North Texas NTMS Microwave Society

Astro-Imaging or Receiving at 300nm to 750nm Wavelengths

Wes Atchison

WA5TKU

Telescope Basics

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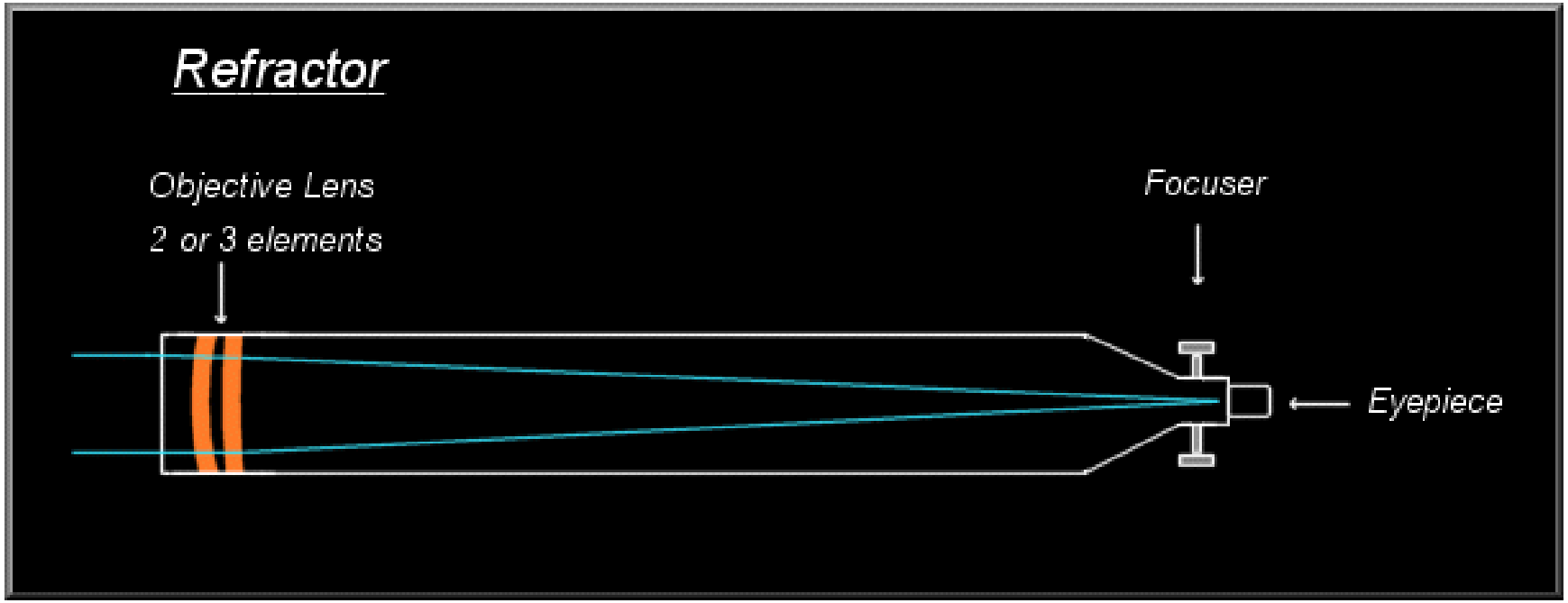
- Refractor
  - Galileo
    - 400 Years Ago Pointed @ Moon & Jupiter
- Reflector
  - Newton
    - 1669 Built 1st
- Catadioptric
  - Cassegrain - 1672
    - Schmidt - 1930
    - Maksutov - 1941

Telescope Basics

North Texas NTMS Microwave Society

- Refractor



Radio Telescope

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- Jansky
  - 1931 1st
  - 20.5 MHz
  - 100 Feet x 20 Feet
  - Photo of Replica

Telescope Basics

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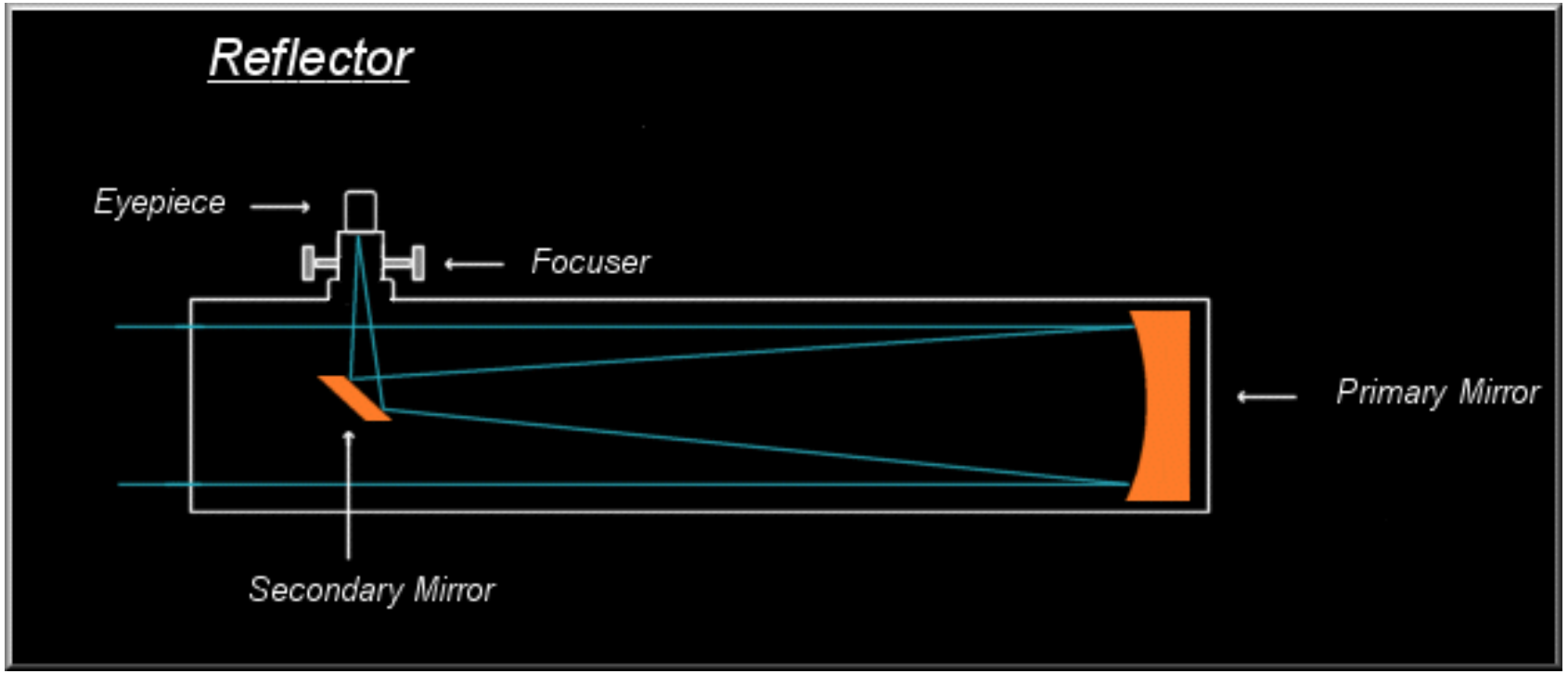
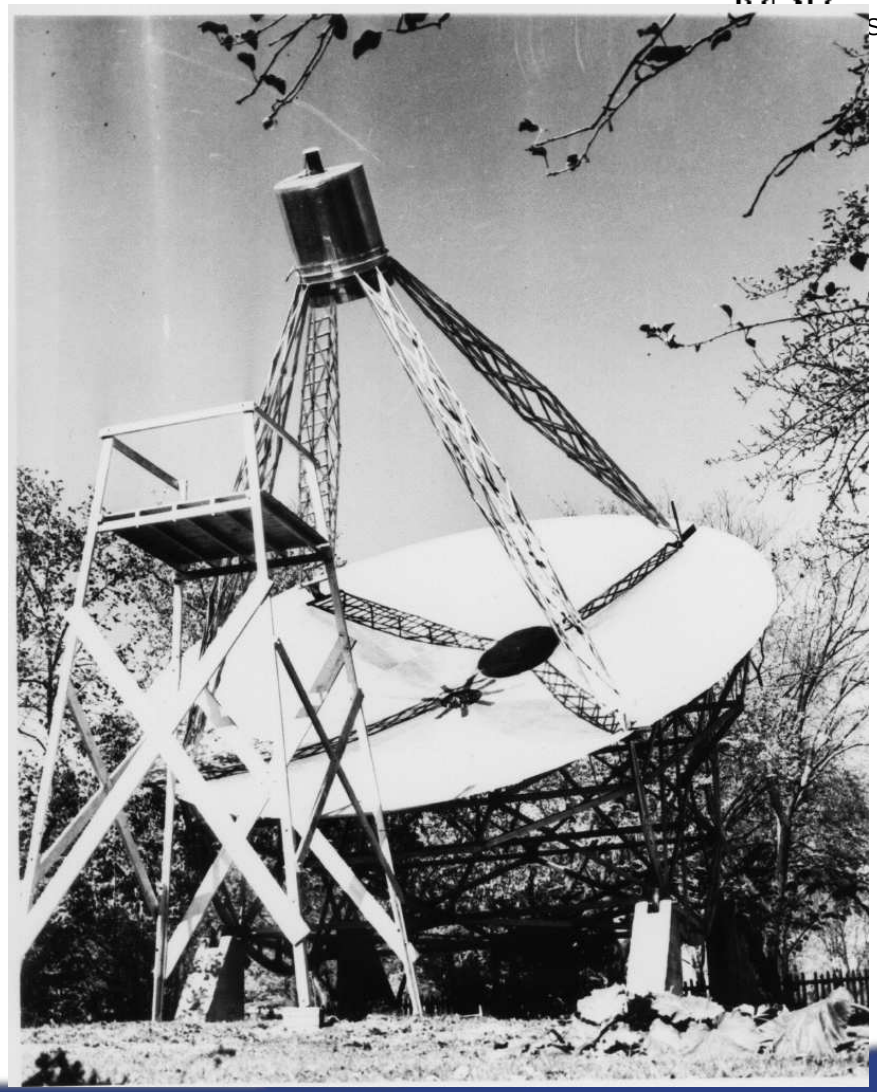
- Reflector



Parabolic Radio Telescope

- Reber
  - 1937 Built 1st
  - 9 Meter Diameter
    - Feed @ 8 Feet
    - f/d = 0.8
  - Built 3300 MHz and 900 MHz Receivers Failed
  - 160 MHz Receiver Successful
  - Completed RF Sky Map 1941



Telescope Basics

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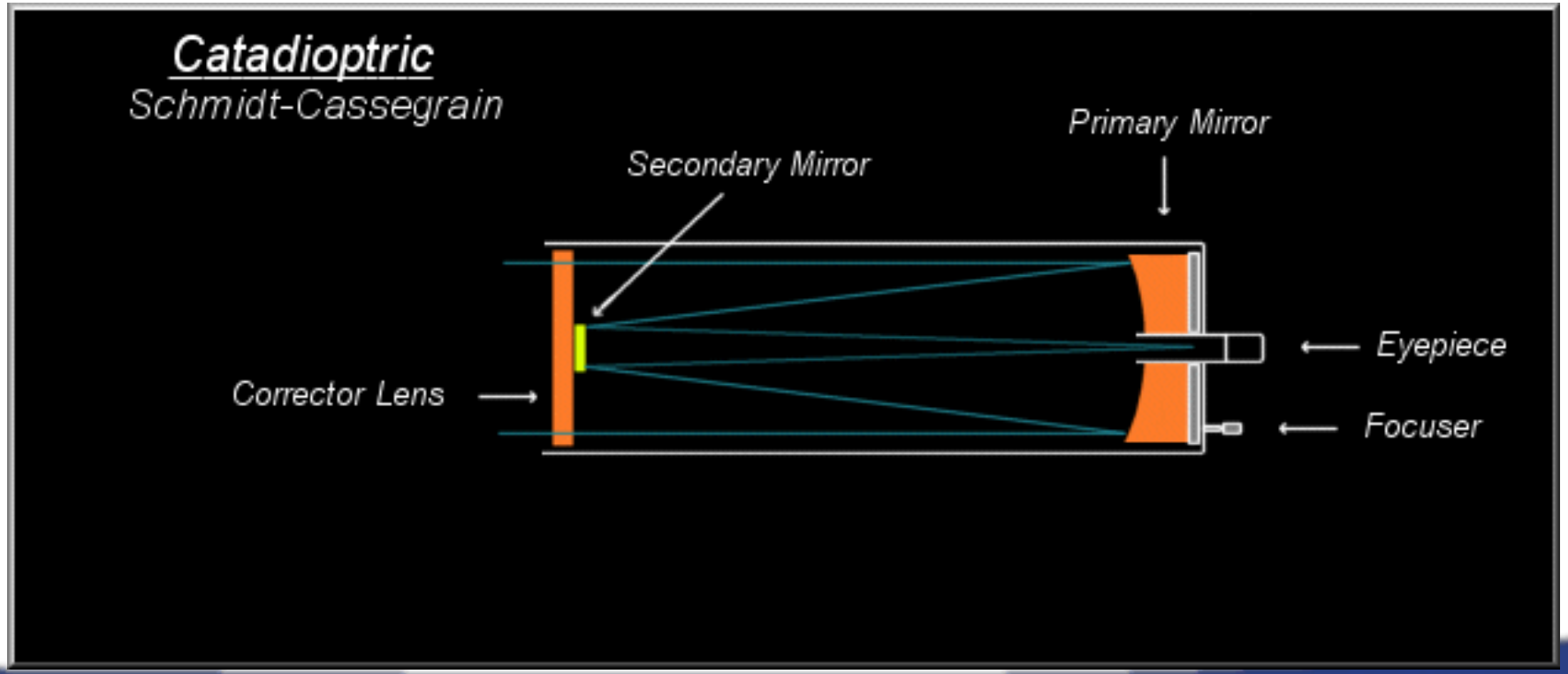
- Catadioptric
  - Schmidt - Cassegrain



Telescope Basics

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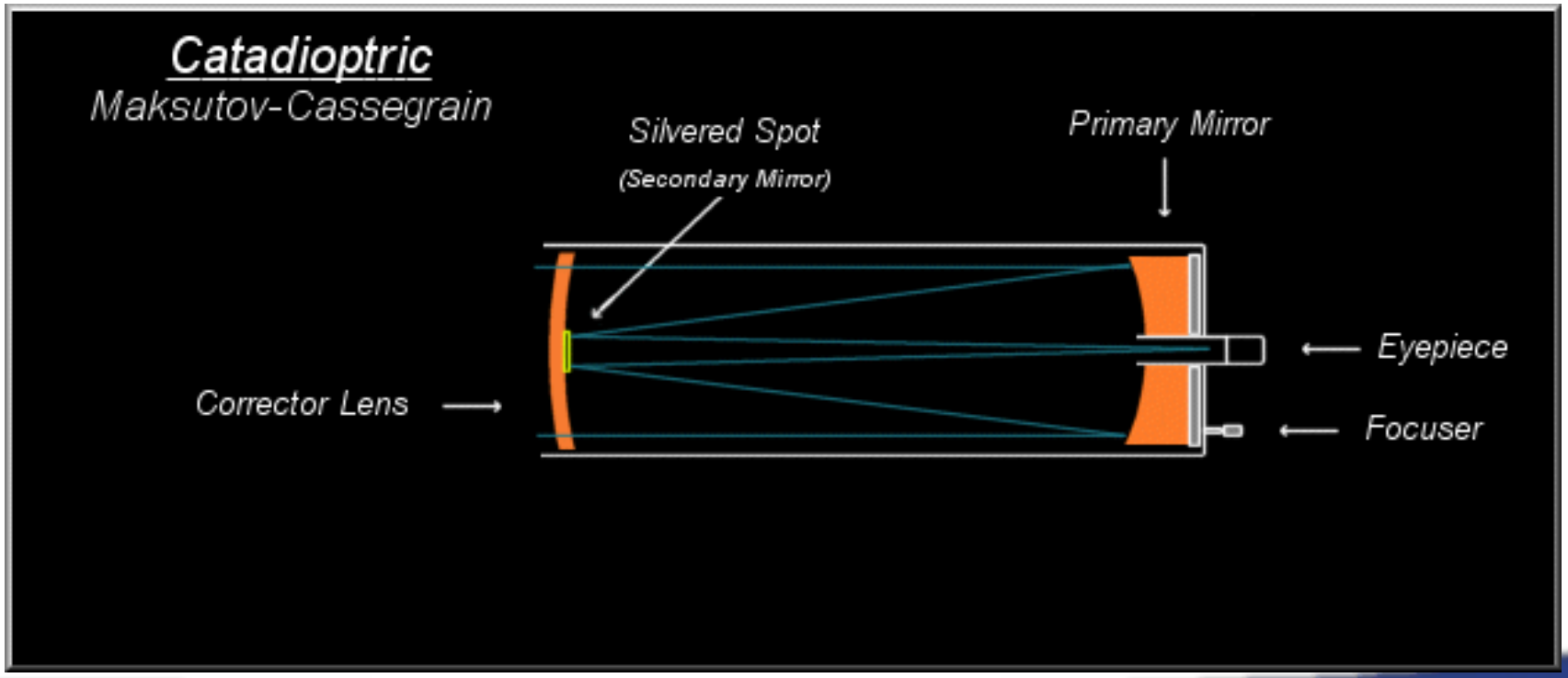
- Catadioptric
  - Maksutov - Cassegrain



Mounts

- German Equatorial
  - More Complex Construction
  - Tracking
    - Manual
    - Motor Driven
  - More Expensive Machining
  - Astronomical Use
    - Visual
    - Imaging

German Equatorial Mount

Mounts

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- Dobsonian – DOB
  - Simple Construction
  - Accommodate Large Mirror
  - Tracking
    - Manual Simple – Just Push
    - Automatic Expensive
  - Astronomical Use
    - Visual

Dobsonian Mount

Mounts

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- Alt-Az Mount
  - Relative Simple Construction
  - Light Weight
  - No Tracking
  - Terrestrial Use
  - Inexpensive Mechanics

Altazimuth Mount

Mounts

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- Fork
  - Altitude Azimuth
  - Expensive
  - Tracking – Motor Driven
  - Astronomical Use
    - Visual
    - Imaging

Fork Mount

Tracking

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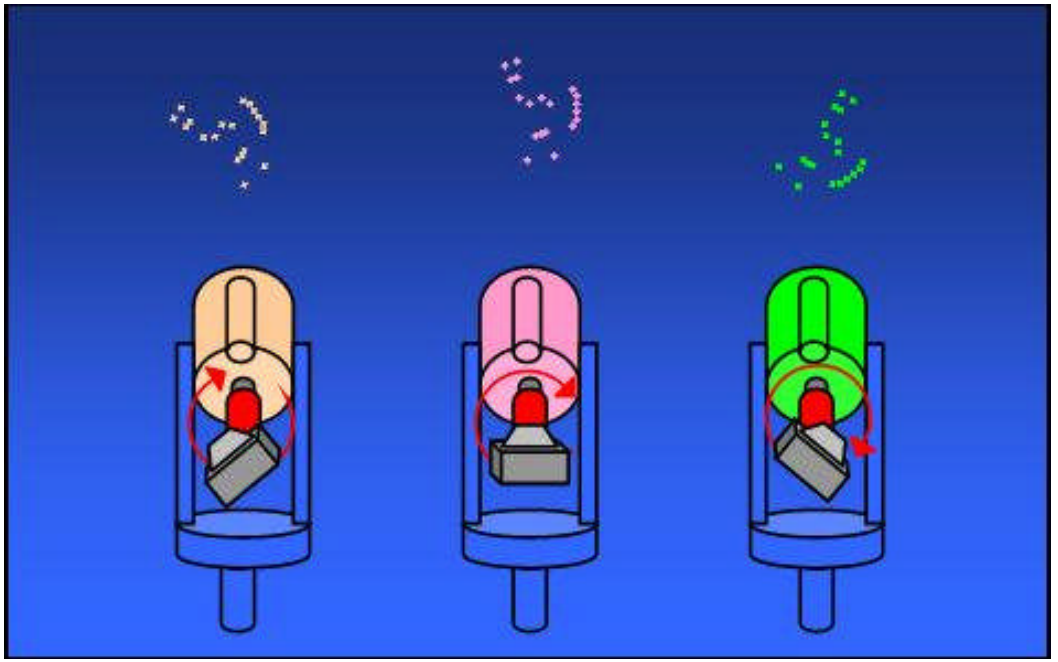
- ALT-AZ Mount
  - Field Rotation
  - Movement in 2 Axis Required



Tracking

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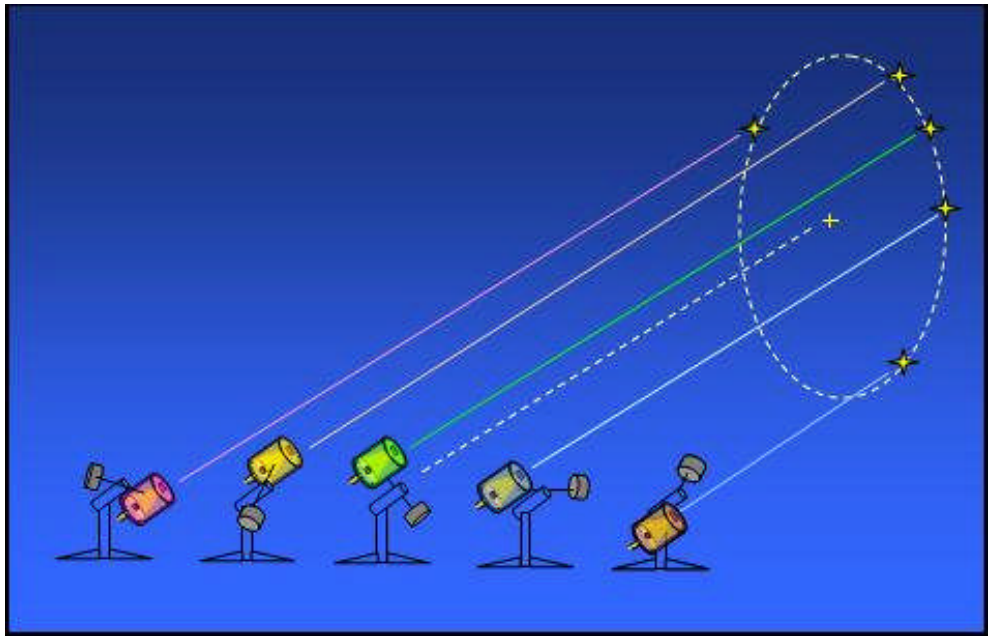
- Equatorial
  - No Field Rotation
    - Accurately Aligned
  - Movement in 1 Axis Only Required



Tracking

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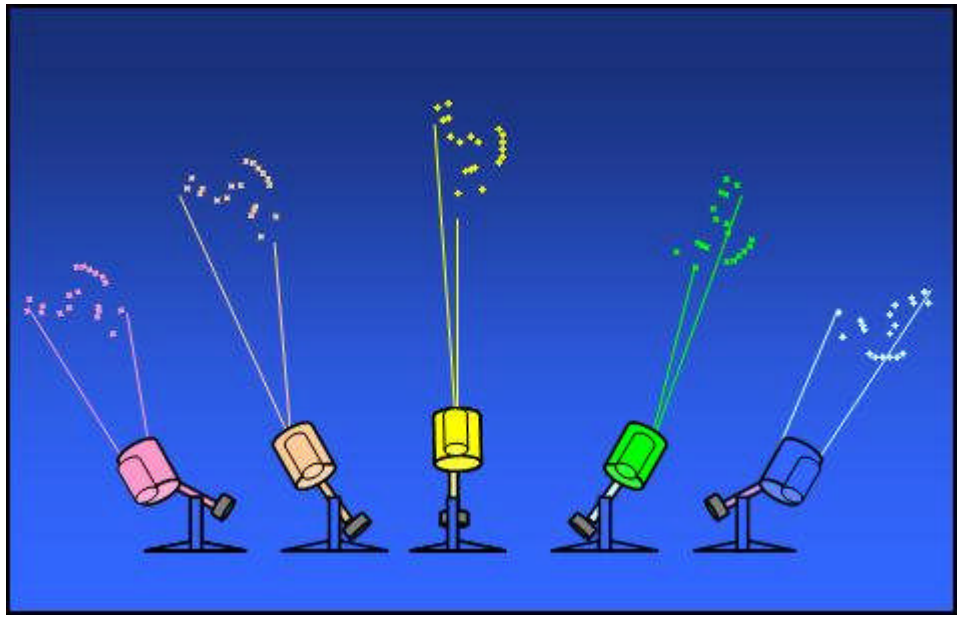
- Equatorial
  - No Field Rotation
  - Requires Accurate Polar Alignment



Tracking

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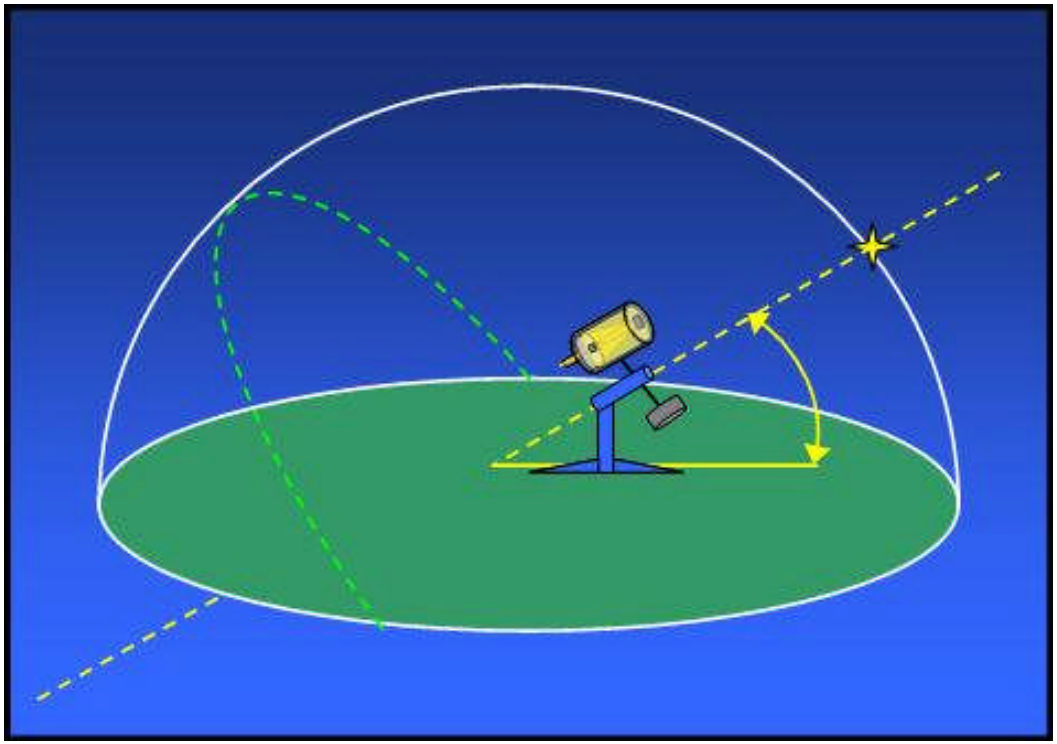
- Polar Alignment
  - Equatorial Mount
    - Right Accession Axis Aligned to Celestial North



Tracking

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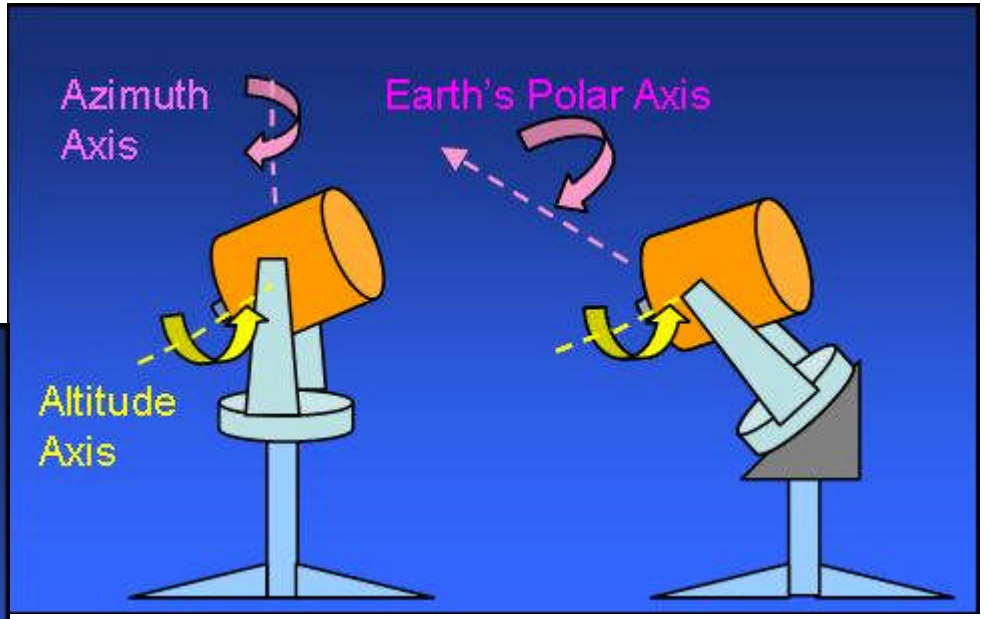
- Polar Alignment
  - Alt-AZ Mount
    - Wedge



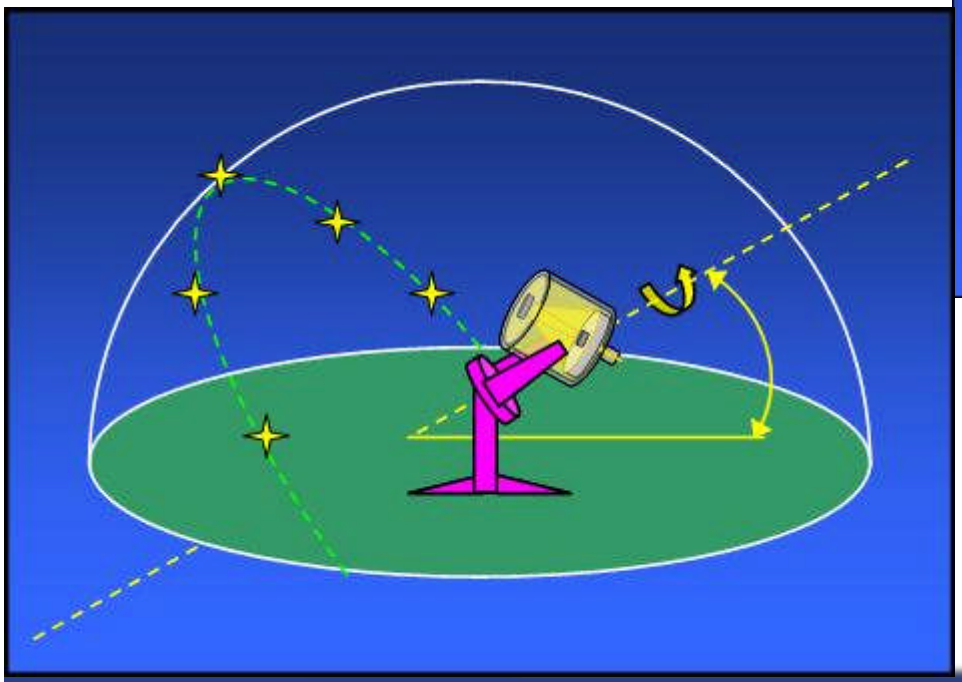


Image Scale

- F= Focal Length
- θ = Angular Size of Object
- d = Image Size @ Focal Distance
- d = F x θ / 57.3 Radians

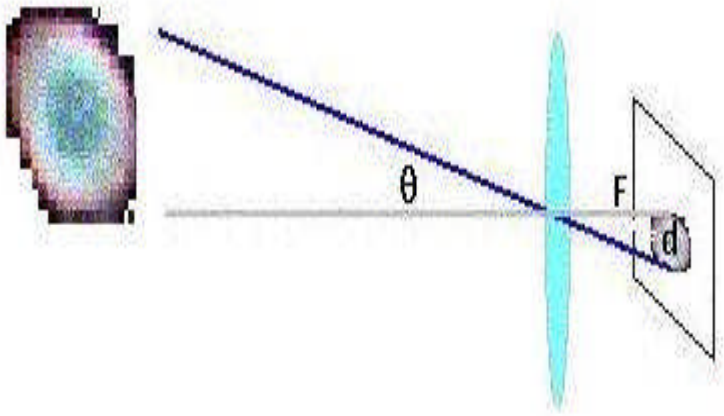


Image Size

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- Minolta 50mm Lens

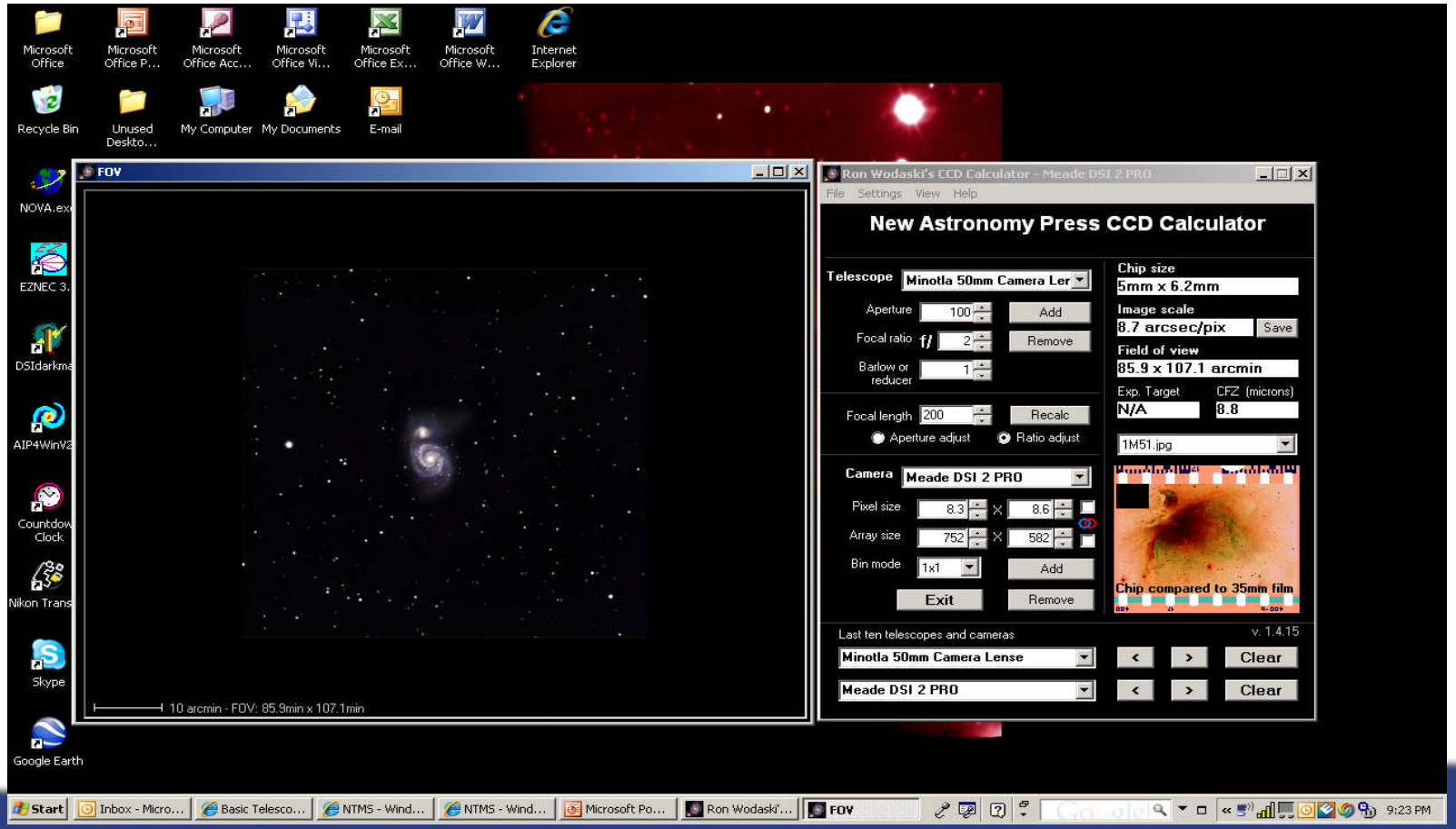

Image Size

North Texas NTMS Microwave Society

- Vixen 80mm Refractor

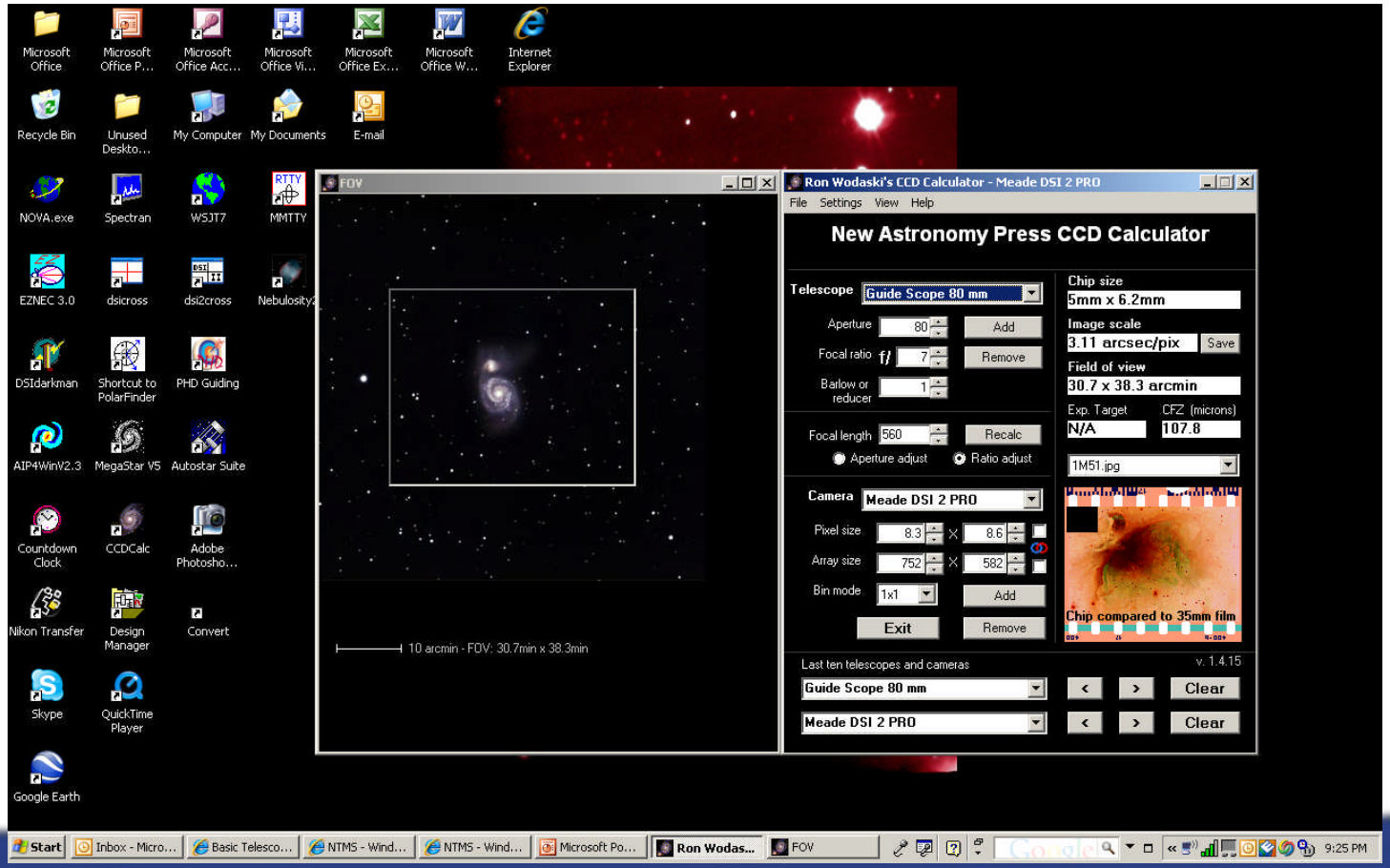

Image Size

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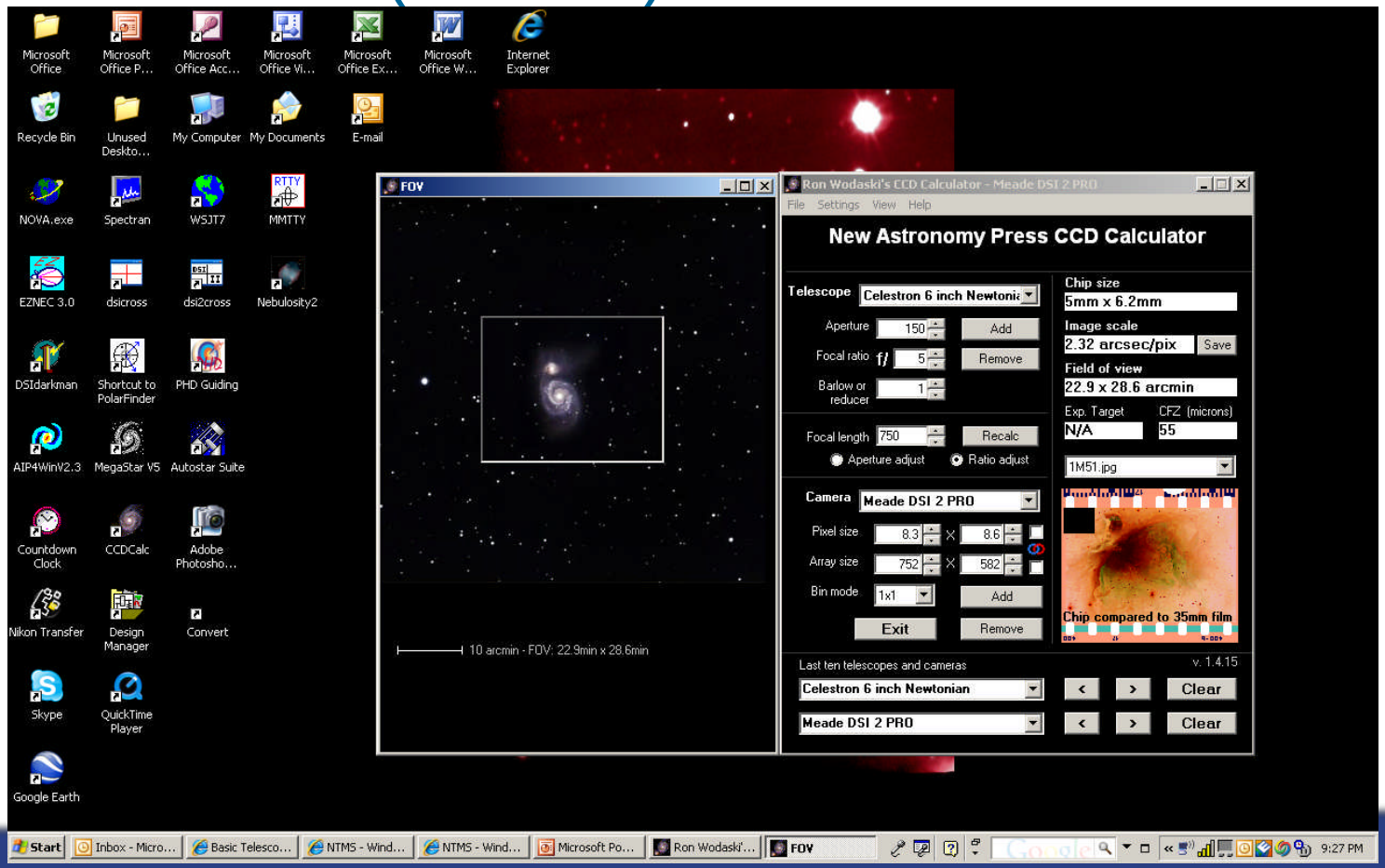
- Celestron 6” (152mm) Newtonian



My Mount

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- Equatorial
  - Celestron CI-700
    - Stepper Motor Drive
    - Polar Alignment Scope

Light Path

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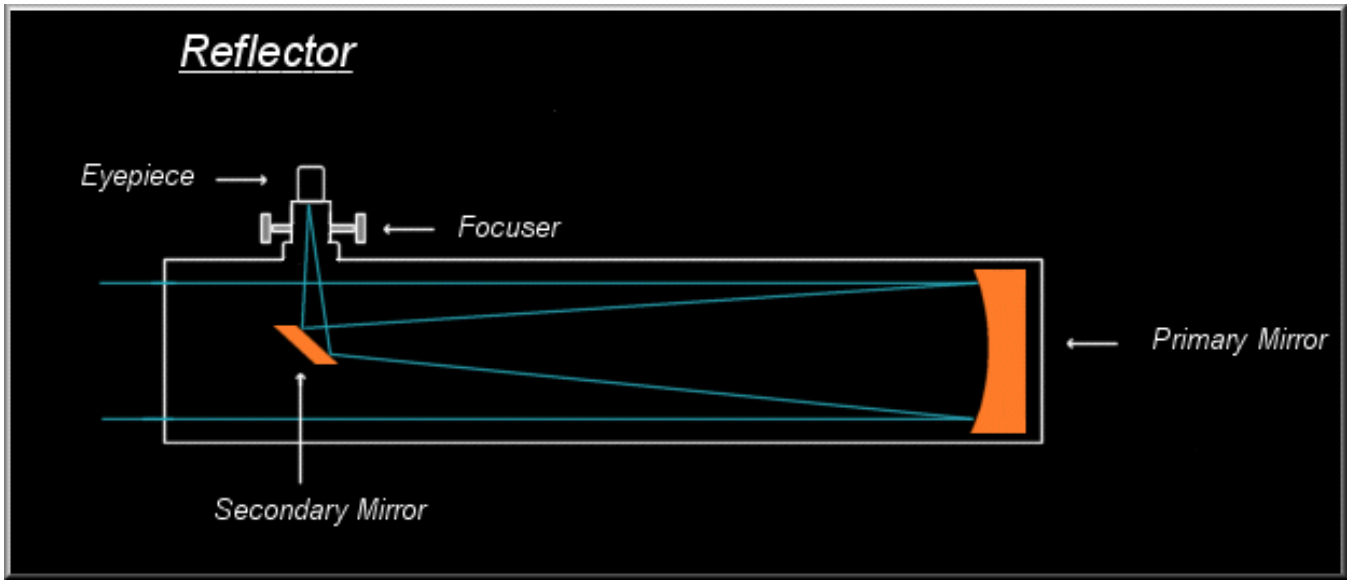
- Celestron 6” (152 mm) Newtonian
  - Primary Mirror
  - Secondary Mirror



Light Path

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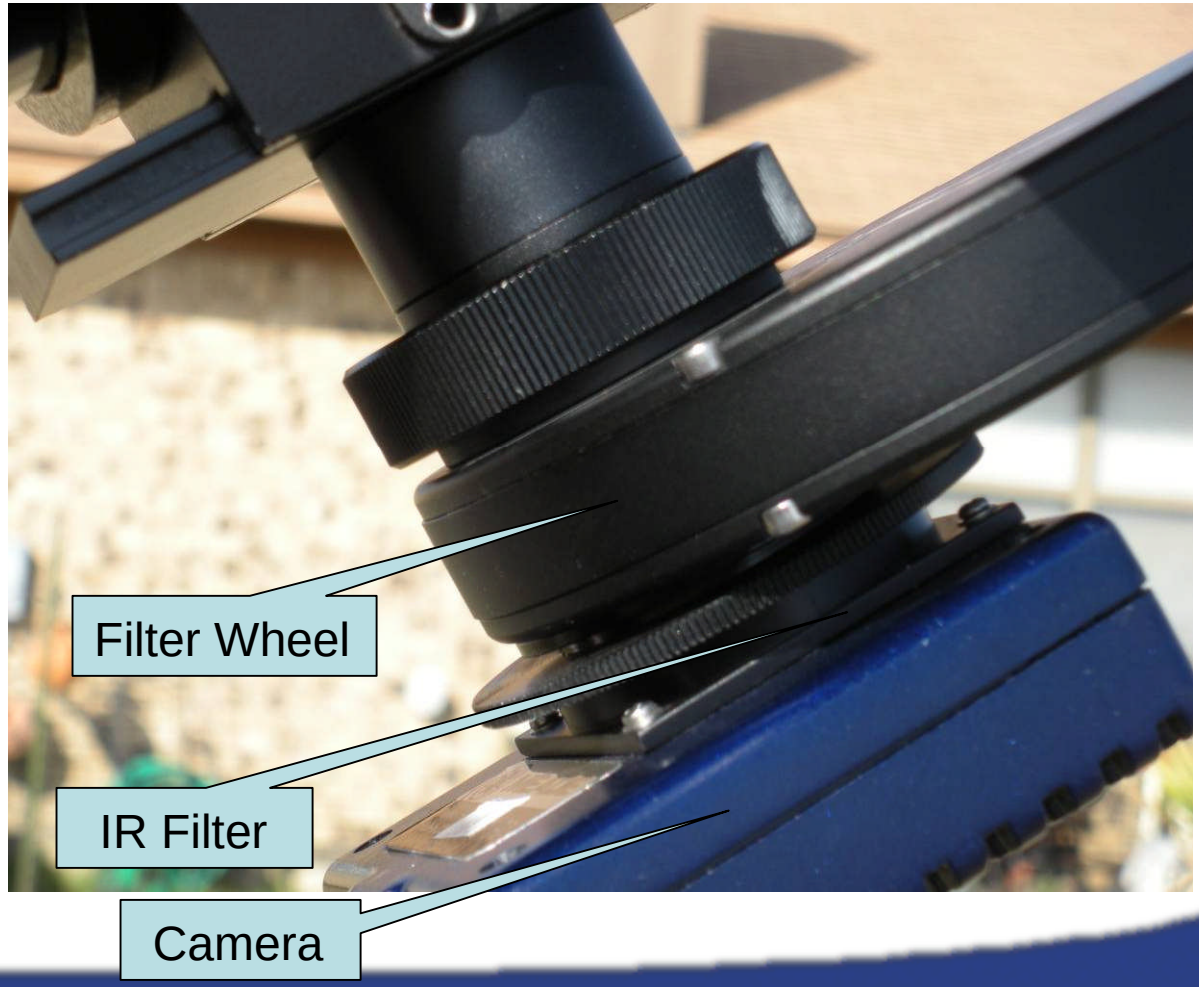
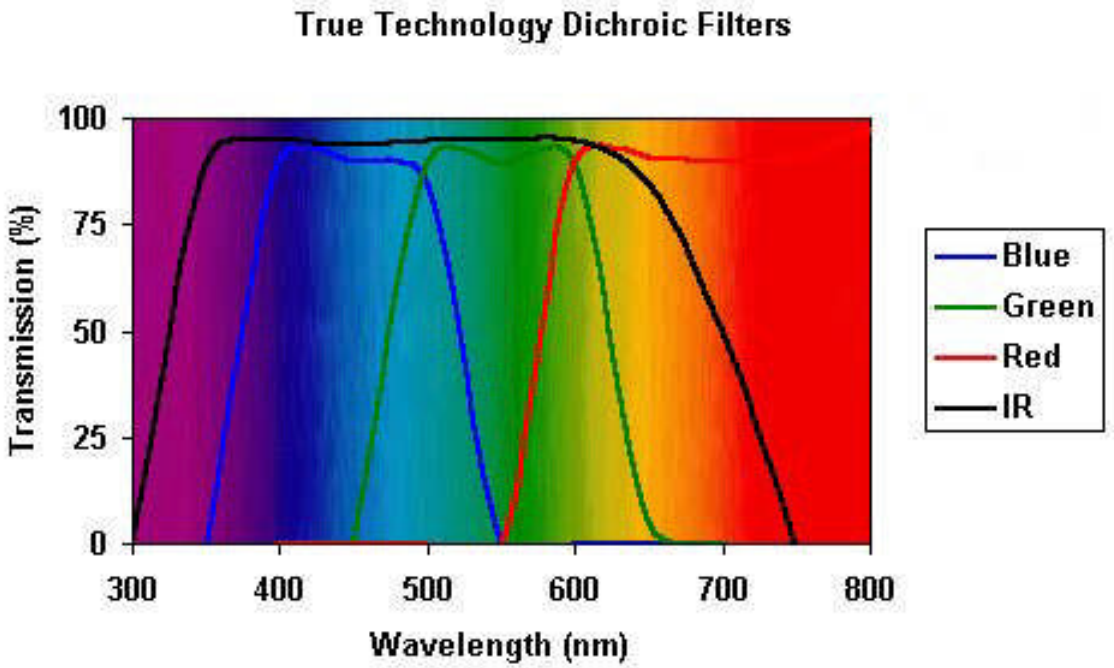
- Scope – 6” Newtonian
  - Main Mirror
  - Secondary Mirror
- Filter Wheel
  - Choose L, R, G, or B Filter
- IR Filter
- Camera – Meade DSI II Pro



Imaging Filter

- True Technology Filters
  - IR – Infrared
    - 300 – 750 nm
  - L – Luminance
    - 300 – 800nm
  - R – Red
    - 550 – 800 nm
  - G – Green
    - 450 – 650 nm
  - B – Blue
    - 350 – 550 nm



B33 - Horsehead

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- Single 2 Minute Frame – Raw Image
- Not Calibrated
  - Noise
  - Dust
  - Hot Pixels

B33 – Horsehead Nebula

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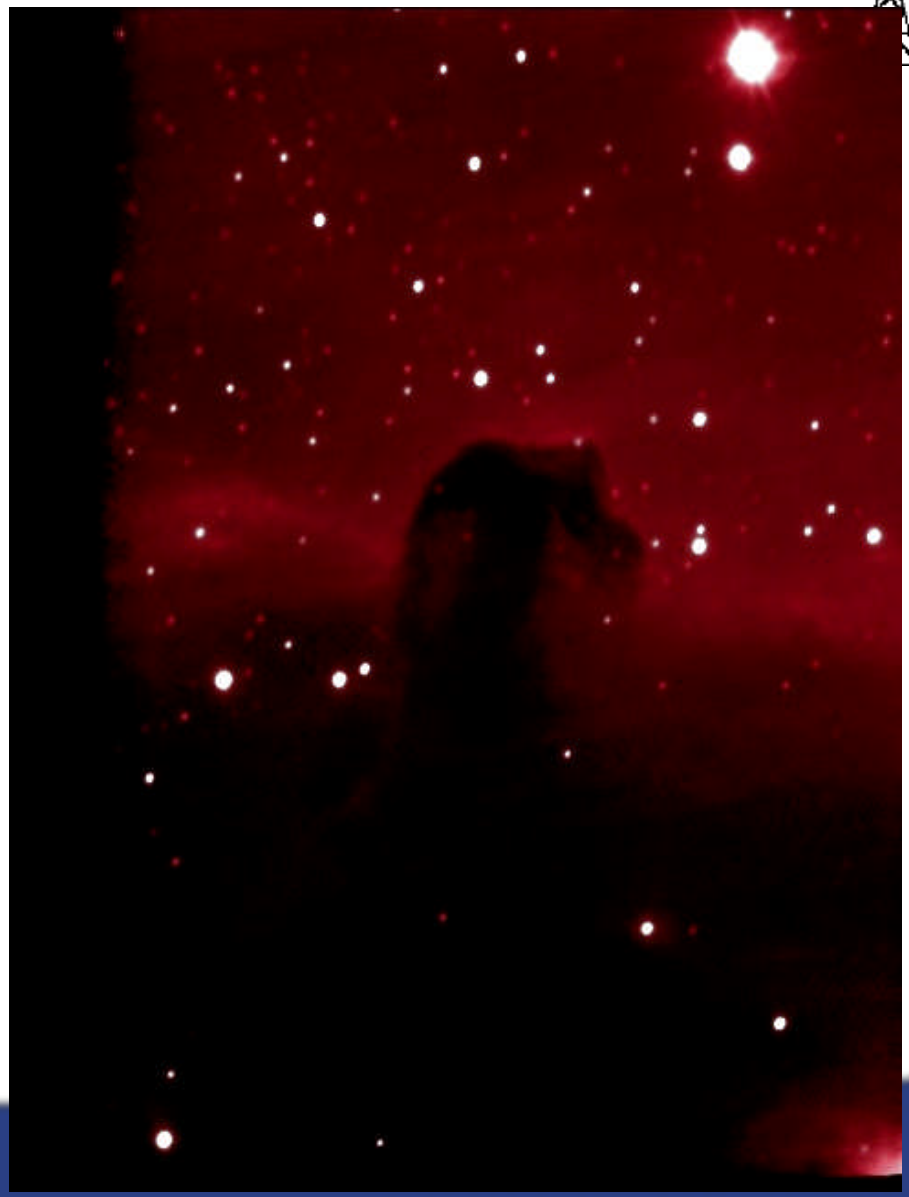
- 44 Stacked 2 Minute Frames
- Calibrated
- Vixen Super Polaris Mount
- Unguided
- False Color
- 8 x 6 arcmins
- 1200 Light Years
- Reflection Nebula



M16 – Eagle Nebula

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- 12 Stacked 2 Minute Frames
- Unguided
- ½ Degree Diameter
- 7000 Light Years

NGC 7000 – North American Nebula

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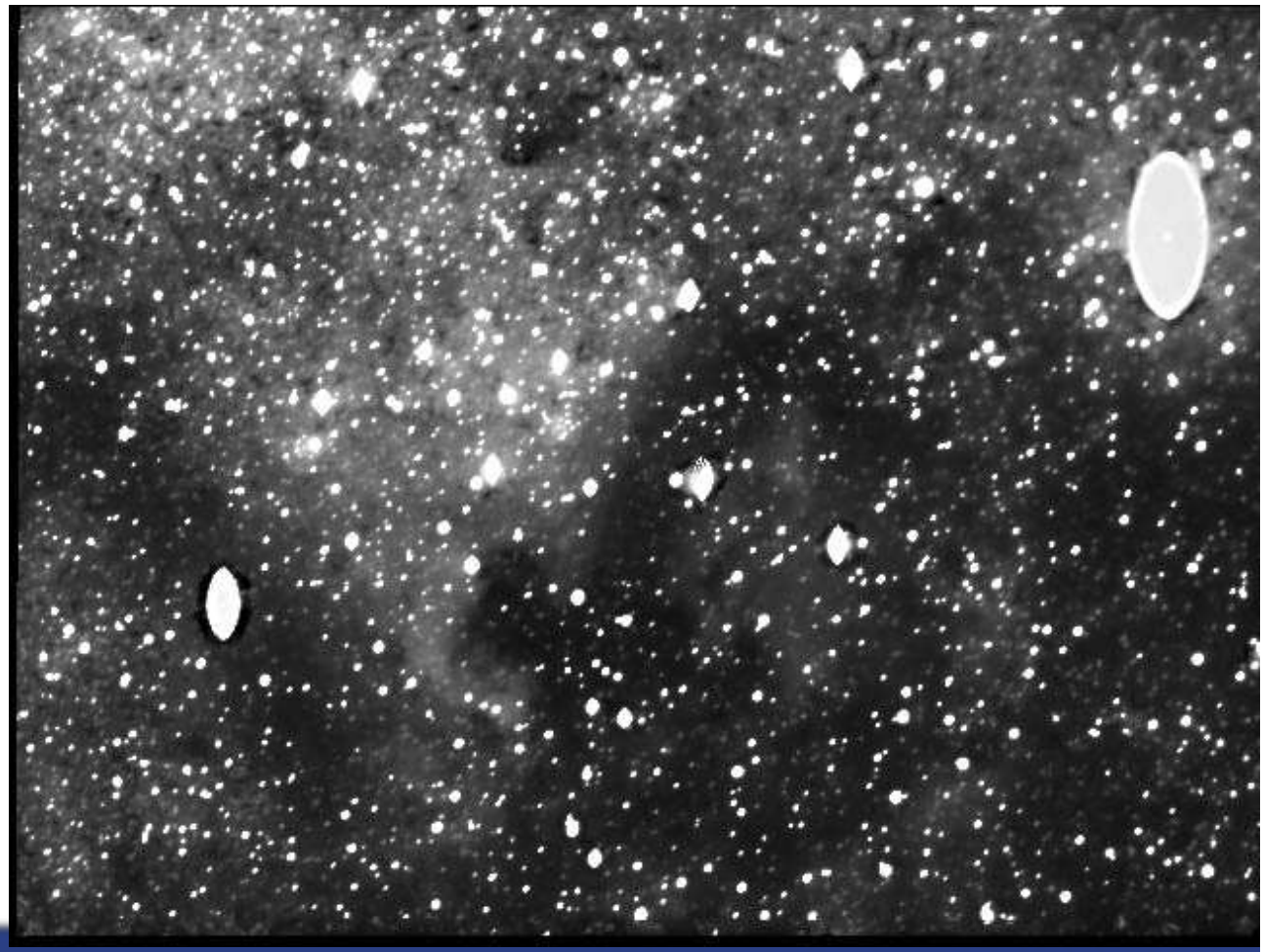
- 13 Stacked 5 minute Frames
- 2200 Light Years
- 30 arcmins
- 50 mm Camera Lens
- Unguided



M57 – Ring Nebula

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- LRGB – 50 Stacked 2 minute Frames
  - L= 20, R= 10, G= 10, B= 10 Minutes Each
- 4100 Light Years
- 230 x 230 arcsecs

NGC 1977 – Running Man Nebula

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- 49 Stacked 1 Minute Frames
- 1500 Light Years
- 40 x 25 arcmins
- Guided

NGC 253 – Sculptor Galaxy

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- 16 Stacked 5 Minute Frames
- 11.4 Million Light Years
- 27.5 x 6.8 arcmins

M51 – Whirlpool Galaxy

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- 27 Stacked 1 Minute Frames
- 23 Million Light Years
- 11.2 x 6.9 arcmins

NGC 891 – Edge on Galaxy

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- 25 Stacked 2 Minute Frames
- 27.3 Million Light Years
- 13.5 x 2.5 arcmins
- Unguided

Star Party Setup

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- Windshield
- Laptop Shield

Star Party Setup Okie-Tex 2008

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- Campsite
- Windshield Frame
- Johns Scope Trailer
- My Popup Trailer

Star-Gazers Group Okie-Tex 2008

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Okie-Tex Overview

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Local Groups

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- Texas Astronomical Society
  - http://www.texasastro.org/
- Star-Gazers
  - Yahoo Group – Star-Gazers