# I can See Through My Telescope! What's Next? ...

Sifan Kahale Hōkū Wahine

# What's Next? ...

- Setting up
- Care and Feeding
- Using a Camera
- Focusing
- Solar Observing
- Accessories
- Formulas
- Setup Checklist
- Shopping
- References

# Reminder: Parts of the 'System'



Setting Up: Balancing the Scope

- Allows scope to stay put after you set it!
- Prevents motors from stressing and allows accurate pointing and smooth tracking
- Must be balanced in both directions (az/alt or RA/Dec)
- Cameras and extra equipment require a rebalancing

# Setting Up: Vibration Mitigation

- Spread tripod as much as possible
- Tighten spreaders
- Add tensioners to bottom of tripod
- Add weight on spreader
- Use vibration pads
- Allow settling of scope

• After a slew or focus or touching





#### Setting Up: Alignment

- Needs to be pointed to True North
  - Use compass to get close
  - Sight north pole (close to Polaris) and move tripod not mount
- Finder Scopes have a larger FOV
  - Use it to zero in on an object, then view it through main scope
- Finder scopes need to be aligned to main scope
  - Do this during day

 Center an 'obvious' object on the ground in main scope, then adjust finder scope

#### Setting Up: Setting Circles

- If your telescope has setting circles:
  - Rings around the alt and az axis, marked in degrees
  - Set telescope to level then move the alt circle to zero
  - Set telescope to north and set az to zero



#### Setting Up: GoTo Alignment

- Computerized mounts, steps you through setup
  - Set time and location (some use GPS)
  - Initialize/find home position (RA and Dec axis to home (zero) marks)
  - Align 'tripod' to Polaris (true north)
  - Align 'scope' to Polaris (follow hand control inst)
  - Mount model (slews to star and you center on it)
  - Tell the computer what you want to see and off it goes!

#### Care and Feeding: Cleaning

- Lens and mirrors have very thin coatings
- Blow dust off with camera bulb/brush
  - If using compressed air make sure no solvent is sprayed keep air can vertical
- 'Gently' brush in downward strokes
  - Do not go in circles!
- If it's worse wash the mirror:
  - https://www.nexstarsite.com/OddsNEnds/CleaningOpticsGlas s.htm
  - https://www.nexstarsite.com/OddsNEnds/ CleaningMirrors.htm

# Care and Feeding: Culmination

- Especially with mirrors: get all the optical parts in line.
  - De-focus a star
  - Use one of the 3 screws holding the secondary mirror (front) to make all the circles concentric.







#### Using a Camera

- Phone holder
- Eyepiece Projection
- Prime Focus





# Focusing

- Stars are point sources.
  - When focused, they should be the smallest possible dot
- Lens, mirrors, air, humidity all will conspire to spread out that point
  - Creates 'airy disk'. We measure that with Full Width/Half Max
  - Try to get FWHM as small as possible (eg the dot)





#### Solar Observing

- The sun can '<u>MELT</u>' your optics!!!
- There are two very important issues:
  - Attenuating the light



- Best is to use a solar filter IN-FRONT of the scope
- First, hold the filter up in front of the light and make sure there are NO pin holes!
- Aligning the scope with the sun
  - Do not EVER look at the sun

- Use a dot/pin and align it's shadow on a screen Note all the 'red' warnings on this page ...



#### Some Formulas

- Magnification and Focal Ratio
  - F/R: Higher=more mag, lower=wider FOV
  - (Camera) Higher=slower, lower=faster, less noise



• FOV: AFOV/MAG

#### Accessories

- Barlow Lens
  - Increases f/l of scope (magnification)
- Focal Reducer
  - Reduces focal length (faster exp)
  - Wider field of view
- Field Flattener
  - Corrects mirrors gives focus to all stars to the edge of the image
- Bino-viewer

Filters

- Use TWO eyes!
- Double the cost in oculars ...







# Setup Checklist

- During the day:
  - Clean scope if needed
  - Site Survey
  - Collect all the pieces (!) and assemble
  - Align finder scope to OTA
- After Nautical Twilight
  - Align <u>mount</u> to the north pole (close to Polaris)
  - Initialize Telescope (move to marks and zero circles)
  - Align <u>telescope</u> to north pole (close to Polaris)
  - Use setting circles to point scope at area of interest
  - Use finder scope to zero in

#### **Selecting Objects**

- Great objects to start with:
  - Ships out at sea
  - A Bird 3 blocks away (!)
  - Moon
  - Jupiter and it's moons
  - Saturn (amazing!)
  - Brighter Messier objects

# **Messier Objects**



# Hints

- Use Averted Vision and Movement
  - Sides of eye are more sensitive don't look directly at faint objects
  - Very slightly move telescope in one axis back and forth to pick up really faint objects
- Scope Vibrations
  - Allow to settle
  - Don't touch when viewing
- Be alert for changing conditions
  - Feel setup for dew
  - Watch street lights for halo
  - Watch for blank areas of sky

#### References

- Interactive Tools:
  - http://www.skyandtelescope.com/observing/interactive-skywatching-tools/
- What's Up:
  - https://dso-browser.com/
  - http://www.skyandtelescope.com/
  - http://www.astronomy.com/
- Sun and Comets
  - https://sohowww.nascom.nasa.gov/
- Charts
  - http://www.stellarium.org/

# Mahalo!

Sifan Kahale Hōkū Wahine