CHAPTER OVERVIEW

6: Exploring Gravity

Gravity is one of the most fundamental, and most mysterious, forces in our universe. There is an adage in astronomy that "*Gravity controls everything*." Gravity was first explored mathematically and scientifically by Galileo in the early 1600's. It was Galileo who first realized that gravity acts on all things equally and that everything falls at the same rate regardless of its mass. Galileo also explored gravitation using ramps and pendulums – something that even the youngest students can experience and begin to understand in school today.

The function of gravity on the solar system was largely unknown until Isaac Newton proposed his ***theory of universal gravitation*** in 1665. Newton's theory says that all things possess gravity and attract each other across space. Therefore while the Earth's gravity attracts you and holds you on the surface, your gravity also attracts the Earth! Newton also proved mathematically that gravitational force controlled all the orbits in our solar system – both those of planets going around the Sun as well as the orbits or moons around various planets. In fact, it was the falling apple that led Newton to prove that the Moon is really falling in its orbit around the Earth. Newton used his ideas to propose that artificial satellites were actually possible some 300 years before anyone actually launched one into Earth orbit.

The concept of what gravity actually is remained mysterious until Albert Einstein figured it out in his ***Theory of Relativity*** which was developed between 1905 and 1915. Einstein argued that space and time are actually one unified thing called ***spacetime***. According to Einstein, it was the curvature of this spacetime that really creates the gravitational force that produces the effects studied by Newton and Galileo. While Einstein's theory is well beyond most of us mathematically speaking, it is perfectly possible for young students to build simple Einsteinian models and explore the concepts of spacetime and gravity in the classroom!

In this unit, the activities we attempt will be arranged ***historically***; that is, we will try some of Galileo's ideas first, then explore Newton, and finally Einstein. What? You didn't think you could teach 21st century science to elementary school children!? Yes, ***you can!*** Let's get started!
