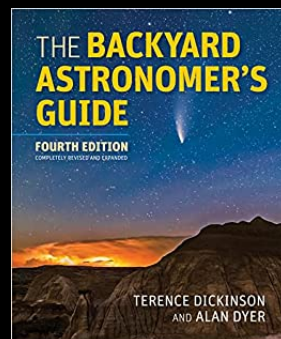
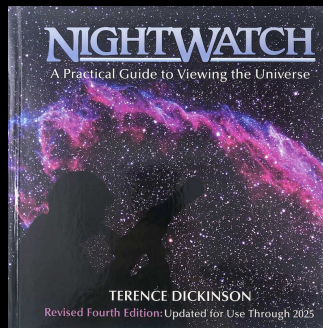
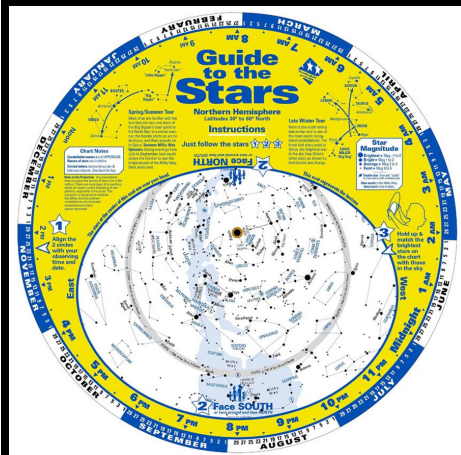




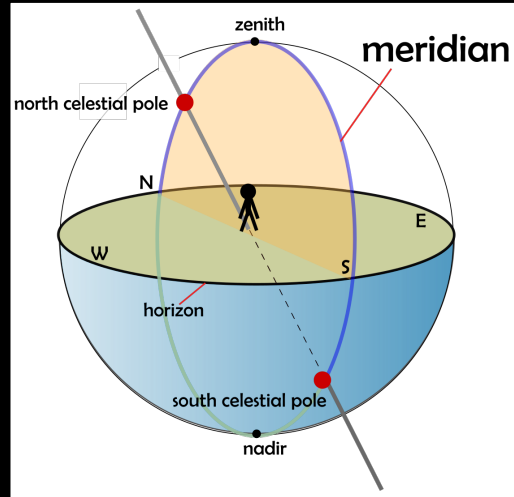
Essential Tools

- Planisphere
- Night Watch
- The Backyard Astronomer's Guide
- Red light headlamp



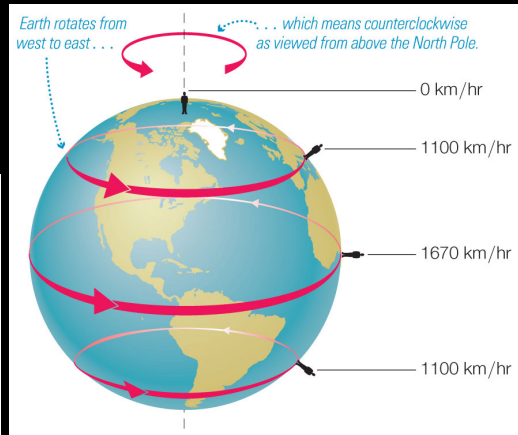
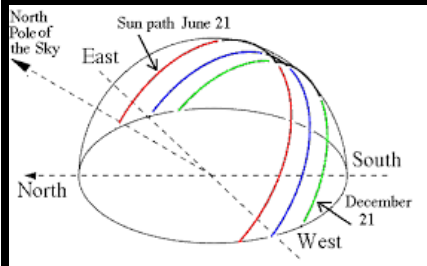
Celestial Sphere

- Cardinal directions
- Meridian
- North Celestial Pole
  - Polaris (North Star)
- Zenith
- Horizon



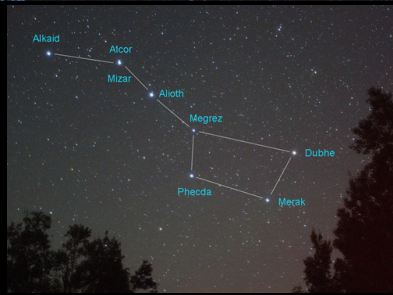
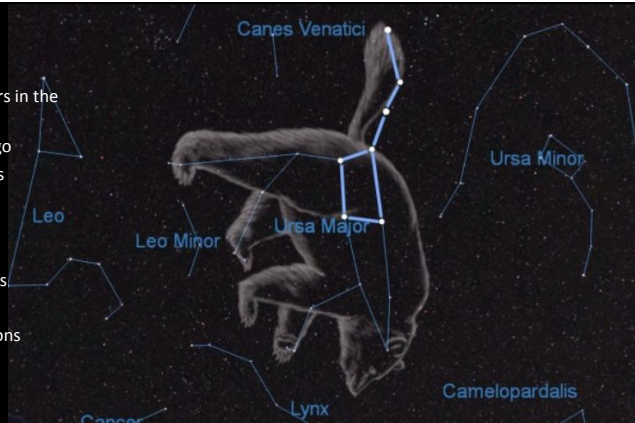
Celestial Motion

- Earth's rotation
- Star movement
- Ecliptic: Apparent path of Sun, Moon & planets



Constellations & Asterisms

- Constellations: patterns of stars in the night sky
- Mesopotamia ~ 5,000 years ago
- Babylonians, Egyptians, Greeks
- Cultural heritage
- 88 modern day constellations
- Most have Greek names
- Bright stars have proper names
- Star names are Arabic
- Asterisms: parts of constellations

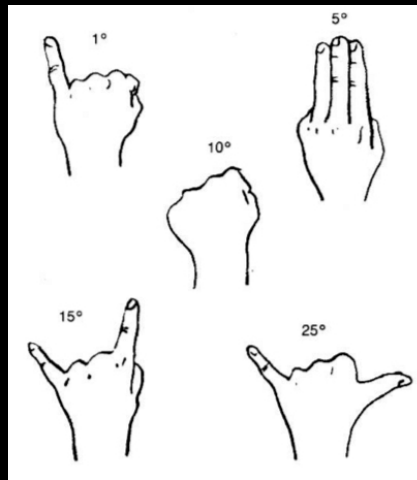


Starry Night

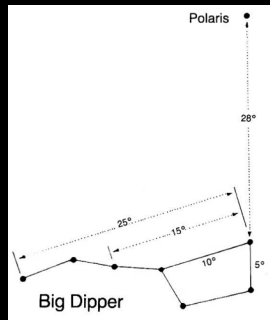
Naked Astronomer

Navigating the Night Sky

- Distance measured in degrees
- Azimuth is direction in degrees
  - North = 0°
  - East = 90°
  - South = 180°
  - West = 270°
- Altitude is height above the horizon in degrees
- 1° = 60'
- Moon = 1/2° = 30'
- Polaris (North Star) = observer's latitude: 44° above north horizon



Terrance Dickinson: Night Watch



Terrance Dickinson: Night Watch

Constellations as Pointers

Capella 0.1  
Auriga  
Pleiades  
Moon  
Castor 1.6  
Pollux 1.1  
Gemini  
Taurus  
Aldebaran 0.9  
Betelgeuse 0.5  
Orion  
Rigel 0.1  
Sirius -1.5  
Canis Major  
Procyon 0.4  
Canis Minor

Navigating with the Big Dipper

AURIGA  
Capella  
Castor  
Pollux  
GEMINI  
Regulus  
LEO  
BIG DIPPER  
Polaris  
LITTLE DIPPER  
Deneb  
CASSIOPEIA  
Vega  
LYRA  
HERCULES  
BOOTES  
Arcturus  
Spica  
VIRGO

Simulation Curriculum Corp

Astro Bob

Magnitude Scale

- Object brightness
- Logarithmic scale
- Brighter objects have lower numbers
- Sirius: -1.4

APPARENT MAGNITUDE

Mag. 1		
Mag. 2		x 2.5 dimmer
Mag. 3		x 6.25 dimmer
Mag. 4		x 16 dimmer
Mag. 5		x 40 dimmer
Mag. 6		x 100 dimmer

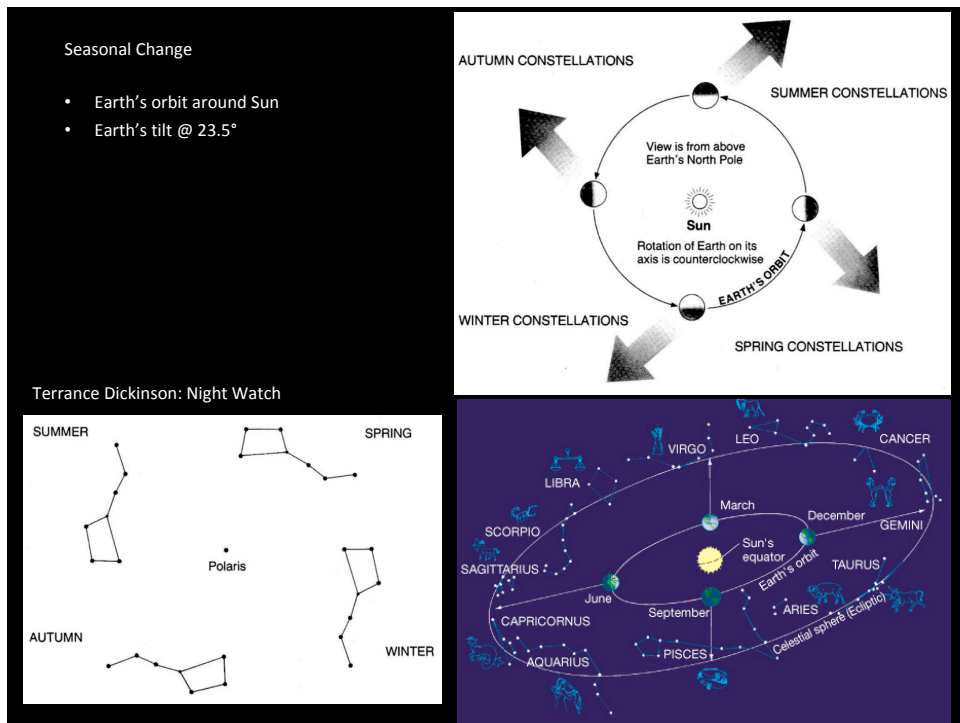
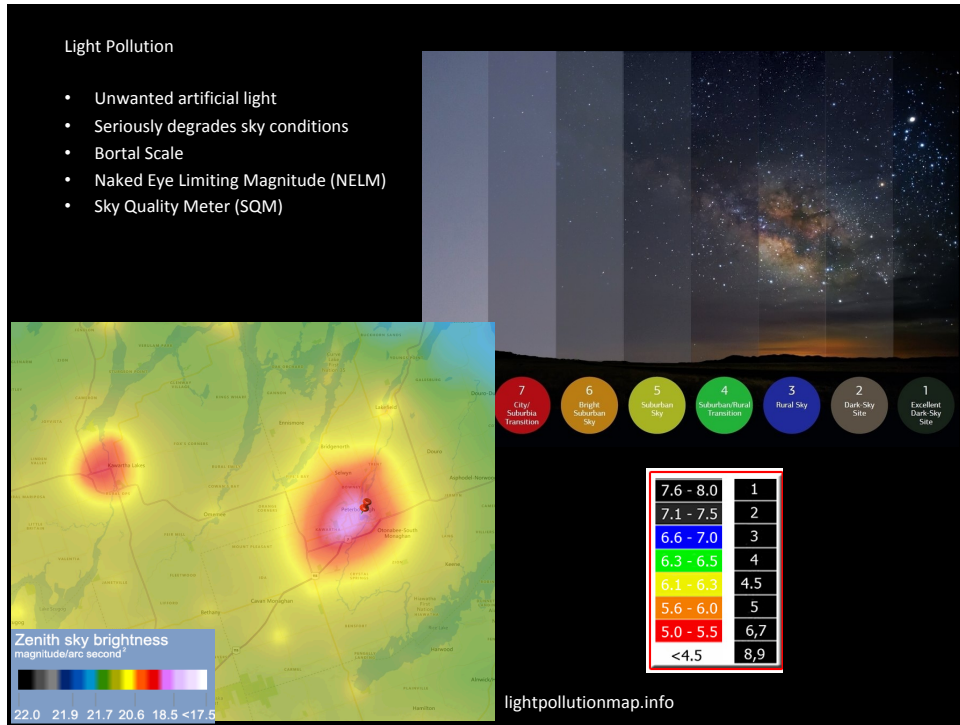
CGSE Astronomy © F.W.

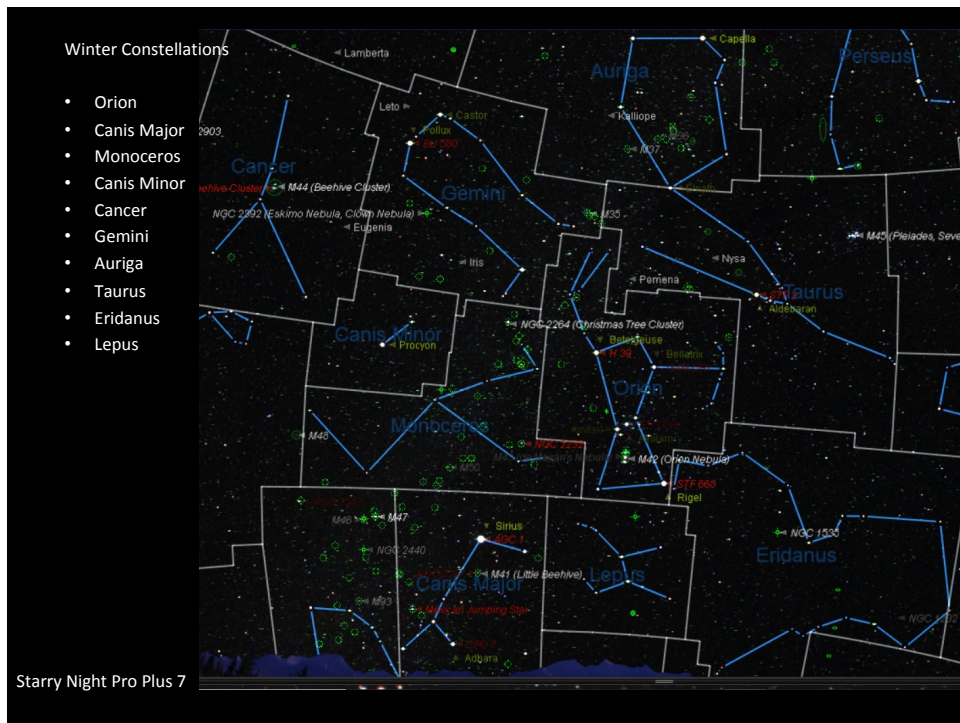
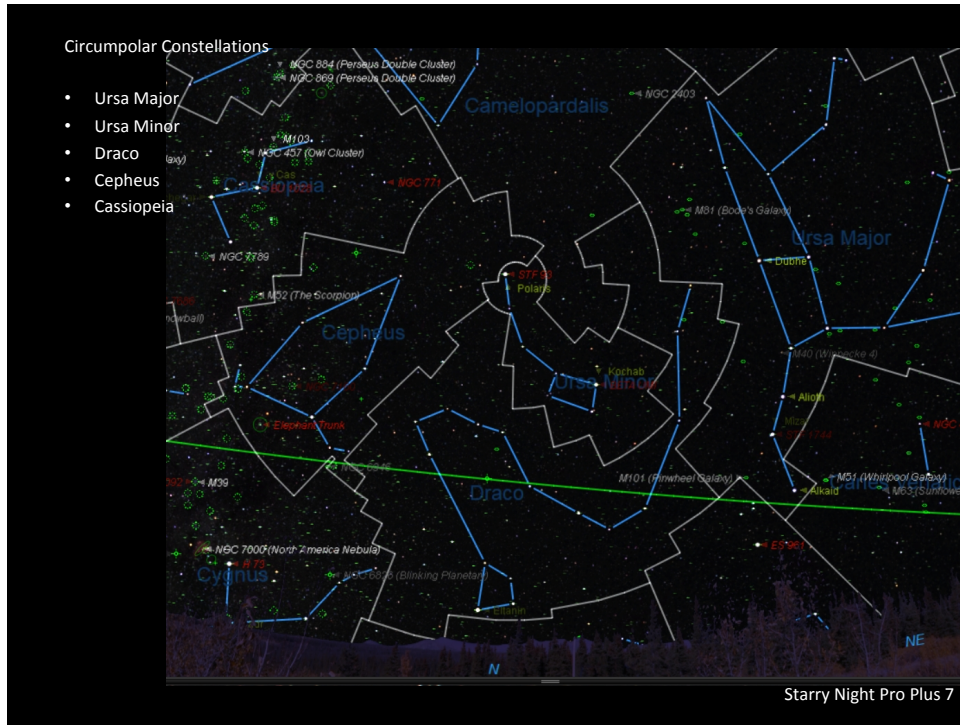
MONOCEROS  
LEPUS  
CANIS MAJOR  
PUPPIS  
COLUMBA  
Adhara  
Sirius  
M41  
M61  
M79  
2260  
2362

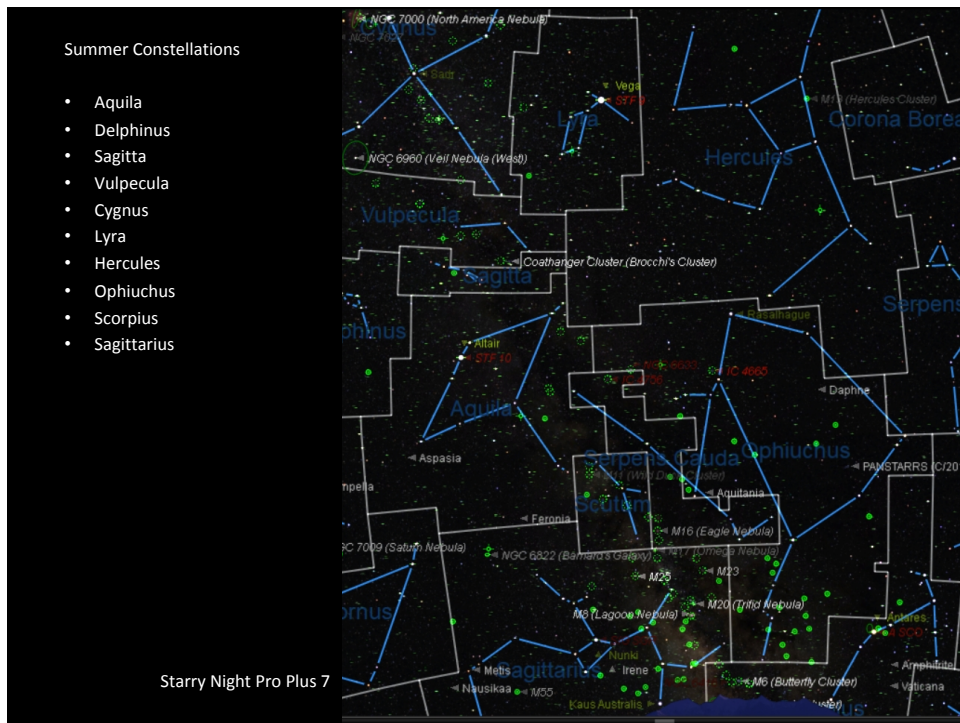
Sun  
Full moon  
Venus at brightest  
Sirius  
Polaris  
Naked eye limit  
Hubble Space Telescope

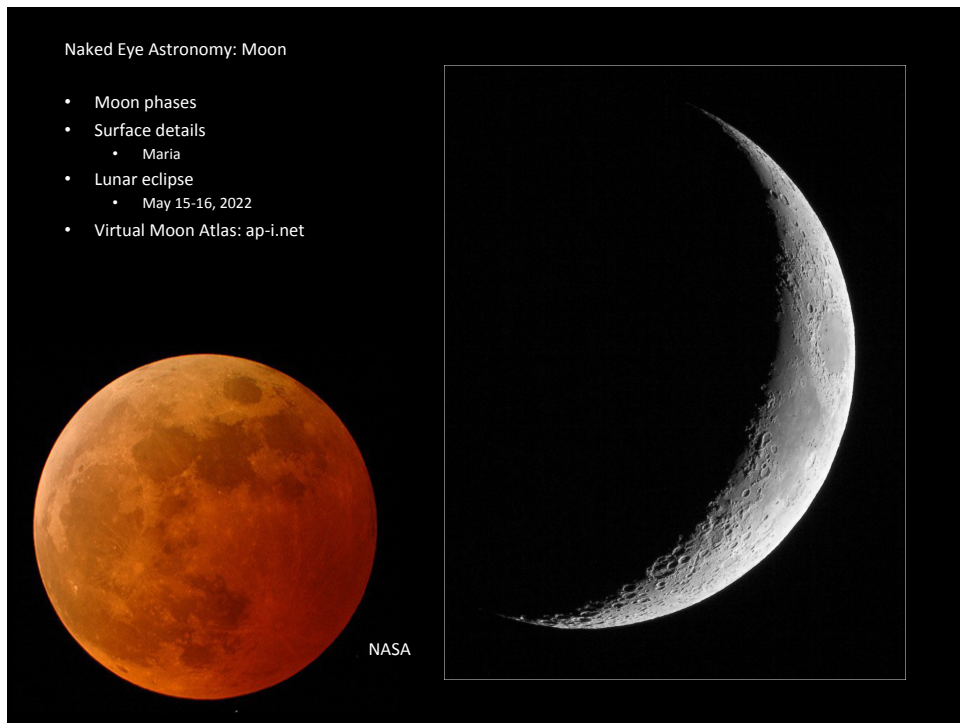
Apparent magnitude ( $m_v$ )

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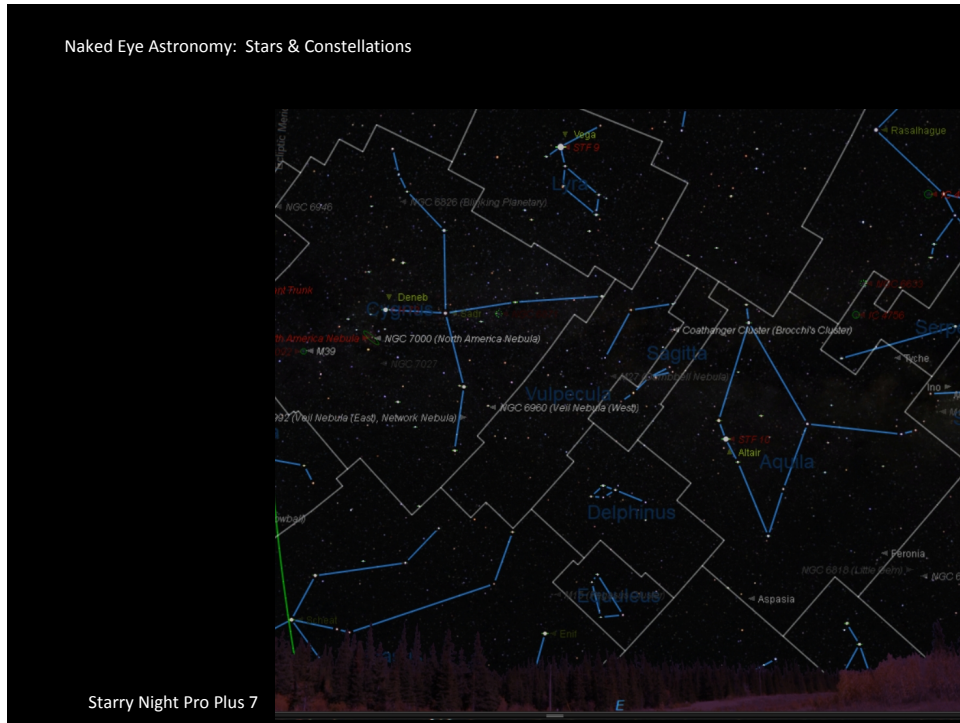








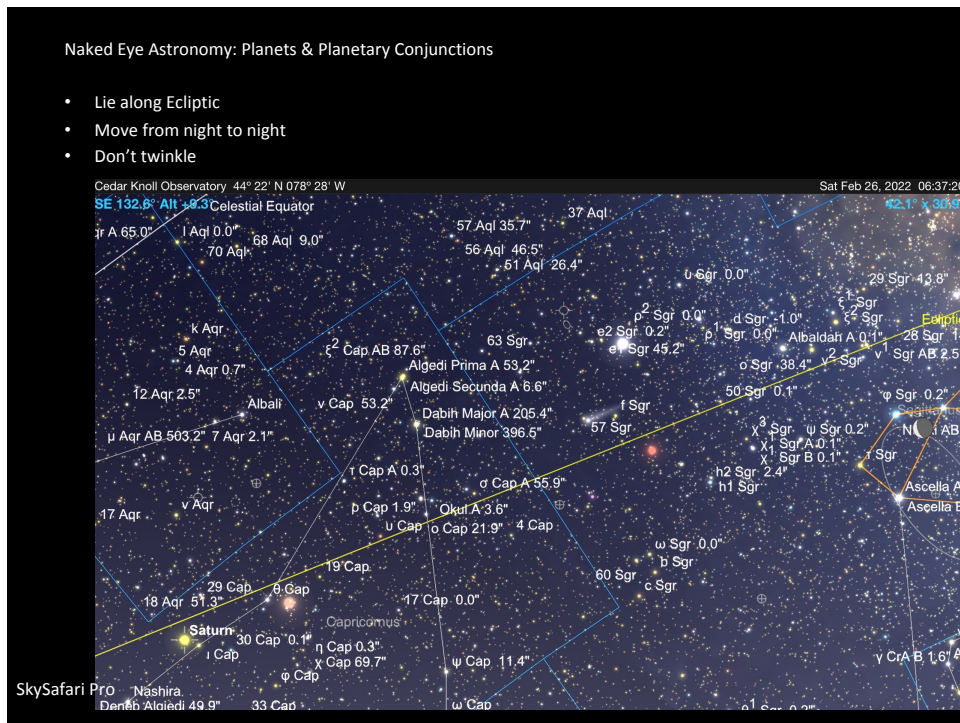
Naked Eye Astronomy: Stars & Constellations



Starry Night Pro Plus 7

Naked Eye Astronomy: Planets & Planetary Conjunctions

- Lie along Ecliptic
- Move from night to night
- Don't twinkle



SkySafari Pro

Naked Eye Astronomy: Meteors

- Small dust sized particles
- Comet debris
- Vaporize high in atmosphere
- Sporadics
- Some leave trails: persistent train
- Meteor showers
  - Radiate from specific location



Bill Ingalls



Geminid Meteor Shower

Naked Eye Astronomy: Satellites

- International Space Station (ISS)
- Tiangong – Chinese Space Station
- Starlink
- Heavens Above: [heavens-above.com](http://heavens-above.com)



Tim Burgess

Naked Eye Astronomy: Aurora Borealis

- Northern Lights
- Space Weather: [spaceweather.com](http://spaceweather.com)



Sebastian Saarioos

Naked Eye Astronomy: Bright Comets



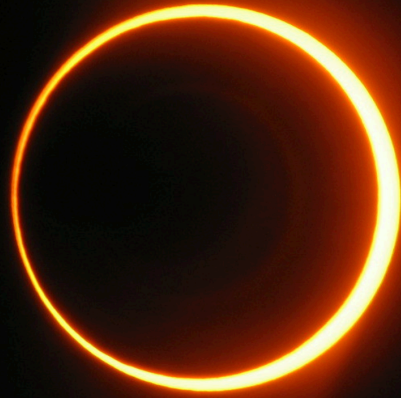
Comet Hale-Bopp: Brian Ventrudo



Comet Leonard (C/2021 A1) & M3: Martin Moberley

Naked Eye Astronomy: Solar Eclipse

- Special eye protection required
- Annular solar eclipse
  - October 14, 2023



Abel Pardo Lopez

Naked Eye Astronomy: Solar Eclipse

- Special eye protection required
- Total solar eclipse
  - April 8, 2024



Ting-Li Lin

