This chapter presents an overview of the history of science (Fig. 3.1). The origins of the theory of evolution and the philosophy of naturalism can be best understood if put in their historical context. Science in Mesopotamia, Egypt, and Asia Minor about 4,000 years ago did not much resemble modern science, but individuals were beginning to think about the structure of the universe. Thales (639–544 B.C.) thought the earth was flat and floated on water, but
one of his pupils, Anaximander (c. 611–547 B.C.), described the earth as a sphere.

**Greek Science**

Beginning in the fifth century B.C., the most highly developed science was in Greece. Three famous representatives of this era were Socrates (470–399 B.C.), his student Plato (429–347 B.C.), and Plato’s student Aristotle (384–322 B.C.). They were interested both in human conduct and the physical world.

Aristotle, Plato’s greatest pupil, wrote in many disciplines, such as ethics, politics, biology, cosmology, and logic. He developed quite a coherent system of thought, though many of his ideas were wrong. His work was the inspiration for the sophisticated Greek science of the Hellenistic age. Unfortunately, many later scholars did not continue his careful inquiry; they looked to the old masters for truth. In the area of cosmology, Plato believed the planets moved in perfect circles (the perfect orbit), and scientists then thought the earth must be the center of the universe. Eudoxos (409–356 B.C.) made the first mathematical model of planetary motion. In it the planets were carried on theoretical spheres carried by other spheres. This model could account for the observed phenomena of planetary motion. It was geocentric; that is, the earth is in the center of the universe. Aristotle further developed the geocentric model of cosmology. Some scientists thought of the planetary spheres as not just theoretical mathematical spheres, but hard, physically linked transparent spheres made of “crystalline.” In the Middle Ages, this idea became dogma.

Not all ancient cosmologists were in complete agreement with the geocentric theory. Heraclides, a contemporary of Aristotle, suggested that the earth rotates on its axis. In a classic case of anticipating a future development, Aristarchus (310–230 B.C.) suggested that the sun and fixed stars are motionless and the earth and planets rotate around the
sun, with the earth circling the sun once a year. He also suggested that the earth rotates on its axis. His ideas were not accepted. Instead, the geocentric theory was further developed and refined to account for new data. Ptolemy (A.D. 85–165), the last of the great Greek astronomers, wrote *The Almagest*, a comprehensive treatise on cosmology (see English translation in Encyclopedia Britannica 1990). He believed in a geocentric cosmology and argued that the earth is stationary. These were reasonable conclusions given the information available at the time.

Figure 3.1
*A brief summary of the history of science in its cultural, political, and religious context. Intertwining of branches represents flow of scientific information between cultures. Time line by Robert Knabenbauer.*
A fundamental concept of this work was the reduction of the apparent irregularities of planetary motion to mathematical law. For example, Mars, Jupiter, and Saturn rotate more slowly than Earth, and Earth overtakes them. Consequently, they appear to go backward (Fig. 3.2). Also, some planets (like Mars) vary in brightness because of the changing distance from Earth throughout the year. Ptolemy explained these observations with two devices. One is an eccentric, a sphere whose center is not Earth. Another is an epicycle, a small sphere that rotates around a point on the perimeter of a larger sphere, the deferent. These mechanisms could mathematically explain the data with surprising accuracy.

**The Decline of Greek Science**

Greek science flourished until the Roman domination and then began to decline. It was almost dead by A.D. 200. Finally, Rome decayed, the Germanic barbarians overran Europe, and Greek culture largely disappeared. During the Middle Ages, the Muslims occupied large areas in the Middle East, Northern Africa, and parts of Europe. During this time, the centers of learning were in Arabic countries. These scholars learned from the Greeks and from the highly developed science of China (Kneller 1978, p. 4–7), and then they added their own contributions and became the keepers of European science.