# ASTRONOMY AND THE UNIVERSE

## Chapter 1

**INTRODUCTION** This chapter is a preview of the entire course. A large amount of this chapter is spent on simply getting the basics: the math necessary for later chapters, a concept of scale, the dynamic nature of theories, and the celestial sphere. Each of the concepts will be expanded upon in later chapters and in the laboratory. In the laboratory, we explored the terrestrial coordinate system of latitude and longitude and the analogous celestial coordinate system of declination and right ascension. Also introduced was the method of determining terrestrial latitude using Polaris.

**GOALS**

- ✓ Understand that the nature of the universe can be systematically studied and that the theories derived from observation and experiment are dynamic and may be modified as time goes on and new observations are made and new experiments are performed.
- ✓ Realize that theories are models by which we explain the mechanics of the origin and future of the universe. Theories must be consistent with observation or they must be modified or discarded
- ✓ Be aware that astronomical and astrophysical observations have helped humanity discover many of the fundamental laws of physics.
- ✓ It is important that each person participating in this course not be afraid of math. Especially important is the appreciation of the scale of the universe and the size of the numbers used to describe this scale. Being able to work with exponential notation (scientific notation) is mandatory for excelling in astronomy.
- ✓ Since it is usually impossible to directly measure the size of a terrestrial object, the use of angular dimensions (in degrees, minutes, and/or seconds) is often employed. The small-angle formula is our way of converting angular measure into linear measure. As such, the ability to work in several different units of measure will be important; *e.g.*, km, AU, ly, pc.
- ✓ The stellar brightness scale (magnitude) was introduced in lab using the planetarium software.

**DEFINITIONS**

You should have a working knowledge of at least these terms and any others used in lecture and lab. Many of. these terms will be found In the glossary at the class website.

angle
angular diameter
angular dimension
angular distance
angular measure
angular size
arc minute (’)
arc second (”)
astronomical unit
Big Bang cosmology
black hole
degree (°)
exponent
exponential notation
galaxy
hypothesis
kilometer
kiloparsec (kpc)
kilolight-year (kly)
light-year (ly)
megalight-year (Mly)
megaparsec (Mpc)
model
nebula *(pl.* nebulae)
neutron star
Newtonian physics
parsec (pc)
physics
planet
pulsar
scientific method
scientific notation
small-angle formula
solar system
subtend (as in an angle)
supernova *(pl.* supernovae)
theory
white dwarf