GLOSSARY AND CREDITS

What is matter? On the one hand, matter might be defined as a combination of a number of chemical substances which combined according to very specific laws to form that something which we call matter. However, that leads to the next question: what are the origins of the individual chemical substances which are combined to form matter? What are the laws that cause them to combine in a given order? Science has isolated over a hundred separate substances which are basic or simple and do not consist of combinations of other substances, but how did they come to be just what they are? Why is gold, gold, silver, silver, or uranium, uranium? Why are all the other isolated elements what they are, and why are they separated from one another? Why are they found where they are found, and what accounts for their peculiar qualities?

Scientists thought they had succeeded in breaking down matter to its last ultimate unit: the atom. In an article which appeared in a national magazine, a writer on this subject was introduced by the editor of that magazine as "one of the nation's foremost interpreters of modern science." This modern authority on science then wrote that the Greeks knew the atom, but they did not know what we know about the atom nor of its infinite smallness. Then this writer continues by making a startling statement asserting that a teaspoonful of water contains a million billion trillion atoms. We can repeat these figures, but no one can comprehend what they mean. The writer then says, "We now have learned that this infinitely tiny atom is composed of still smaller parts which form a microscopic universe in which there is action, energy, and motion similar to that of our own solar system.

"In everyday language we speak of dead matter. Of course, it is dead in the sense that it does not have in it what we call the germ of life, nor can it propagate itself. But it is not dead in the sense that it is inactive or absolutely static. In a lump of so-called dead matter, there are countless billions of atoms, each one an active universe, a bundle of energy and force beyond all comprehension, as we have learned since the atomic bomb has come into existence."

This unit will guide our exploration of the history of atomic theory and develop some ideas about our modern model of the atom.

VOCABULARY

alpha particle	Helium nucleus emitted from the nucleus of a decaying isotope; represented by 2^{+}or 4/2 He.
atomic mass or mass number	The number of protons plus neutrons in the nucleus.
atomic number	The number of protons in the nucleus.
beta particle	An electron or particle similar to an electron with negligible mass and a charge of -1; represented by β^{-} or 0/1 e.
daughter	The nuclide produced from a radioactive decay.
electron	Negative particles basic to matter; symbolized by (-), e-, or p~; located outside the nucleus; in constant motion; 1/1,837 the mass of a proton; generates most of the volume of the atom.
emission spectrum	The distribution of light when passed through a prism or other device that breaks the light into its individual components.
energy level	The broad bands or regions located around the nucleus where the electrons are found.
gamma ray	High energy ray of energy emitted from some radioactive atoms.
group	The vertical column of the periodic table; groups have similar valence electron structure and similar chemical and physical properties.
half life	The time necessary for the decay of one-half of sample of a radioactive substance.

ion	Atom or group of atoms with a net charge caused by unequal numbers of electrons and protons.
ionization energy	The energy necessary to overcome the attractions of electrons to the nucleus of an atom so as to remove electrons from the atom.
isotope	A member of the same element (same atomic number) but different mass number due to different numbers of neutrons in the nucleus.
mass defect	The difference between the mass of a nucleus and the sum of masses of its components. Equivalent to binding energy according to $E = mc^2$.
neutron	Neutral particle found in the nucleus; mass about equal to that of a proton; neutrons plus protons constitute mass of atom.
nucleus	The central core of the atom containing most of the mass and made up of protons and neutrons.
nuclide	The isotope of a radioactive element.
orbital	The region of space occupied by the moving electrons of the atom; each orbital can hold a maximum of two electrons. The regions of high probability of electron location.
parent	The beginning nuclide in the radioactive decay chain.
period	The horizontal row in the periodic table.
periodic table	A table of the elements, arranged to illustrate the periodic (repeating) characteristics of the elements; order increases by increasing atomic number.
photon	A bundle of energy, usually light, emitted from some energy source or atom.
proton	One of the particles of the nucleus; positively charged; symbolized by (+) or p; assigned a mass value of 1 unit; protons plus neutrons constitute mass of atom.

quantum	Energy available or given off in specific, predictable quantities.
radioactive	Unstable and capable of disintegrating into different elements, producing radiation and energy.
sublevels	The energy divisions of the atom represented by s, p, d, and f which define the shape of the orbital-q containing electrons.