6th Grade Astronomers: Daytime Observing Warm-up

1 Our telescope

The Lynch Observatory has a 16" reflecting telescope, built by Meade corporation. That means the primary mirror is about the size of a large pizza. As a reflecting telescope, the primary mirror reflects light from objects in the sky to a secondary mirror, which focuses the light on to your eye. Because it is so big, we need a computer to control it, as it is very heavy. It operates in essentially the same manner as the giant telescopes in Hawaii, Chile, Australia and South Africa, they just have mirrors that are much, much larger.

In chapter 1, section 2 of the Holt Astronomy textbook for 6th grade, the telescope in the right panel of Figure 2 is a similar design, except the secondary mirror in our telescope reflects the light back to the bottom of the telescope. This design is very much like the Keck telescope, in Figure 3 and the Hubble Space Telescope, in Figure 4.

We also recently acquired a dedicated solar telescope from Coronado. It is a 60mm refracting telescope, with a special filter that lets through less than $1/100,000$th of the light that enters the telescope. If you pointed this telescope at anything but the sun, you would not see anything at all! The filter also lets through one particular wavelength of Hydrogen at 656nm (also known as the Hα emission line). As the sun is mostly made of Hydrogen, this lets us see structure in the atmosphere of the sun (called the photosphere).

2 Observing the sun

The main portion of the daytime observing lab will involve looking at the sun. The sun is very bright, so we have a special filter which will protect our eyes. NEVER look at the sun with your naked eyes, and **NEVER** look at the sun through a telescope or binoculars on your own.

The sun is more than just a big glowing ball: sometimes it has sunspots. The locations and sizes of these spots change over time, so on a particular observing day, there may be none, a few or many sunspots. The more sunspots there are, the more active the sun is! When there are a lot of sunspots, there are often solar flares than can damage satellites. We are near the bottom of the sunspot cycle right now, so there are less sunspots visible than there were a few years ago.

3 At the dome

I would like the students to work in groups of two, as they will be making drawings and answering some questions. Also, I can only have a certain number of students in the dome itself at any one time, and if they work with partners, it will be easier to manage. Please select (or have them select, whichever you think is most appropriate) these groups before coming to the telescope, so they will be partnered up when you arrive.

I will have handouts and some pencils for the groups when they arrive, but if the students have a favorite pen or pencil (colored pencils are good), they can bring that too. Also, if any of the students wear

glasses or contacts, please make sure they have them. That way, we won't have to refocus the telescope (they should wear their glasses while observing).

Also, the telescope is outside, on the roof of a building. Thus, it can get quite windy on the deck next to the dome, and inside the dome it can get fairly cold during the winter. Make sure and bring a coat, hat and gloves (a scarf too, if it is very cold).

4 Questions

Please ask the students these questions before coming, so they have some time to think about them:

1. How many students have previously looked through a telescope, or binoculars, at the sky?
2. How many students have previously seen a planetarium show?
3. What is the farthest object they have seen with their eyes before?
4. Without a measuring stick, or the odometer on your car, how can you determine the distance between two objects? There are several methods: see how many the students can come up with.

The quick lab on page 37 (chapter 2, section 1) about parallax could be useful for the students to try, while answering question 4. We won't be measuring distances to stars, but I will talk about parallax some.