Introduction to Astronomy

To introduce you to the study of astronomy, let's start with a couple of simple activities that talk about astronomical scales in both size and age. The size and age of things in astronomy are so immense that it is difficult to get a grasp on them, but we will attempt to shed some light here by relating them to two familiar things from our everyday lives: a road trip on a highway, and a calendar year.

Part 1: Interplanetary Highway

Imagine there exists an "interplanetary highway" that connects the Sun and the planets (the practicality of this will require some suspension of disbelief!). Here are some assumptions about our interplanetary highway:

- The highway forms a straight line connecting the Sun to the orbits of planets along the shortest possible route.
- We are riding on a robot-driven bus that drives 24/7 without stopping.
- The bus travels at 80 mph.
- The bus is solar-powered so there's no need to stop for fuel.
- Bathrooms, food, and all other basic needs are provided for us inside the bus.
- No need to stop, ever!

1. Mercury

    a) How long would the bus ride on this interplanetary highway take if you were traveling from the Sun to the first planet of our solar system, Mercury? Don't google, just make your best guess/estimate and write it down.

    b) The instructor will provide you with the correct answer. Write it down below. Does this answer surprise you? Why?

c) If you are taking this trip and you left the Sun today, how old would you be when you arrived at Mercury?

2. Earth

   a) How long would the bus ride take from the Sun to the Earth? You might wish to use the answer from 1(b) to help you but again just give your best guess/estimate.

   b) The instructor will provide you with the correct answer. Write it down below.

   c) If you left the Sun today and rode the interplanetary bus to the Earth, how old would you be when you arrived?

   d) Suppose this bus is a "colony ship" that carries many families. If you had children at the age of 30, how old would your children be when the bus arrives at Earth? If your children had children also at the age of 30, how old would your grandchildren be? If each generation had children at the age of 30, what would be the youngest generation alive (relative to you) when the bus arrives at Earth?

   e) The Earth-Sun distance is about 93 million miles. Miles aren't a very good unit for this distance because they are too short! So astronomers have invented a unit in which the Earth-Sun distance is equal to 1. This is called an "**Astronomical Unit**" (AU):

   > 1 AU = 93 million miles

3. Saturn

   a) How long would the bus ride take from the Sun to Saturn? You might wish to use the answer from 2(b) to help you but again just give your best guess/estimate.

   b) The instructor will provide you with the correct answer. Write it down below.

   c) If you were to arrive at Saturn *today*, in what year would you have had to leave the Sun? What was going on in human history at this time?

4. Pluto

   a) How long would the bus ride take from the Sun to Pluto? You might wish to use the answer from 3(b) to help you but again just give your best guess/estimate.

   b) The instructor will provide you with the correct answer. Write it down below.

   c) If you were to arrive at Pluto *today*, in what year would you have had to leave the Sun? What was going on in human history at this time?

Just our own neighborhood – the solar system – is almost unimaginably vast in size compared to our everyday experience. And even the solar system itself is an infinitesimal speck in the bigger picture, as we will see later this semester.

Part 2: A Cosmic Year

Moving on from the scale of space, let's discuss the scale of time.

The Universe as we know it began in the Big Bang about **13.8 billion years ago**.

How long is 13.8 billion years? This is such a large amount of time that it is difficult to wrap our minds around it.

To help us, let's compress the age of the Universe down to something very familiar: one calendar year.
- Jan 1 is the Big Bang (13.8 billion years ago)
- Midnight on New Year's Eve is right now (0 years ago)

On the next page you'll find a calendar. On that calendar, circle the day on which you think each of the following would have occurred. They are already in chronological order for you:

1) Big Bang
2) Our galaxy's first stars appear
3) Formation of our solar system, including the Sun and the Earth
4) Photosynthesis begins
5) Multicellular organisms first appear on Earth
6) Insects first appear on Earth
7) Dinosaurs first appear
8) Dinosaurs become extinct
9) Humans first walk upright
10) Industrial revolution (~1850)

When you are finished, the instructor will reveal the correct answers.