I. Objectives

1. Explain Lab Requirements

2. Explain Available Equipment and Check-Out Procedures

3. Learn and Experiment with Cameras

4. Examples
II. Lab Requirements

2. Data Table for all photos taken.
3. Photos to meet the following requirements*:
   1. Fixed Camera Method.
      1. Star Trail of 20 minutes or Longer.
      2. Short Exposure Night Scene with Astronomical Object.
      3. Short Exposure Constellation
   2. Piggyback Method.
   3. Telescope Mounted Method.
4. A creative piece of your own.
*You must use the fish-eye for at least one of these photos!
III. Equipment

- 4 DSLR Cameras with 50 mm (f/1.8) Lenses and wireless remotes and 2 gigabytes of media storage.
- 4+ Tripods
  - Allows you to use the telescope to track an object.
- 2 Piggyback Mounts
  - Allows you to use the telescope to collect more light and track an object.
- 2 T-Adapters
  - Allows you to use the telescope to collect more light and track an object.
- 2 Fish-Eye Lenses (10 mm; f/2.8)
  - Very wide field of view.
III. Equipment

● A Standard Camera Case will contain the following:
  – The DSLR Camera Body
  – 50 mm lens
  – Wireless remote
  – USB connecting cable

● All other equipment must be checked out independently!

● You will sign out this equipment just signing out the telescope.
IV. Camera Use: Terms to Know

- ISO = Light Sensitivity
- Aperture = Opening of Camera
  - f/stops: Ratio of the diameter of the lens to the focal length.
    - Focal length is fixed, alter the diameter of the lens
- Exposure Time
  - Length of time the shutter is open
  - Displayed in seconds
- White Balance
IV. Camera Use

Toggle Focus Mode

Toggle Shooting Mode

Scroll

ISO

Power
IV. Camera Use

Shutter Speed

"1/125"

f/8.0

Toggle Shutter Speed or f/#

White Balance

Auto Focus Mode

See Photos

Shooting Mode
IV. Camera Use: White Balance

This sets what is “true white” in an image. You will need to experiment and determine what is best for your imaging needs.
IV. Camera Use: ISO

**Low ISO:**
- lower light sensitivity
- lower noise
- better resolution

**High ISO:**
- more light sensitivity
- more noise
- lower resolution (grainy)
IV. Camera Use: Aperture (f/ stop)

High f/# = slow
- less light

Low f/# = fast
- more light!
IV. Camera Use: Aperture (f/ stop)

Low f/# = Shallow Depth of Field
← only a small region of the image is actually in focus
- this is because opening up the aperture wide means that light rays can come in from all angles through the lens, this has the effect of only letting a narrow region come into focus

High f/# = Deep Depth of Field
← more of the image is actually in focus
- by stopping down the aperture we cut back on the off-axis rays and more of the image is brought into focus
- we also let in less light and so need to take longer exposures or up the ISO

1/60 s
f/1.8
ISO 100

1/60 s
f/8.0
ISO 1600
V. Examples

- National Solar Observatory + Star Trail
- 18 mm
- F/5.6
- 415 seconds (~7 minutes)
- WB: Incandescent
- ISO 200

Here the Moon is behind the photographer and casts a shadow of the tree across the observatory. The clouds also create the colors near the horizon due to reflections.

Privon & Beaton 2007
V. Examples

- Fan Mountain Observatory
- 18 mm
- F/3.5
- 40 seconds
- WB: Manual
- ISO 400

We can see people's flashlights moving around during this exposure on the ground!
V. Examples

• Firetruck + Ghost People
• 18 mm
• F/5.6
• 220 seconds (~3.7 minutes)
• WB: Incandescent
• ISO 800

Use Flashlight to illuminate subjects for brief periods of time to create ghost figures and illuminate the foreground.

From Left: Rachael Beaton, Paul Ries, David Whelan
V. Examples

- Clarke 6 inch + Orion Short Trail
  - The image is focused on the telescope and a flashlight was used to illuminate the telescope for this image.

- 20 mm
- F/5.6
- 90 seconds
- WB: Incandescent
- ISO 200
V. Examples

- National Solar Observatory + Star Trail
- 18 mm
- F/5.6
- 1566 seconds (~26.1 minutes)
- WB: Incandescent
- ISO 400

This long trail is off-centered on Polaris to show the full motion.

Privon & Beaton 2007
V. Examples

- Leesville Lake + Big Dipper
- 18 mm
- F/4
- 308 seconds (~5 minutes)
- WB: Manual
- ISO 200

Here you can see the light pollution from houses and on the horizon from a nearby city. These are things to try and avoid for some images, but add aesthetic quality for other images.

Beaton 2008
V. Examples

Privon & Beaton 2007: A long trail of the VLA showing some motion in the dishes.
V. Examples

Beaton 2008
V. Examples

February 2009 Total Lunar Eclipse
V. Examples

The Plieades through the McCormck dome slit.

A chance alignment of the crescent Moon with three planets.
V. Examples

**TOP:** Flashlights and sparklers can be used to sketch out shapes and “write” on an image. They can also be used to illuminate people.

**LEFT:** A long exposure of the Full Moon can create daylight in an image. The bright streaks around the Moon are diffuse clouds.
V. Examples

You can use a flash light to illuminate someone in shadow with a long trail.
V. Examples

Try using normal light sources, like this light in my parent's house to illuminate objects in your image – check the light on the tree.
You can use a full or bright Moon to get shots of people “doing” Astronomy.
V. Examples

Beaton 2007

... if the Moon is bright, you can use it to get nice shadows and detail without saturating the sky.