

Some Notes on the History of Physics

I. Natural Philosophy

The study of the physical world by the people of ancient Greece was called natural philosophy. It was the study of nature by philosophers. When the first western universities began in the middle ages, this name was aptly retained. The Greek and medieval scholars believed that reason alone could deduce the laws of nature. The word science did not come into usage until the 19th century.

Aristotle (384-322 B.C.) presented much of the ancient Greek thought in a sophisticated form. His name is associated with the "Aristotelian world view." He believed that all matter was made up of five elements: earth, wind and fire, water, and ether (the substance of the heavenly bodies). He believed the earth was the center of the universe and that the earth was spherical. He believed that all objects sought their "natural place." Others continued to philosophize about their world. Their assumptions and logical arguments were discussed by medieval scholars. The emphasis was on scholasticism, and explanations were judged by such standards as "Ockham's razor" (which strived to use the fewest assumptions to describe the same phenomena). For 2,000 years, Aristotle remained generally unchallenged.

II. Experimental Physics

Galileo (1564-1642) was not the first to conduct experiments. Archimedes (287-212 B.C.) and Hero (1st century A.D.) were Greek scholars who were exceptions to the rationalism of their times. In the middle ages, others began to experiment. Galileo made experimentation spectacular and popular. He criticized the Aristotelian natural philosophy. The birth of modern science is usually dated with Galileo.

III. Astronomy

Much of the beginning of the physics we study today centers around the history of the study of the planets and their orbits. The Greek astronomer Ptolemy (2nd century A.D.) developed a fairly accurate geocentric or Aristotelian model of the solar system, accepted for 1400 years. Polish astronomer Copernicus (1473-1543) waited until his death to publish his heliocentric model which placed the sun at the center. German astronomer Johannes Kepler (1571-1630) spent many years with his despised Danish master, Tycho Brahe. He finally acquired the astronomical data when Brahe died in 1601. Through long study, Kepler deduced what we call today Kepler's Three Laws of Planetary Motion. He found that the orbits were not circular, but elliptical with the sun at one of the focal points. Kepler spent 16 years trying to provide a mathematical model to explain his observation. He wrote volumes. In the end, he is remembered for his three correct observations.

III. Classical Mechanics

Isaac Newton (1642-1727) was born on Christmas Day, the year Galileo died under house arrest in his home in Italy. His laws of motion and his universal law of gravity explained mathematically Kepler's laws. He had discovered the "key to the mechanical universe." Newton also invented calculus and made many other correct observations. He is regarded as one of the greatest scientists in history.

IV. Modern Physics

In the 19th century with the understanding of electricity and magnetism, one scholar proclaimed that there would no longer be a need to study physics in that all the questions had been answered. With the 20th century, beginning with Albert Einstein (1879-1955) the world would find that Newton's laws of mechanics, the foundation for all of physics, were not quite accurate. They were close but not quite right!