

biological effects of radiation—are discussed briefly to provide some necessary basic knowledge. For further study, see the comprehensive reference list at the end of the chapter.

Meanings of "Atomic Terms"

Before discussing the characteristics of ionizing radiation, it would be best to define many of the terms used. A word printed in *italics* is defined elsewhere in this glossary.*

ACCELERATOR A device for imparting very high velocity to charged particles such as *electrons* or *protons*. These fast particles can penetrate matter and are types of *radiation*. Fast particles of this type are used in research or to study the structure of the *atom* itself. Some accelerators are called *atom smashers*.

ACTIVATION Making a substance artificially *radioactive* in an *accelerator* such as a *cyclotron* or by *bombarding* it with *neutrons* in a reactor.

ALPHA PARTICLE (ALPHA RAY, ALPHA RADIATION) A small electrically charged particle of very high velocity thrown off by many *radioactive* materials, including *uranium* and *radium*. It is identical with the *nucleus* of a helium *atom* and is made up of two *neutrons* and two *protons*. Its electric *charge* is positive and twice as great as that of an *electron*.

ANTI-PARTICLE A particle which interacts with its counterpart of the same mass but opposite electric *charge* and magnetic properties (e.g., *proton* and anti-*proton* or *neutron* and anti-*neutron*), with complete annihilation of both and production of an equivalent amount of *radiation* energy. The *positron* and its anti-particle, the *electron*, annihilate each other upon interaction and produce *gamma rays*.

ATOM The tiny "building block" of nature. All materials are made of atoms. The *elements*, such as iron, lead and sulfur, differ from each other because they contain different atoms. Atoms are unbelievably small. No one has ever seen one. There are six sextillion (6 followed by 21 zeros) atoms in an ordinary drop of water. The word "atom" comes from the Greek work meaning indivisible. Now we know it can be split and con-

sists of an inner core (*nucleus*) surrounded by *electrons* which rotate around the nucleus like the planets around the sun.

ATOMIC ENERGY Energy released in *nuclear reactions*. Of particular interest is the energy released when a *neutron* splits an atom's *nucleus* into smaller pieces (*fission*) or when two nuclei are joined together under millions of degrees of heat (*fusion*). "Atomic energy" is really a popular misnomer. It is more correctly called "*nuclear energy*."

ATOMIC NUMBER The number of *protons* (positively charged particles) found in the *nucleus* of an *atom*. All *elements* have different atomic numbers. The atomic number of hydrogen is 1, that of oxygen 8, iron 26, lead 82, *uranium* 92. The atomic number is also called *charge number* and is usually denoted by *Z*.

ATOMIC THEORY Since the time of the ancient Greeks man has held the theory that all matter is composed of tiny, invisible particles called *atoms*. It remained for the chemists and physicists of the 19th and 20th centuries to verify the existence of the atom and the validity of the atomic theory.

ATOMIC WEIGHT The atomic weight is approximately the sum of the number of *protons* and *neutrons* found in the *nucleus* of an atom. This sum is also called *mass number*. The atomic weight of oxygen, for example is approximately 16, with most oxygen atoms containing 8 neutrons plus 8 protons. Aluminum is 27—it contains 14 neutrons and 13 protons.

ATOM SMASHER. A machine (an *accelerator*) that speeds up atomic and sub-atomic particles so that they can be used as projectiles to literally blast apart the *nuclei* of other *atoms*.

AUTORADIOGRAPHY Self-portraits of *radioactive sources* made by placing the radioactive material next to photographic film. The radiations fog the film leaving an image of the source. It was such self-portraits that led to the discovery of radioactivity.

*This glossary is adapted from one originally published as "101 Atomic Terms and What They Mean," by the Esso Research and Engineering Company, and is reproduced here by permission.