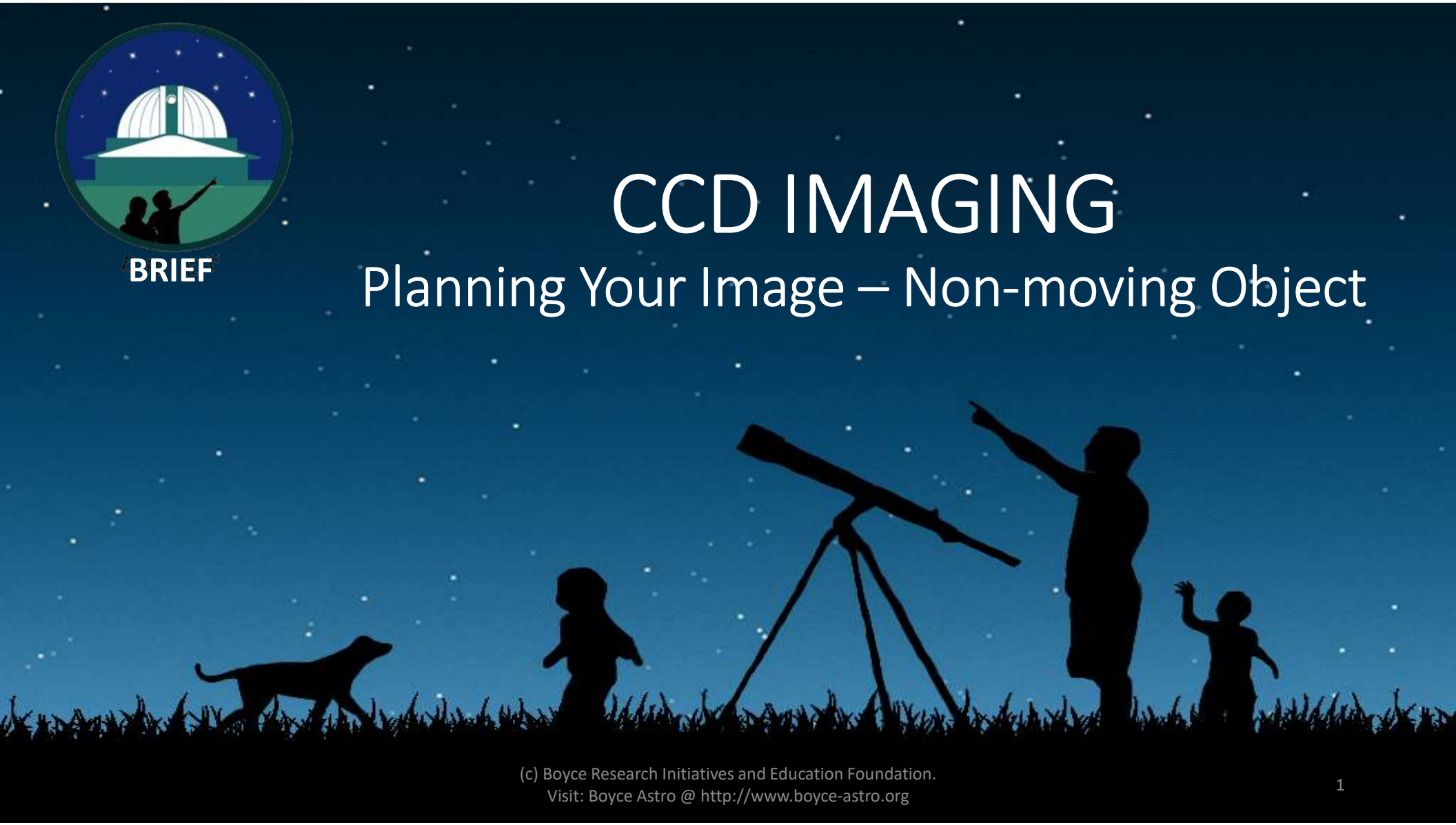
BRIEF

CCD IMAGING

Planning Your Image – Non-moving Object



Overview

This lesson will take you through a thought process when setting up for an observation/imaging run for an object that is not moving through the sky.

This will discuss topics that have been covered in previous lessons and therefore, will not spend a great amount of time on those topics here.

This lesson should be viewed as guidance and process.

Timing

Computer Clock (if necessary)

- In some cases, the computer controlling the imaging system is automatically calibrated
- If this isn't the case, you can use a number of methods to calibrate your computer's clock:
  - GPS
  - United States Naval Observatory
  - Freeware Internet programs
- Ensure the clock is calibrated relative to Universal Time, local or daylight savings time

Target Location and Visibility

After determining your target, locate it (RA/Dec) using any of the following:

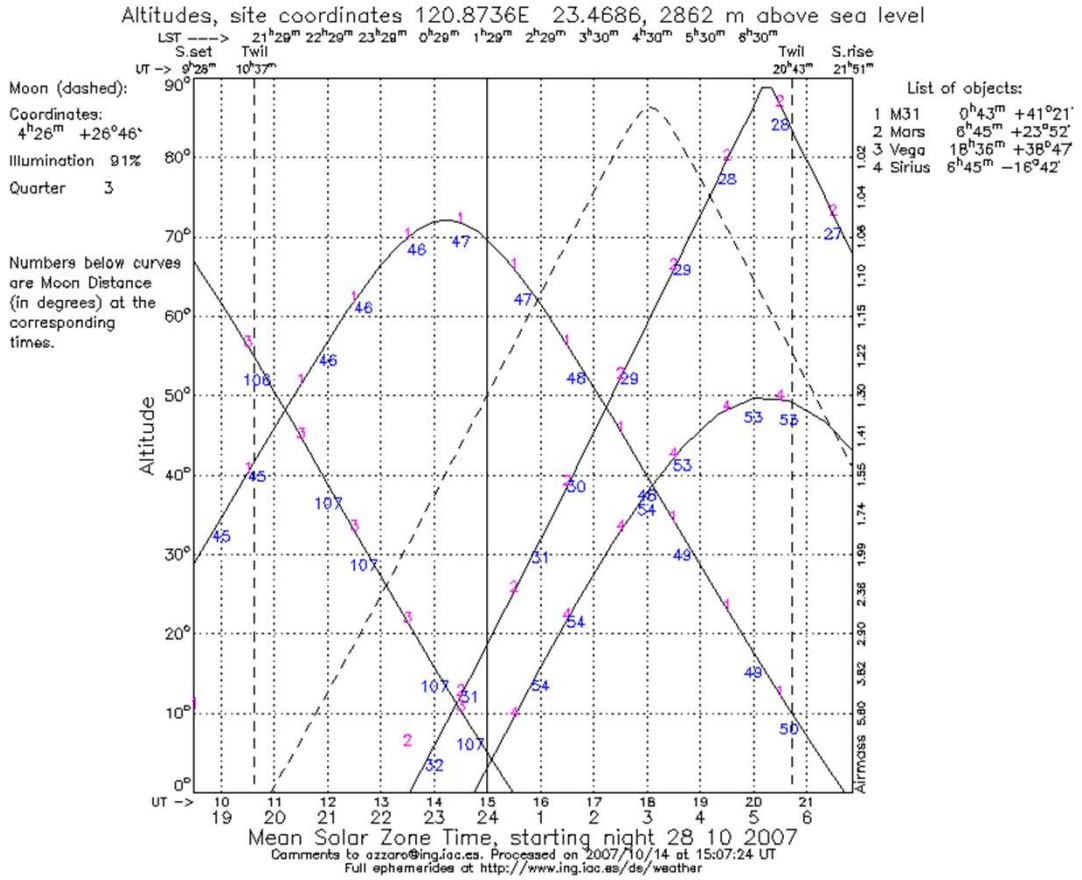
- Planetarium Software
- Online Catalogs

Determine when the object will rise in the sky. A wonderful tool is the visibility calculator at: http://catserver.ing.iac.es/staralt/ (NOTE: you will need to know the location of the desired observatory for this calculator to be effective)

Note the rise and set times and range of airmasses.

Check the weather on planned day of imaging.

Compare the best imaging time (ex. Exoplanet, asteroid, etc) vs rise, set, and airmass.



Schedule the Imaging Run

Understand the goal of your imaging to best determine the integration times and filters to use:

- Pretty pictures will require 3 or 4 filters: Luminance, Red, Green, Blue
- Exoplanets may require at least two different filters
- Late K or M class stars may require red or IR range filters

Integration/Exposure Time:

- Bright stars will require less integration time. However, if your target is a faint star, and there are bright stars in the field of view, oversaturation on the bright stars may be acceptable.
- Ensure the integration time for each filter is the same. This will allow similar flux counts for each filter without a time bias.
- Set a time that at least provides an SNR of 100 or greater.
- Are you going to use a cadence?
  - A cadence can be useful if the period of a variable star or exoplanet is 5 hours and you don't need an image every few seconds, but instead can use one every 3-4 mins
  - A cadence may allow for a back and forth shifting of filters for targets like Exoplanets
- CAUTION: Too short of integration times may make WCS coordinates difficult as few stars will appear in the image.

Calibration

Determine whether or not your imaging system already has a set of calibration files (Darks, Flats, Bias).

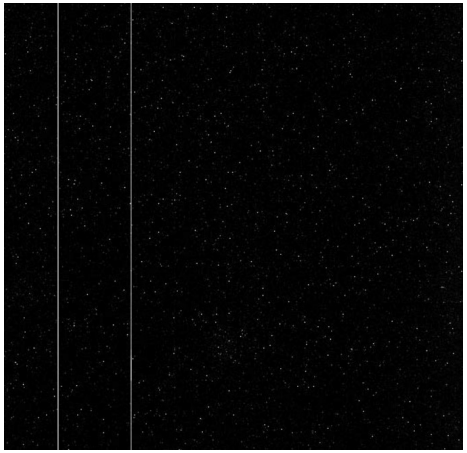
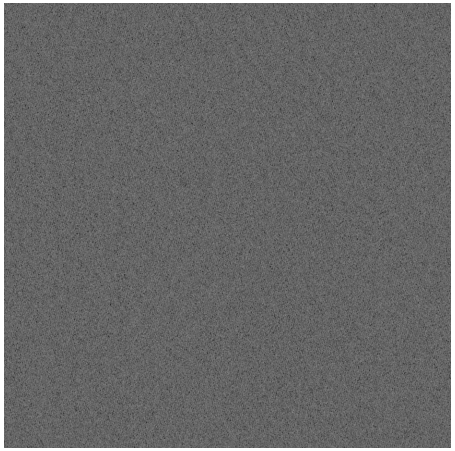
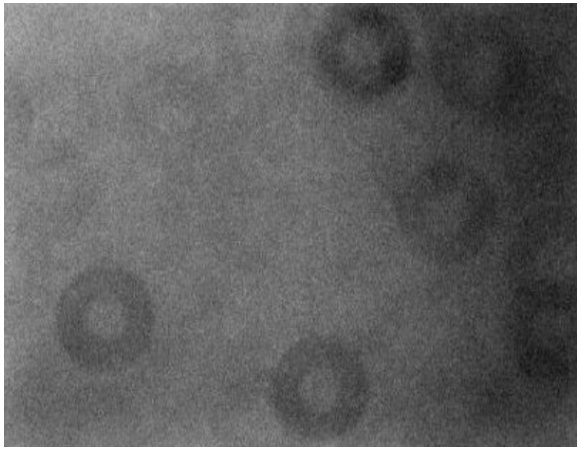
If not, time will need to be scheduled to collect these images for later calibration.

Calibration can be conducted during imaging, but this is not always necessary as it can be conducted after the imaging run.

End of the Imaging Run

When the imaging run is over, three primary steps have to occur before attempting to analyze the images for scientific value:

1. Reduction with Darks, Flats, Bias
2. Calibration of the images with WCS coordinates
3. Removal of bad images

Summary

This lesson provided a rough overview of how to plan an imaging session for an object that is stationary.

Within this lesson there were assumptions of basic CCD imaging knowledge. For more information on those fields, consult those individual lessons.

One advantage to imaging non-moving objects is that if the run is unsuccessful on a given night, for whatever reason, the image plan can be rerun on a subsequent night. This is not the case for a moving object. That topic will be covered in another lesson.

Questions?