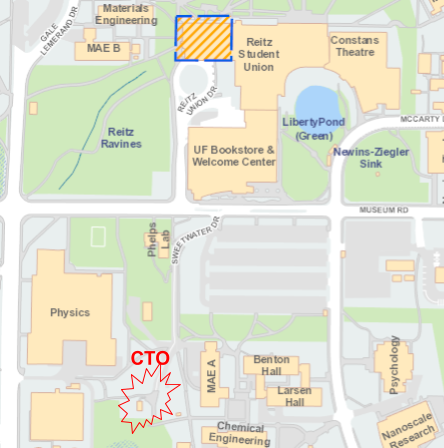
**Lab 1: Introduction to the Campus Teaching Observatory**

*Due: September 5, 2021*

Submit a PDF document via Canvas

The first lab period will be used for an introduction to the Campus Teaching Observatory (CTO), which will be used later in the semester for observing projects. A map to CTO, which is just south of Reitz near the physics building, is shown below. You should head directly to CTO; we will begin class there at 7:30pm. Bring your lab notebook with you.  You will meet with either Professor Ginsburg or TA Karolina Garcia, depending on the day.

This introduction will not be the same as a normal lab in the sense that there is no formal report and the written instructions are less formal (instead augmented by verbal instructions during the lab).

Nevertheless, you are expected to take notes in your lab notebook on how to use the telescopes. Specifically, you should record the procedure that you use for setting up the 5” (or 8”) telescopes. You will also be expected to briefly and clearly answer the questions posed in the instructions. Finally, you should write a section in your notebook summarizing anything that you have learned and questions that you may have.

Outline for the CTO Intro

1. Background on CTO and RHO
2. Tour of CTO telescopes
3. Demonstration on telescope operation
4. Setup and observing with the 5”-8” telescopes
5. Observing with 8”-14” telescopes

We will begin with a discussion of the facilities and available telescopes, and then move on to the activities below. In general italics indicate a questions that you should answer or something that you should record in your notebook.

**Section 1: Using the 5” and 8” telescopes**

You will be using the 5” or 8” telescopes in 1-2 person teams. Your instructors will give a demonstration on how to set up and use the telescopes. After the introduction, each team will be assigned a telescope to work with and you will do the following:

1. Set up the telescope following the procedure in the demonstration. Make sure that the bolts are securely attached to the pillar, and be sure that the flip latches securing the barrel of the telescope are loose before you try to rotate it.

2. Insert a wide field eyepiece (15 mm or more) and secure the eyepiece. Do not worry about focusing yet.

*Record the procedure that you use to set up the telescope. Comment on any details that you deem important.*

3. Look at the dials on the sides of the telescopes. The vertical dial shows the declination.

The horizontal dial can be used to determine either the right ascension or hour angle. We will discuss coordinates and hour angle in an upcoming lecture.

*Question:* ***From the declination dial*** *can you figure out our latitude in Gainesville? If so, how, and what is it?*

**Section 2: The night sky without a telescope**

As an initial exercise, before observing with the telescopes, we will spend a few minutes familiarizing ourselves with the night sky. While at modern observatories telescope operation is a fully automated procedure, there are still times when it is useful to have a familiarity with the night sky. For example, it is good to be able to step outside the dome and see whether there are clouds in the direction of the objects that you wish to observe!

Do the following:

1. Orient yourself. Which directions are south and east*? Record landmarks that will help you remember, making note of directions.*

2. Take a few minutes now, look up at the night sky, and see what stars/planets/constellations you can identify. *Write down a list of what you can identify.* [If the answer is none, that’s fine.]

3. For this part, you will use a sky map app on your phone/computer\*. Match up your star chart to the sky. *Identify four constellations and record which ones you have found. Sketch these constellations in your notebook, also marking down any additional stars that you find helpful in locating them.*

\*It is possible to quickly identify objects in the sky using a smartphone or tablet via programs such as SkyView, Google Sky Map, and StarWalk, or via programs like Stellarium or World Wide Telescope on a computer. **You should download one or more of these apps before coming to class.** If you found objects in the sky manually, spend a few minutes using one of these devices to verify that you have identified the correct objects and learn a few more.

4. Next, locate Sirius and Procyon in the sky. *Record in your notebook the time, the cardinal direction to these stars* (aka, are they in the West? the South? the Northeast? you may estimate the azimuthal angle if you want, where North = 0 degrees)  *and their rough elevation above the horizon* (a fist at arm’s length is about 5 degrees).

5. Locate Orion and identify the location of the Orion Nebula. Can we observe it now? Record its location and say whether it can be observed.

6. Locate Deneb in the constellation Cygnus. Can we observe it now? Record its location and say whether it can be observed.

**Section 3: Getting to know the sky with your telescope**

It is now time to start observing with your telescope. During the lab time we will also be setting up the 12” and/or 14” reflectors (if possible). Before leaving, use all of the telescopes that we are operating. Several questions below require doing so.

1. First, turn your telescope to Vega*.*  Use the finder scope on the side of the telescope to locate and center on Vega. Each person in the group should then take turns locating a star in the finder scope and focusing the eyepiece. Once you are centered, adjust the focus knob to obtain the best focus possible. When you think that you have the telescope well-focused, call over the instructor so that they can verify that everything looks OK. *Record the focal length of your eyepiece and sketch what you observe; record any relevant details. All sketches should have a circle for the approximate field of view.* Try out several different eyepieces and compare. *Record focal length, sketches, and notes for the other eyepieces (at least 2) that you use and compare the results that you obtain with each.*

2. Next, locate Antares in Scorpius. Try out several different eyepieces and compare. *Make notes recording the eyepieces that you use and comparing the results that you obtain with each.*

*3. Question: You should have tracking turned on while you are observing Antares. Turn off tracking and time how long it takes for Antares to move out of your field. From this information, roughly estimate the field of view for the combination of telescope and eyepiece that you are using.*

4. Now point the telescope at the Ring Nebula (M57) near Vega in Lyra. This is a planetary nebula that will most likely appear as a faint, fuzzy circle at first. *Sketch what you see, including the field of view of the eyepiece to give a sense of scale.* Try a higher magnification lens and *again sketch what you see, being sure to record the focal length of the lenses.*

*5. Question: One of the larger telescopes is also pointed at the Ring Nebula. Sketch what you see using this telescope and comment on how this compares with what you saw through a 5” or 8” telescope.*

*6. Question: If you wish to acquire a better image of the Ring nebula, what do you think would be the most important thing to change: the size of the telescope, the location, or the detector (i.e. your eye versus a camera). Please explain your reasoning.*

*7. Question: One of the larger telescopes may be pointed at another object (Planet or a star cluster, most likely M13 in Hercules). Sketch what you see using this telescope and make a note of the eyepiece focal length.*

**On your own**

1. On another night before lab reports are due go outside in the evening for half an hour and, using the star chart or a smartphone app, identify as many constellations as you can. *Record in your notebook what day and time you go out, what constellations you are able to find. Repeat, now trying to find the constellations again without a planisphere or smartphone app, again recording what you can identify.*

2. Summarize what you’ve learned and list any questions you still have.

**For this lab assignment, you must turn in a typed report with images of your sketches either photographed or scanned onto the document. This does not need to be a formal report, but all sections with descriptions/procedures, questions, and sketches must be included and clearly labeled! You should have:**

* Using 5” and 8” Telescopes: set-up procedure and question(s)
* The Night Sky Without a Telescope: sketches, notes, and question(s)
* Getting to know the sky with your Telescope: sketches, notes, and question(s)
* On Your Own: notes and summary

**Please also include your name, the date, and the names of anyone you collaborated with (who was in your group?)**