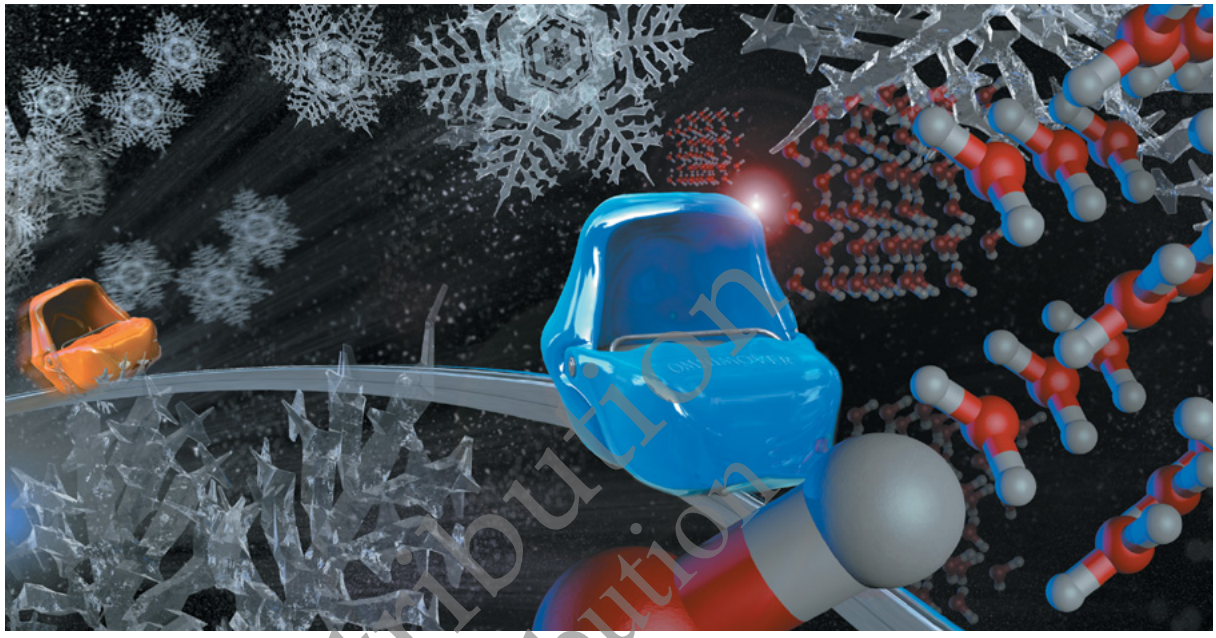
Pearson

Chapter 1
Atoms



This image portrays the Disneyland ride, *Adventure Thru Inner Space*. The premise of the ride is that you enter a microscope and get shrunk down to the size of an atom. The red and white spheres shown here depict oxygen and hydrogen atoms bound together to form water molecules.

> "The first principles of the universe are atoms and empty space; everything else is merely thought to exist."
>
> —*Democritus (c. 460 BC–c. 370 BC)*

Learning Outcomes

WHAT DO YOU THINK IS THE MOST powerful idea in all of human knowledge? There are, of course, many possible answers to this question—some practical, some philosophical, and some scientific. If we limit ourselves only to scientific answers, mine would be this: *The properties of matter are determined by the structure of the atoms and molecules that compose it*. Atoms and molecules determine how matter behaves—if they were different, matter would be different. The structure of helium atoms determines how helium behaves; the structure of water molecules determines how water behaves; and the structures of the molecules that compose our bodies determine how our bodies behave. The understanding of matter at the particulate level gives us unprecedented control over that matter. For example, our understanding of the details of the molecules that compose living organisms has revolutionized biology over the last 50 years.