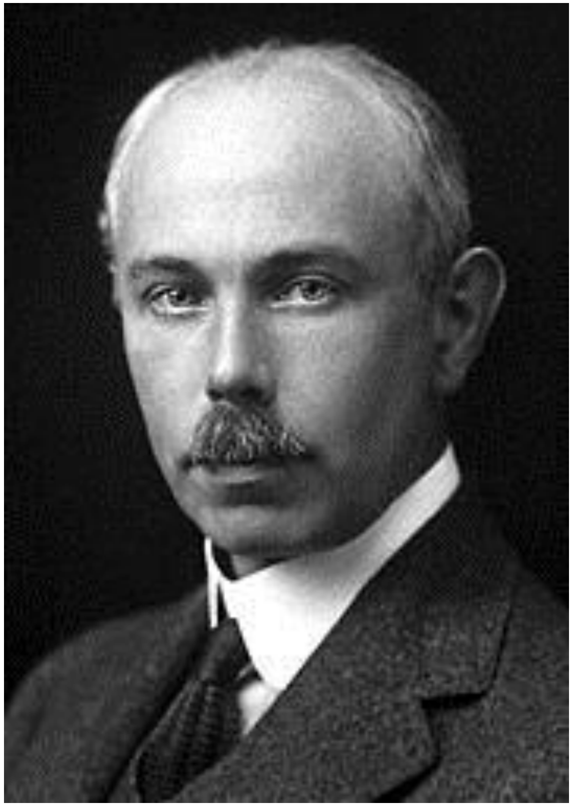
Robert Millikan (1868-1953) determined the unit charge of the electron in 1909 with his oil drop experiment at the University of Chicago. Thus allowing for the calculation of the mass of the electron and the positively charged atoms.

$$e = 1.60 \times 10^{-19} \text{ coulombs}$$



Ernst Rutherford (1871-1937) proposed the nuclear atom as the result of the gold-foil experiment in 1911. Rutherford proposed that all of the positive charge and all of the mass of the atom occupied a small volume at the center of the atom and that most of the volume of the atom was empty space occupied by the electrons. This was a very radical proposal that flew in the face of Newtonian Physics. Although positive particles had been discussed for some time, it was Rutherford in 1920 that first referred to the hydrogen nucleus as a proton. Also in 1920, Rutherford proposed the existence of the third atomic particle, the neutron.

Henry Moseley (1887-1915) discovered that the energy of x-rays emitted by the elements increased in a linear fashion with each successive element in the periodic table. In 1913, he proposed that the relationship was a function of the positive charge on the nucleus. This rearranged the periodic table by using the atomic number instead of atomic mass to represent the progression of the elements. This new table left additional holes for elements that would soon be discovered. Unfortunately, Moseley was killed at Gallipoli during WWI.



Francis Aston (1877-1945) invented the mass spectrograph in 1920. He was the first person to observe isotopes. For example he observed that there were three different kinds of hydrogen atoms. While most of the atoms had a mass number of 1 he also observed hydrogen atoms with mass numbers of 2 and 3. Modern atomic masses are based on mass spectral analysis. His work led Rutherford to predict the existence of the neutron.

James Chadwick (1891-1974) discovered the neutron in 1932. Chadwick was a collaborator of Rutherford's. Interestingly, the discovery of the neutron led directly to the discovery of fission and ultimately to the atomic bomb.

Alfred Werner proposed the theory of coordination compounds in 1893 and received the Nobel Prize in Chemistry in 1913 for his work on the linkage of atoms in molecules. Led to an enormous growth of research interest in coordination chemistry, a major branch of inorganic chemistry, leading to a plethora of coordination compounds that has been mainly dominated by transition-metal complexes. These complexes were popular given the unlimited combination of ligands of different denticities and bonding modes, a variety of oxidation states, and the diversity of colors, properties, and reactivities.