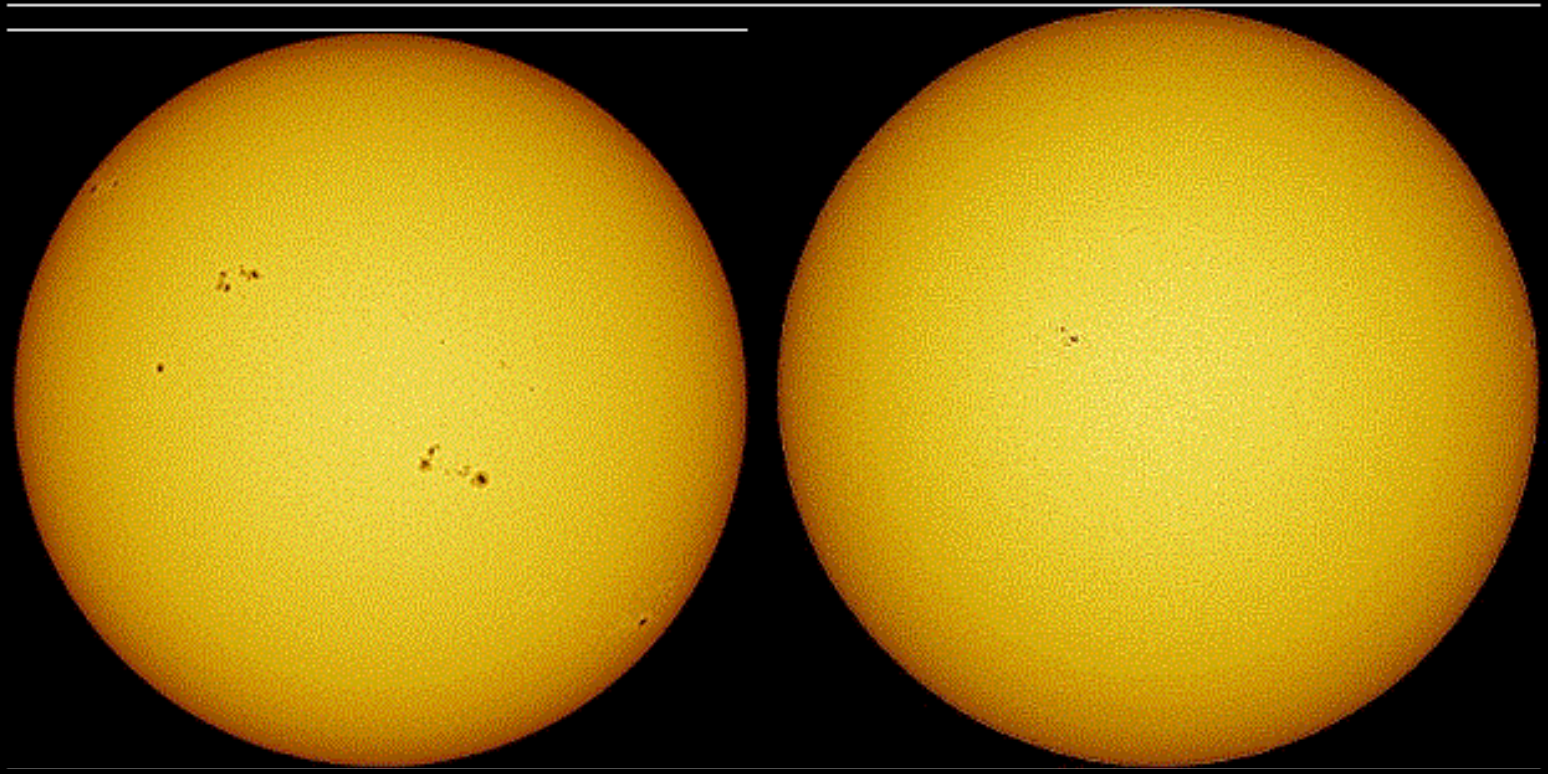
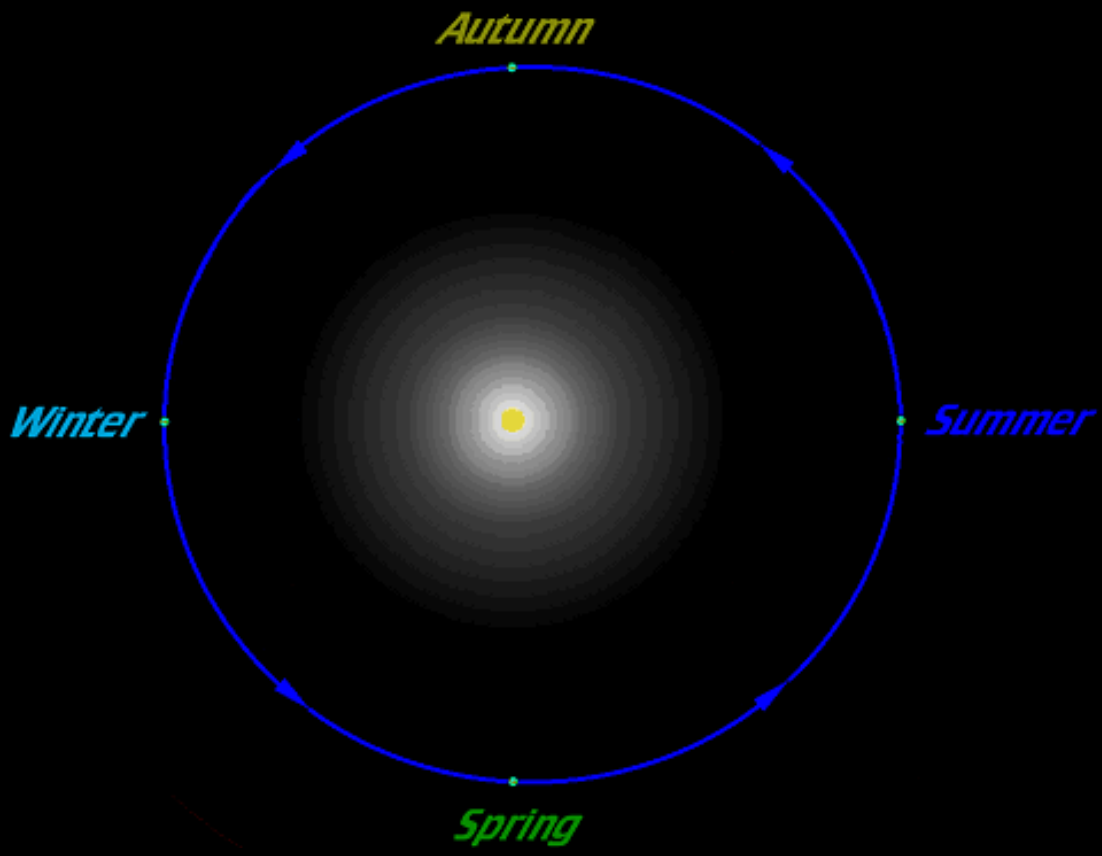
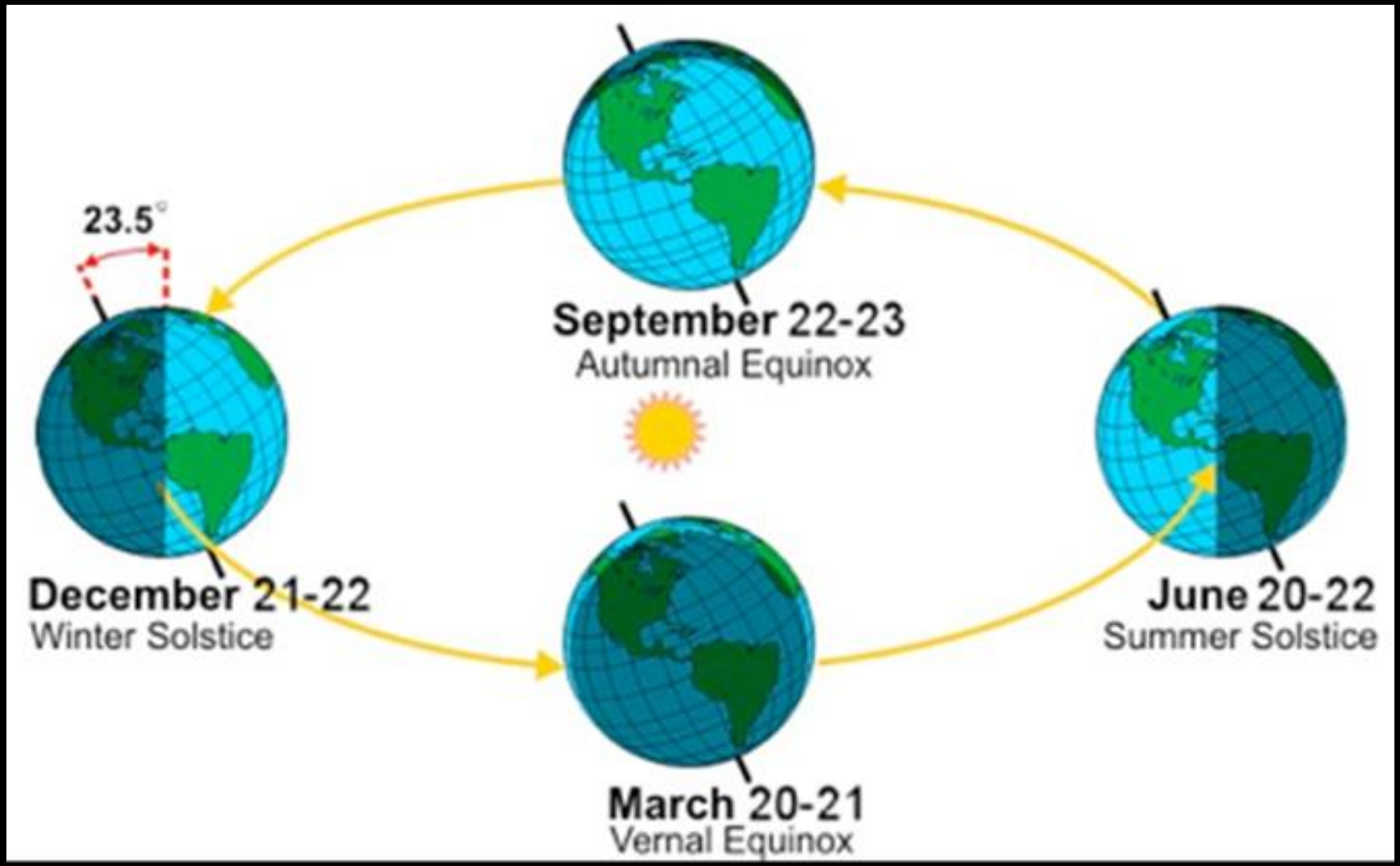
A Buyer's (and User's) Guide to Telescopes & Binoculars

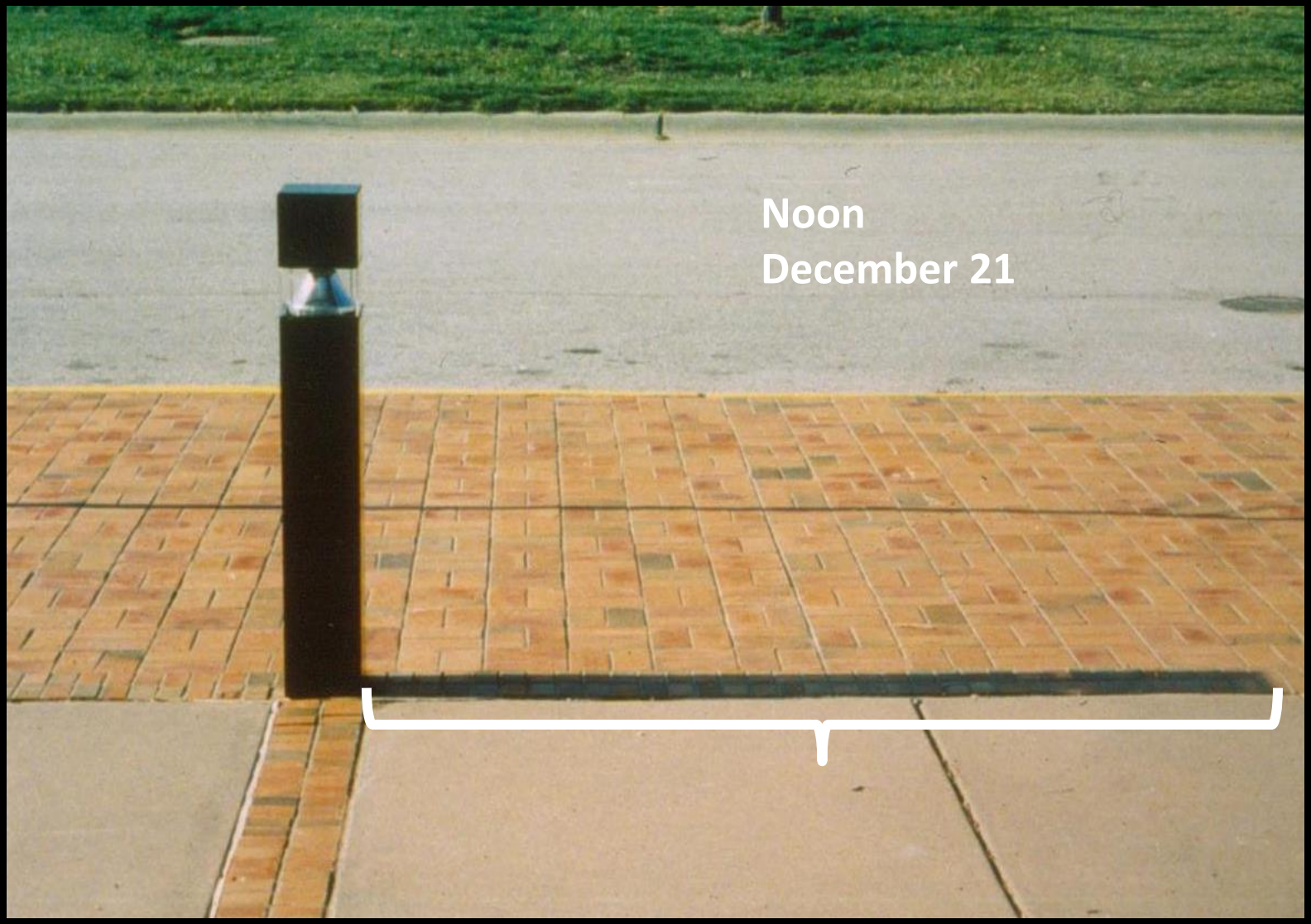
OLLI Week #7



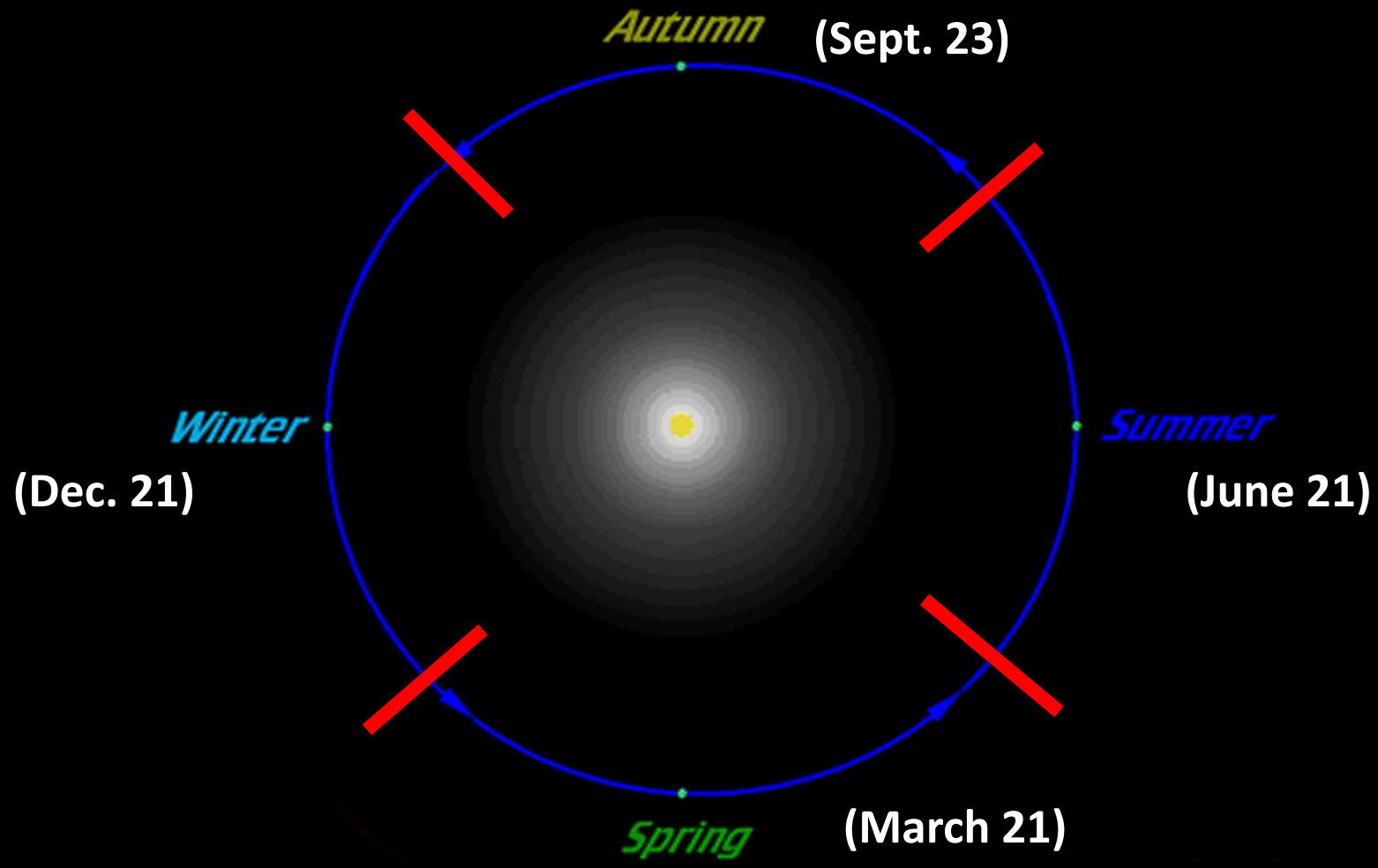
The Distance of the Earth from the Sun




23.5°
September 22-23
Autumnal Equinox
December 21-22
Winter Solstice
June 20-22
Summer Solstice
March 20-21
Vernal Equinox


Noon
December 21


Noon
June 21


Autumn
(Sept. 23)
Winter
(Dec. 21)
Summer
(June 21)
Spring
(March 21)

“Cross-Quarter Days”

- February 2 – “Groundhog Day” or “Candlemas”
- May 1 – “May Day”
- August 1 - “Lammas”
- October 31 – “Halloween!”


CELESTRON

A class demo . . . . .


POWER!!!!

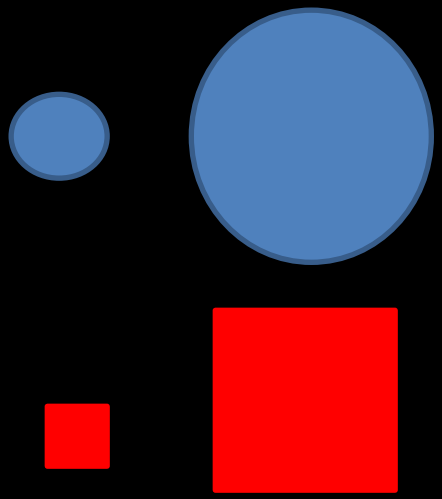
Different “powers”

- **Magnification** – “making things larger”
- **Light Gathering** – “collecting more light than your eye.” Depends on “aperture,” or diameter of light collector.
- **Resolving** – “the ability to see fine detail.” Depends on quality, aperture & sky conditions. Measured in arc seconds.

A little ditty . . . bout Jack & Diane . . .

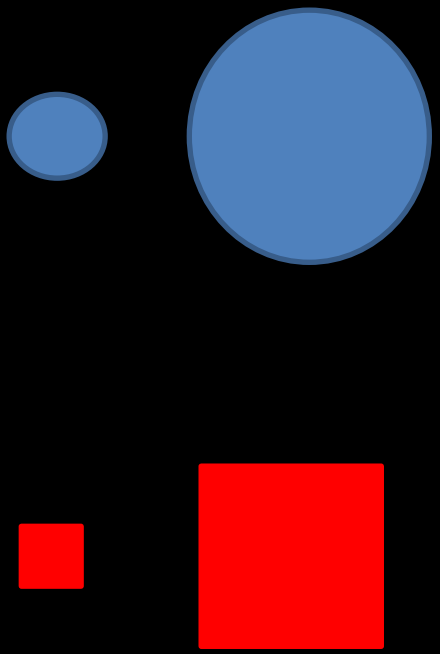
Follow this . . . . .

- Diane . . . 2” telescope, 7x
- 2” is 8x larger than eye (1/4”)
- Think “areas” 8 x 8 = 64x more light
- Magnify 7x, spread out light 7 x 7 = 49x
- 64/49 = 1.3x brighter



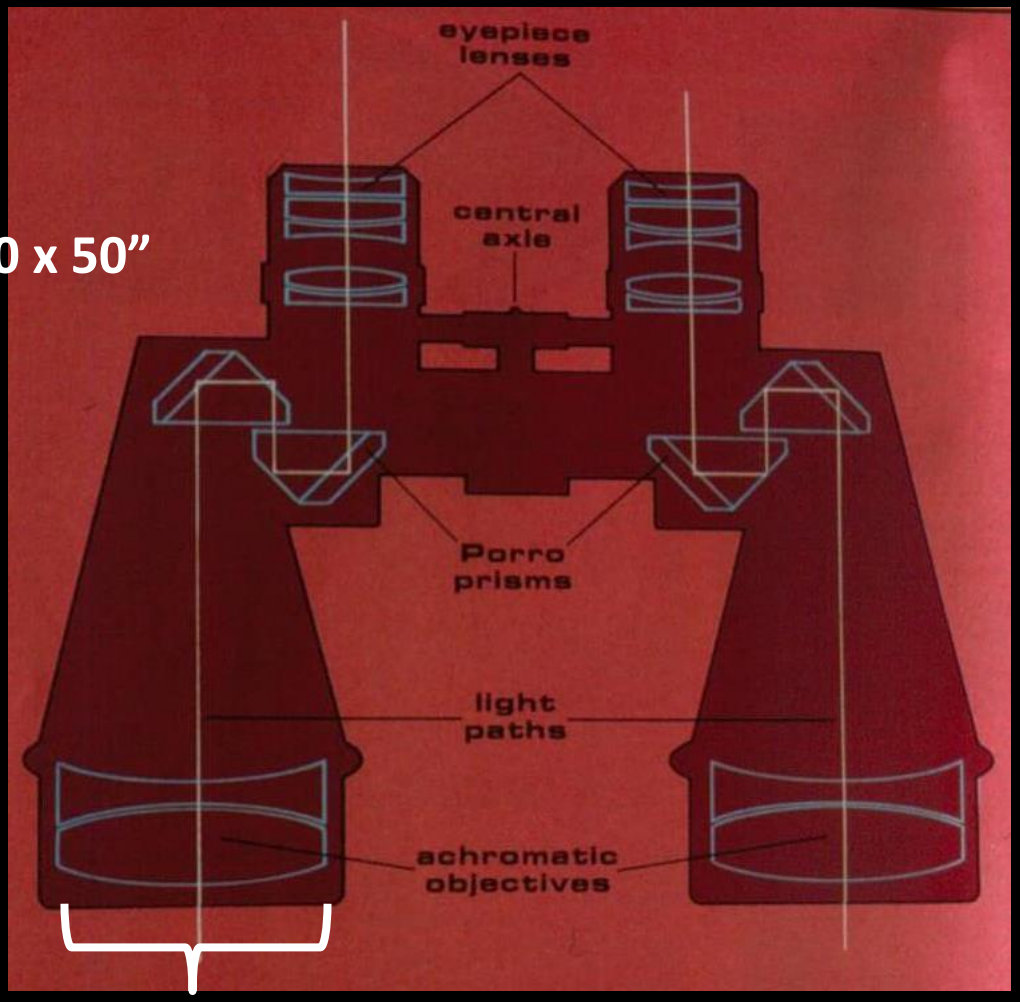
Follow this . . . . .

- Jack . . . 3” telescope, 500x
- 3” is 12x larger than eye (1/4”)
- Think “areas” 12 x 12 = 144x more light
- Magnify 500x, spread out light
  500 x 500 = 250,000x
- 144/500,000 = 0.0003x brighter
  (3500x fainter!)

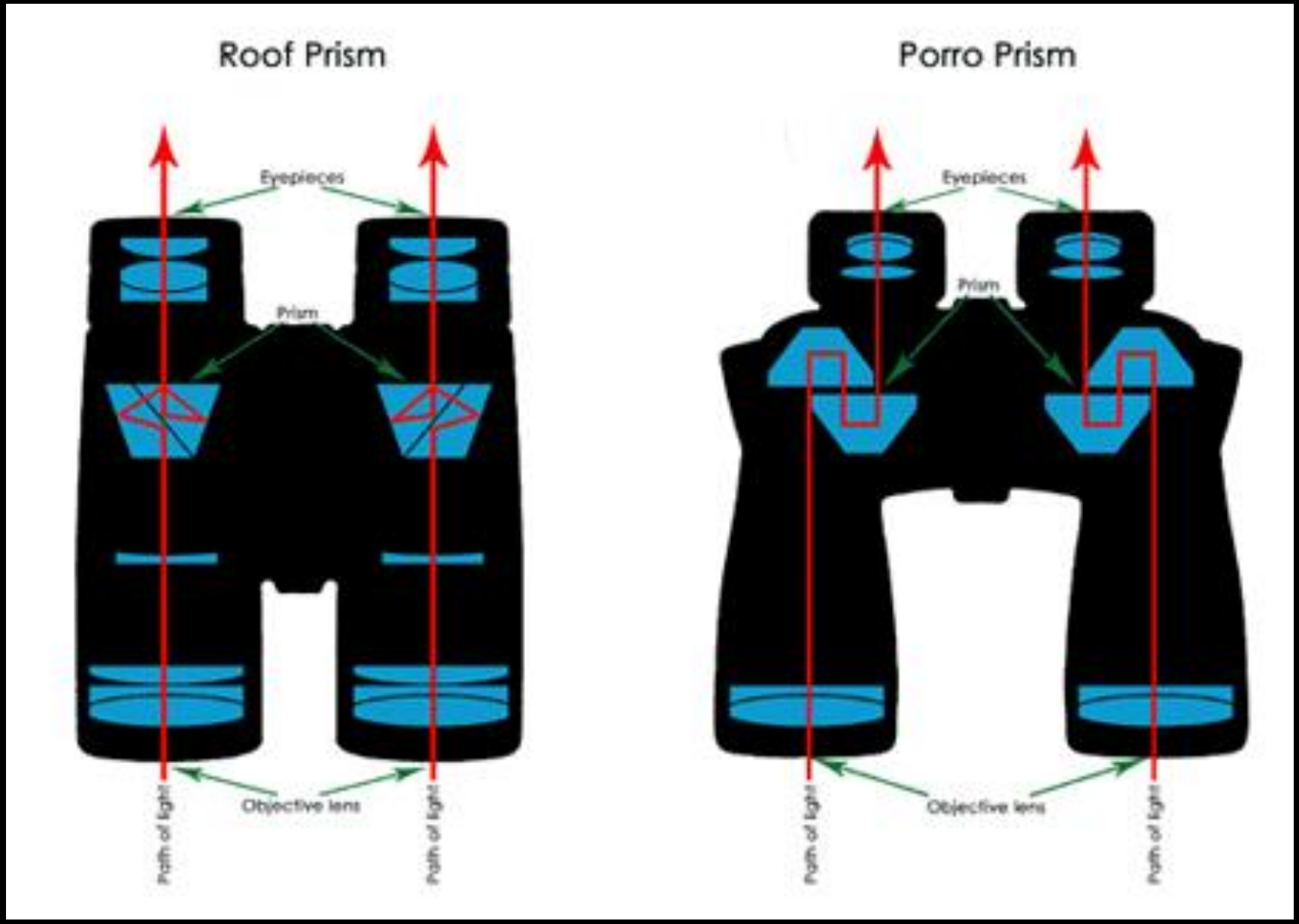


Diane's "telescope"

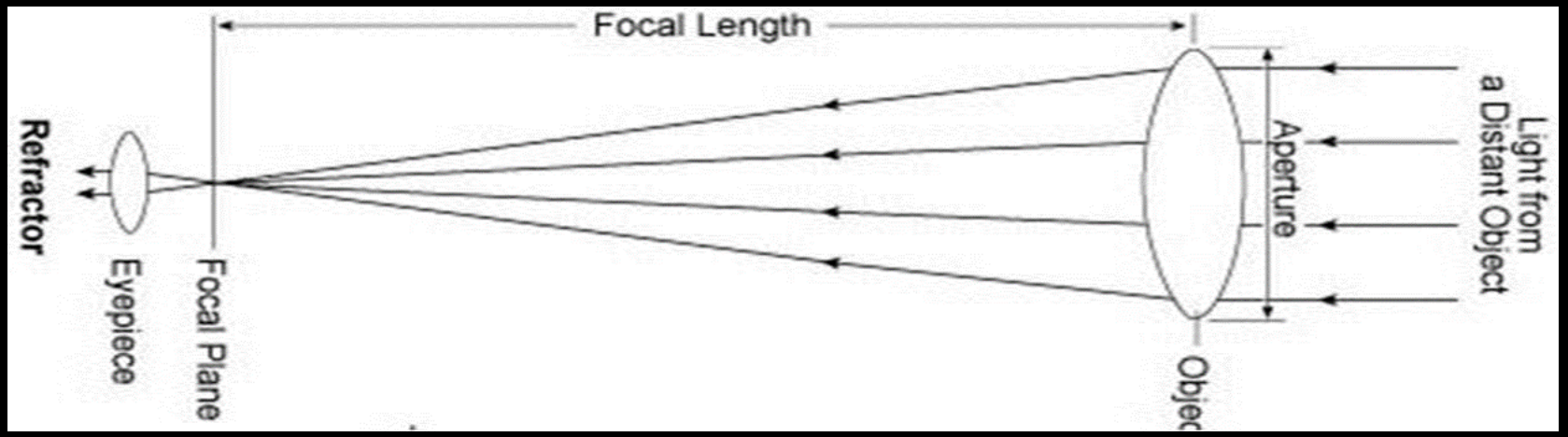
"10 x 50"



50mm = 2 inches

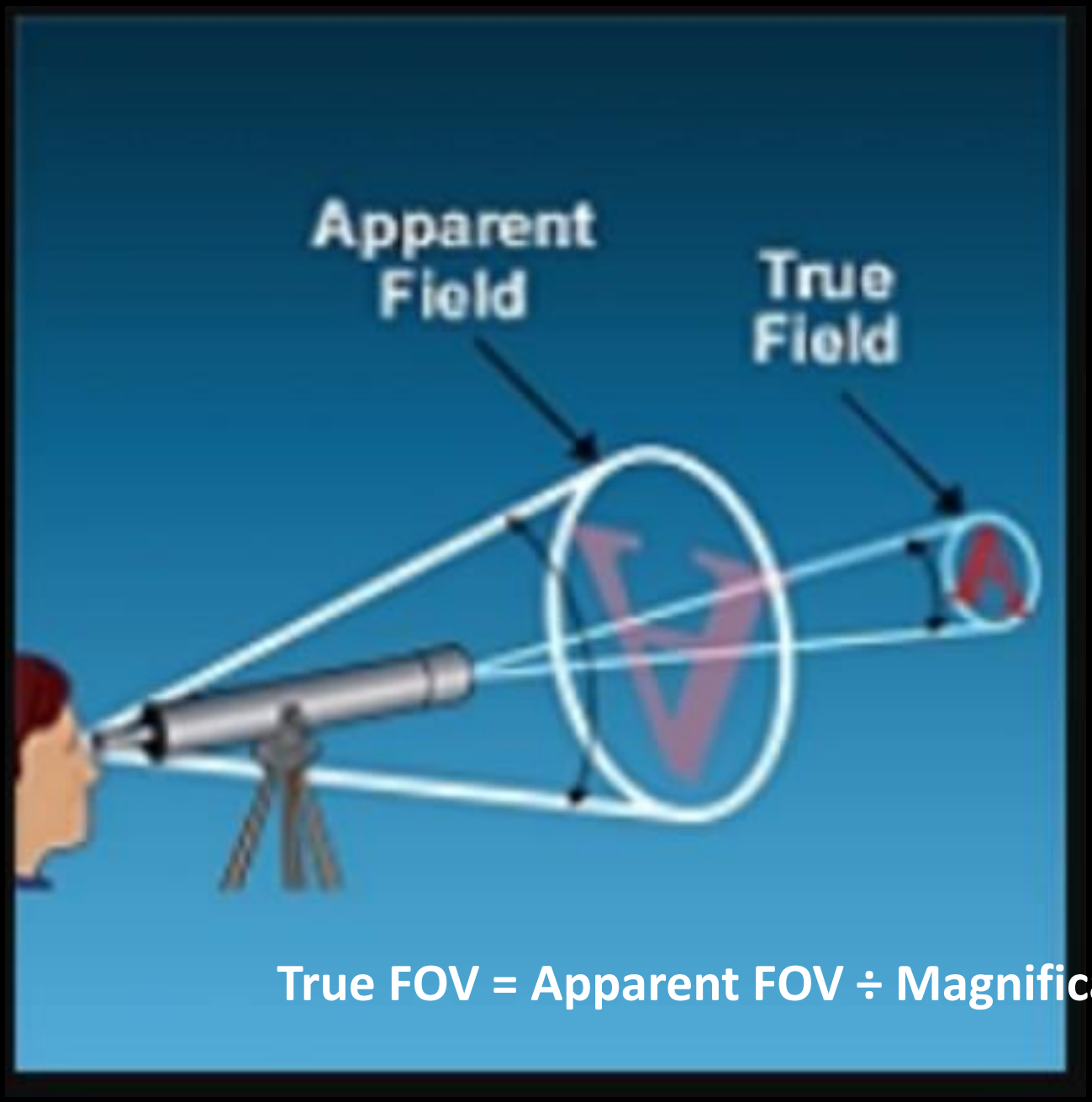

Roof Prism
Eyepieces
Prism
Path of light
Objective lens
Path of light
Porro Prism
Eyepieces
Prism
Path of light
Objective lens
Path of light

Some useful definitions



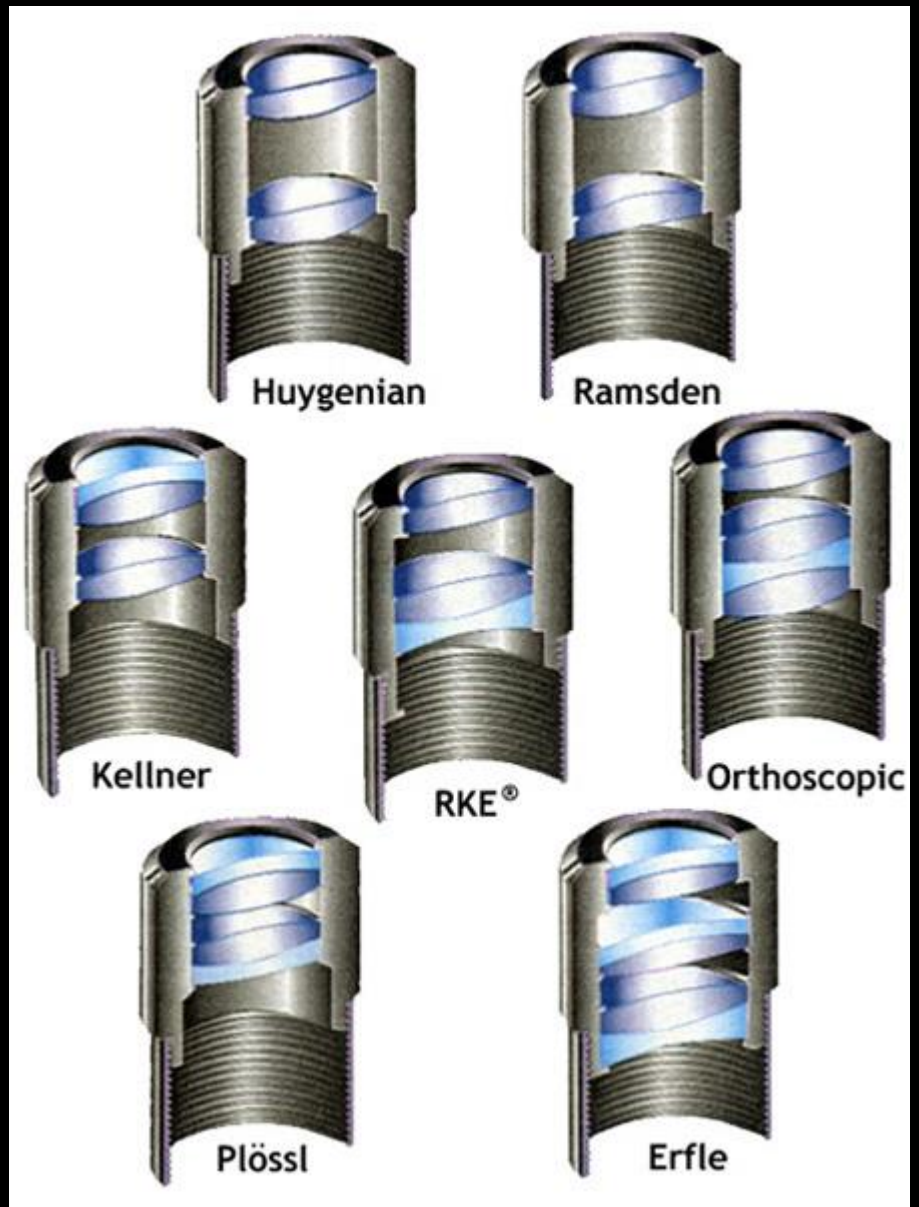
"Objective" – whatever is doing the collecting (lens or mirror)
"Aperture" – diameter of whatever is collecting the light (lens or mirror)
"Focal Point" – the spot where the light comes to a focus, the light rays come together.
"Focal length" – the distance from the lens (or mirror) to the focal point.
"Eyepiece" – what you look into. This does the magnifying. You can change eyepieces and change the magnification.

$$\text{Magnification} = \frac{\text{Focal length of objective}}{\text{Focal length of eyepiece}}$$

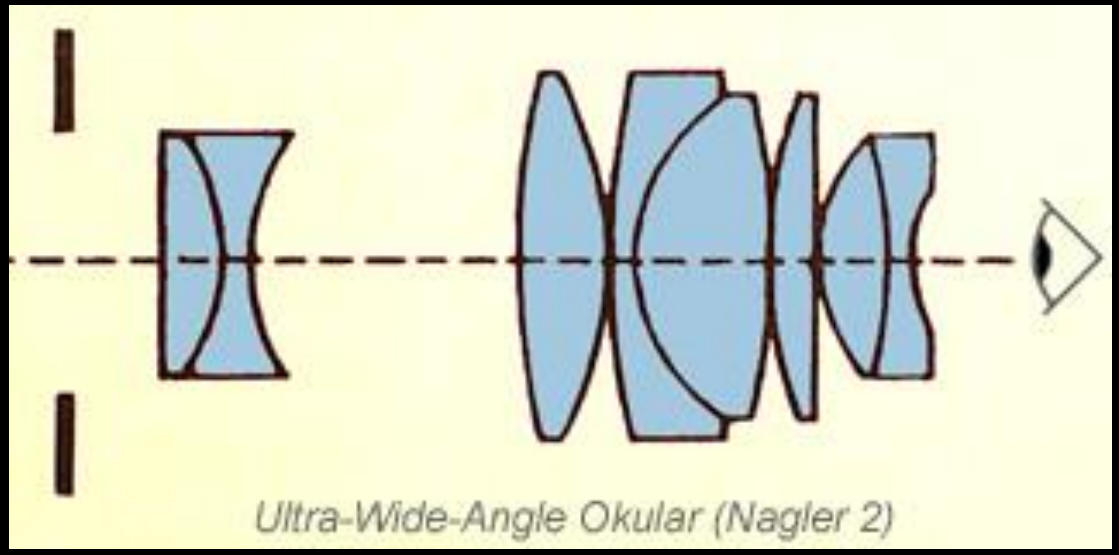


True FOV = Apparent FOV ÷ Magnification

Eyepieces designs



Nagler

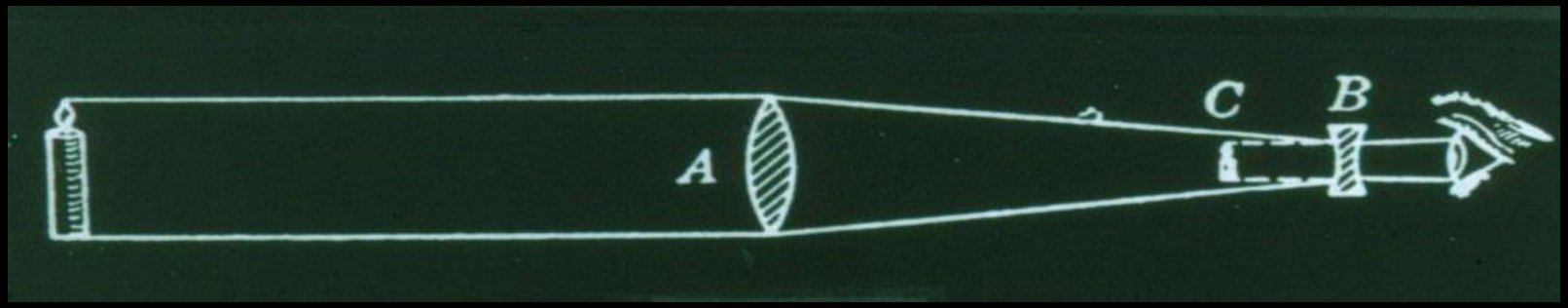


While we're at it . . . . . Filters . . .

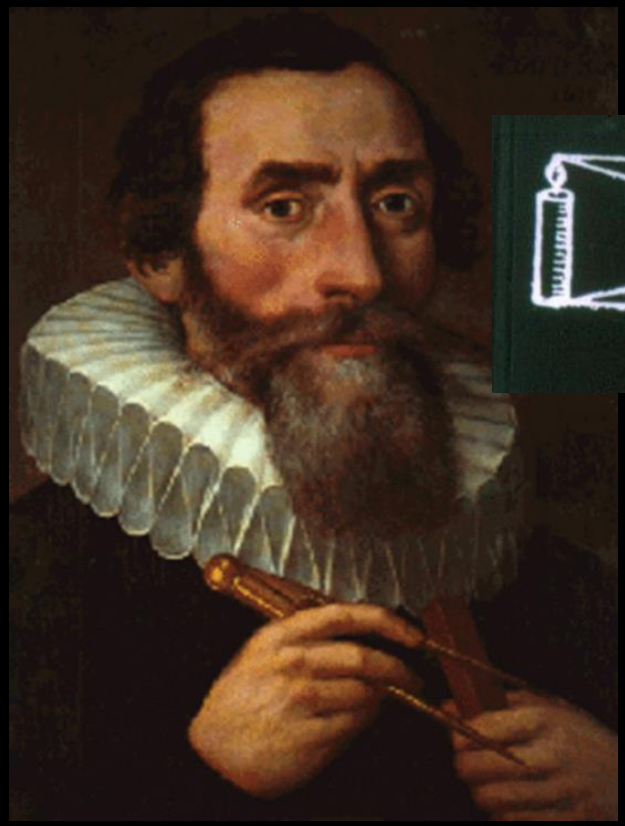
“How can we funnel light?”
Two basic types:

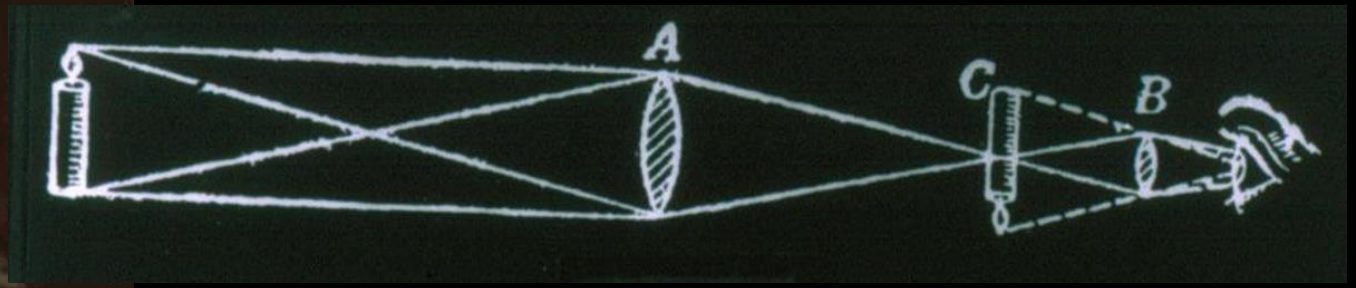
- **Refractors** . . . . . “bends” light by way of a lens
- **Reflectors** . . . . . .reflects light by way of a curved mirror.

Galileo, 1610

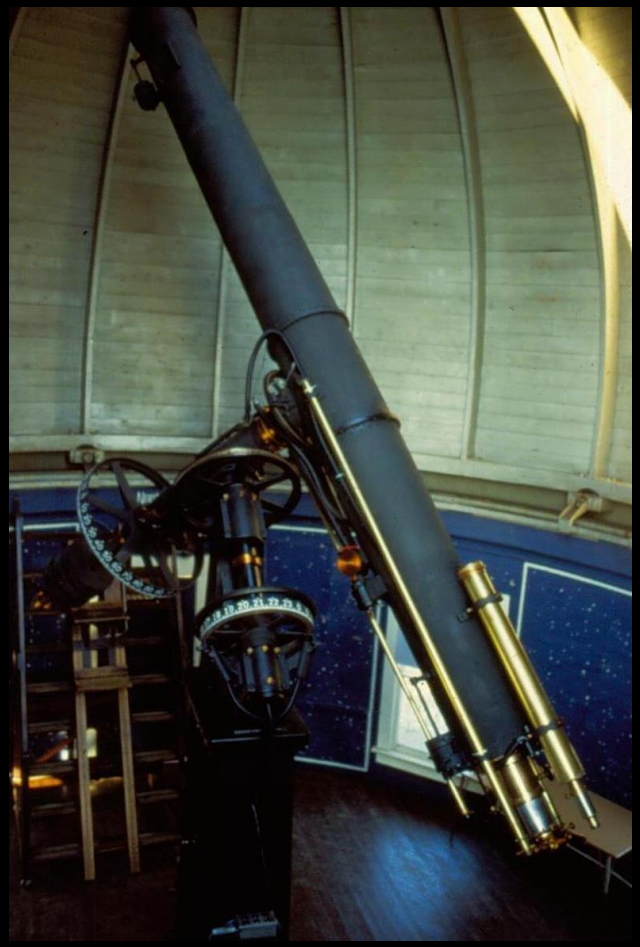


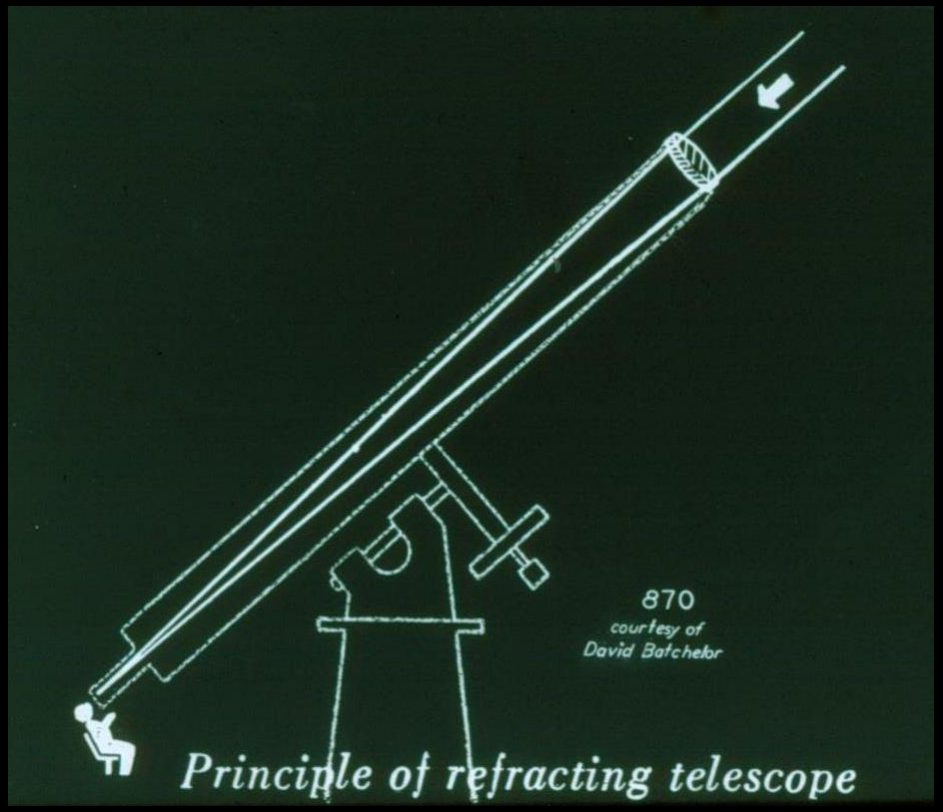
Kepler’s improvement

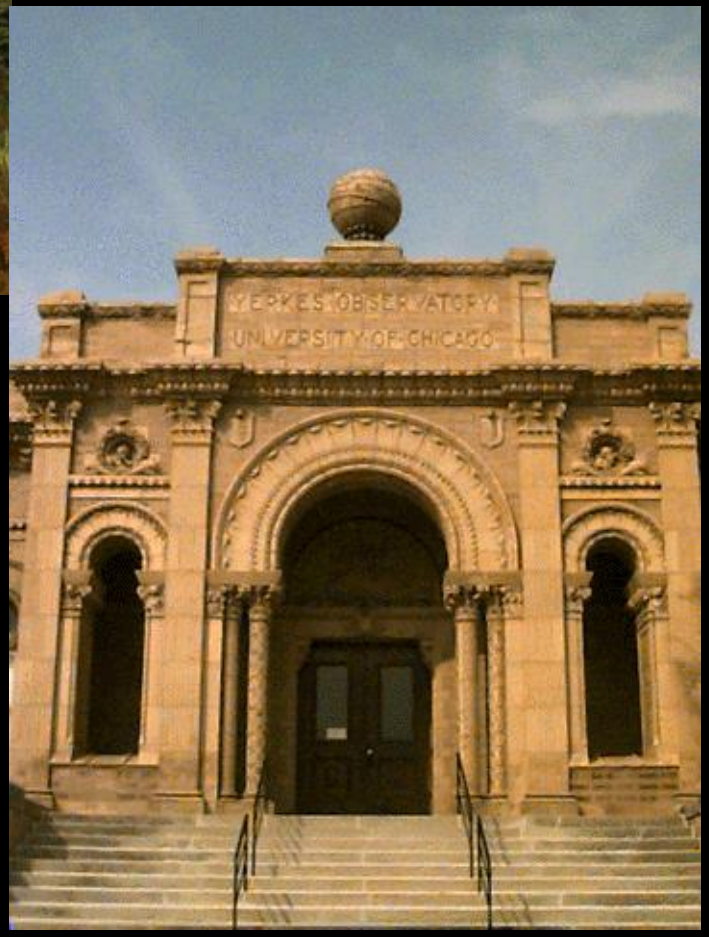




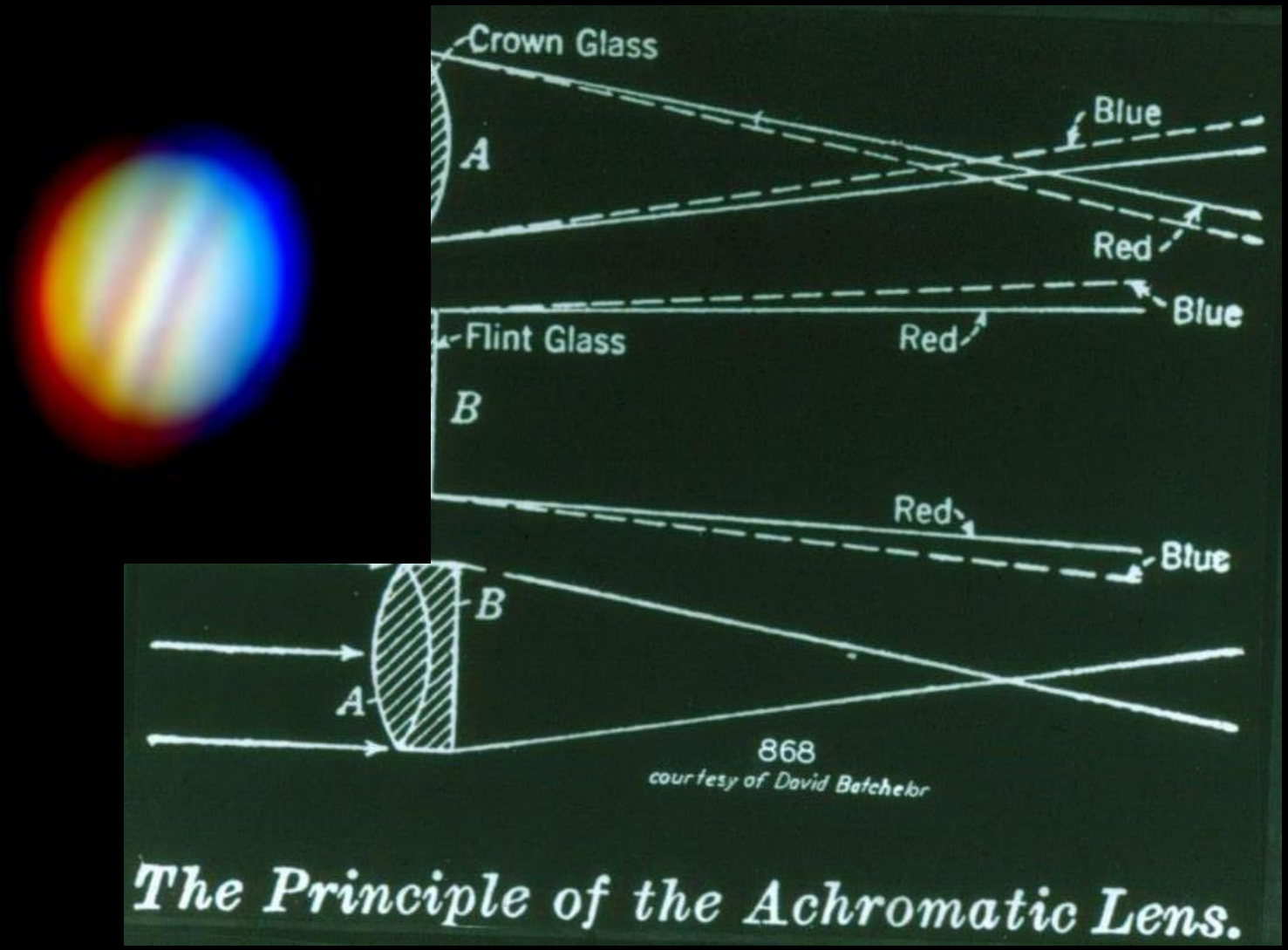
The Refractor



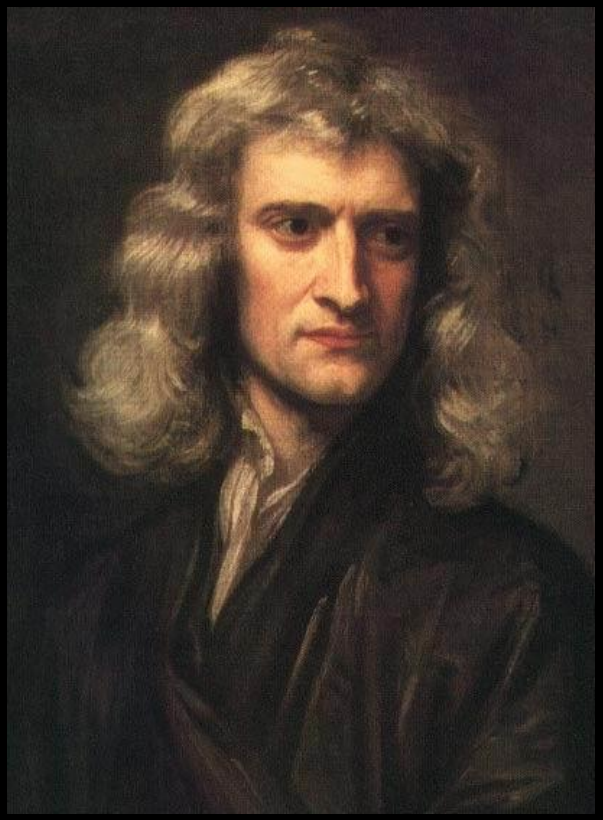


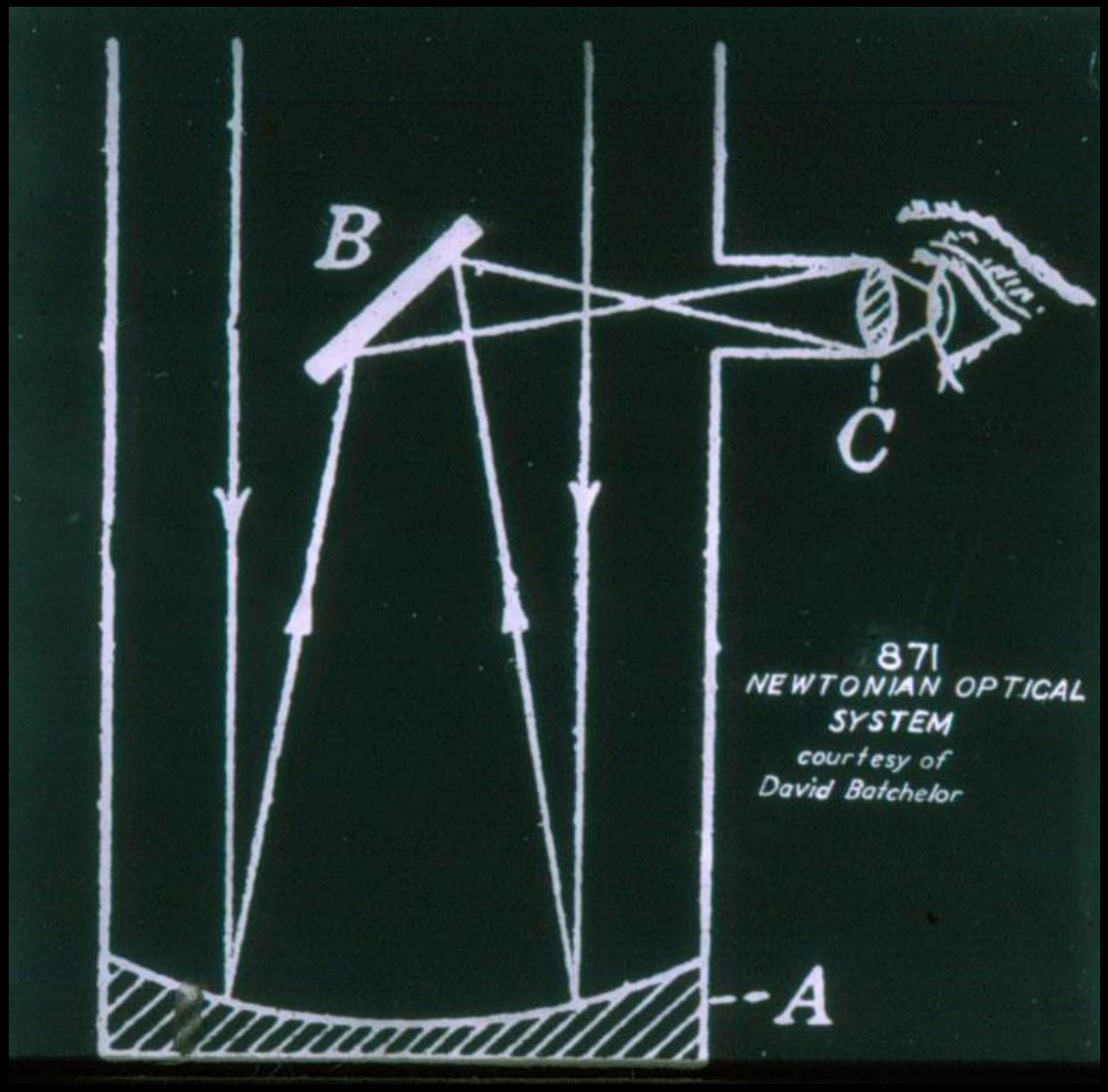

YERKES OBSERVATORY
UNIVERSITY OF CHICAGO

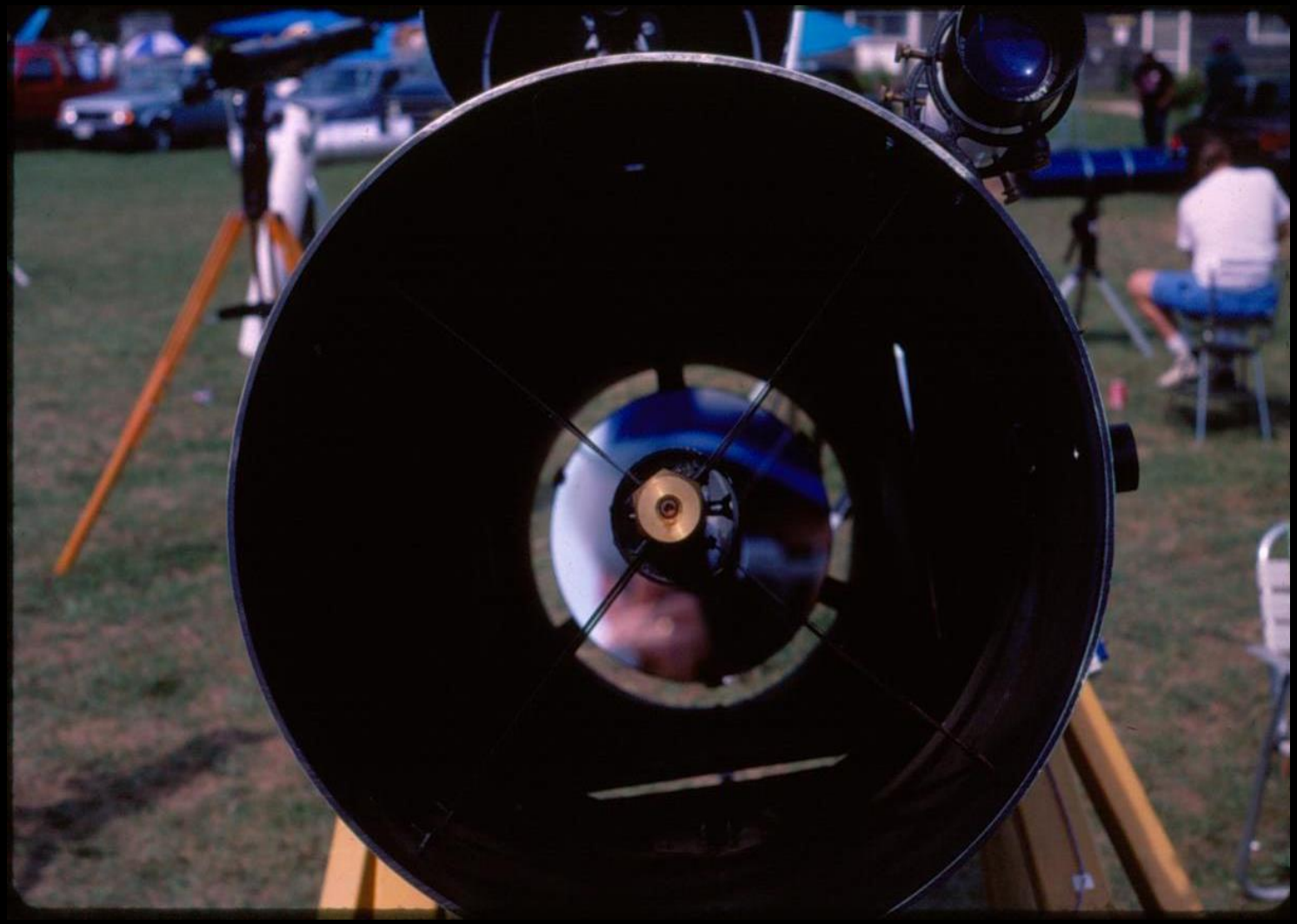
Refractor problems



Isaac to the rescue!





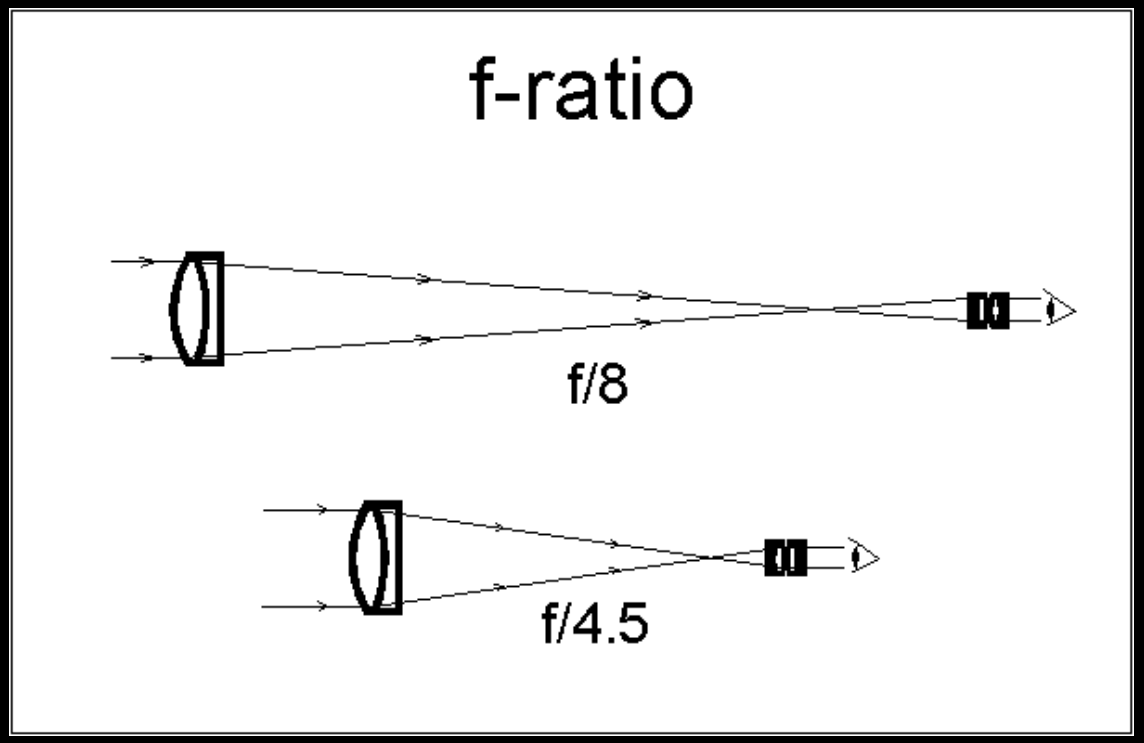


“Focal Ratios”

- **f/ratio = focal length/aperture**

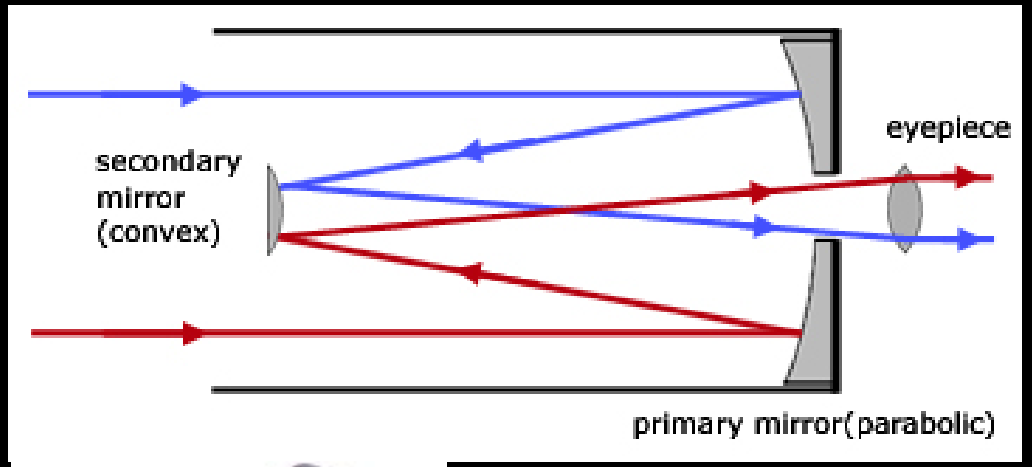
  Examples . . . .12” f/15 telescope or 4” f/4 telescope

  Cameras . . . . Focal length same, adjust aperture



Edmund “Astroscan”

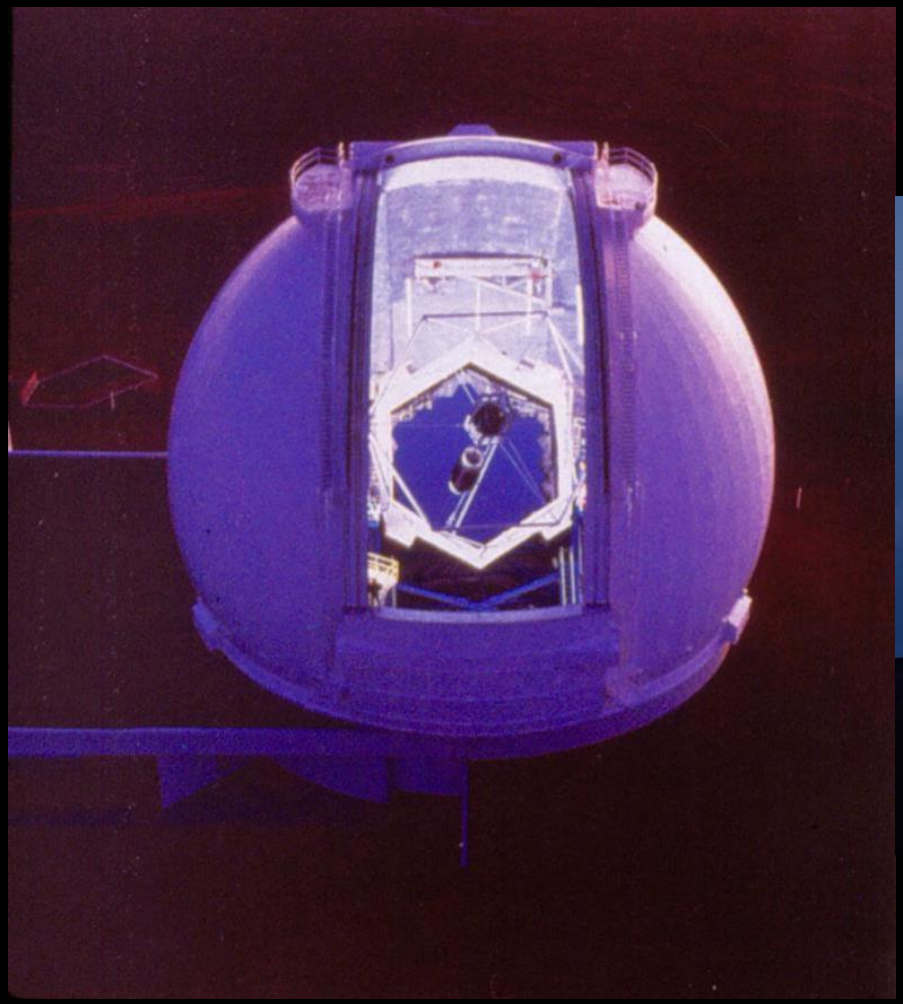
“Folded Telescopes” (Cassegrains)

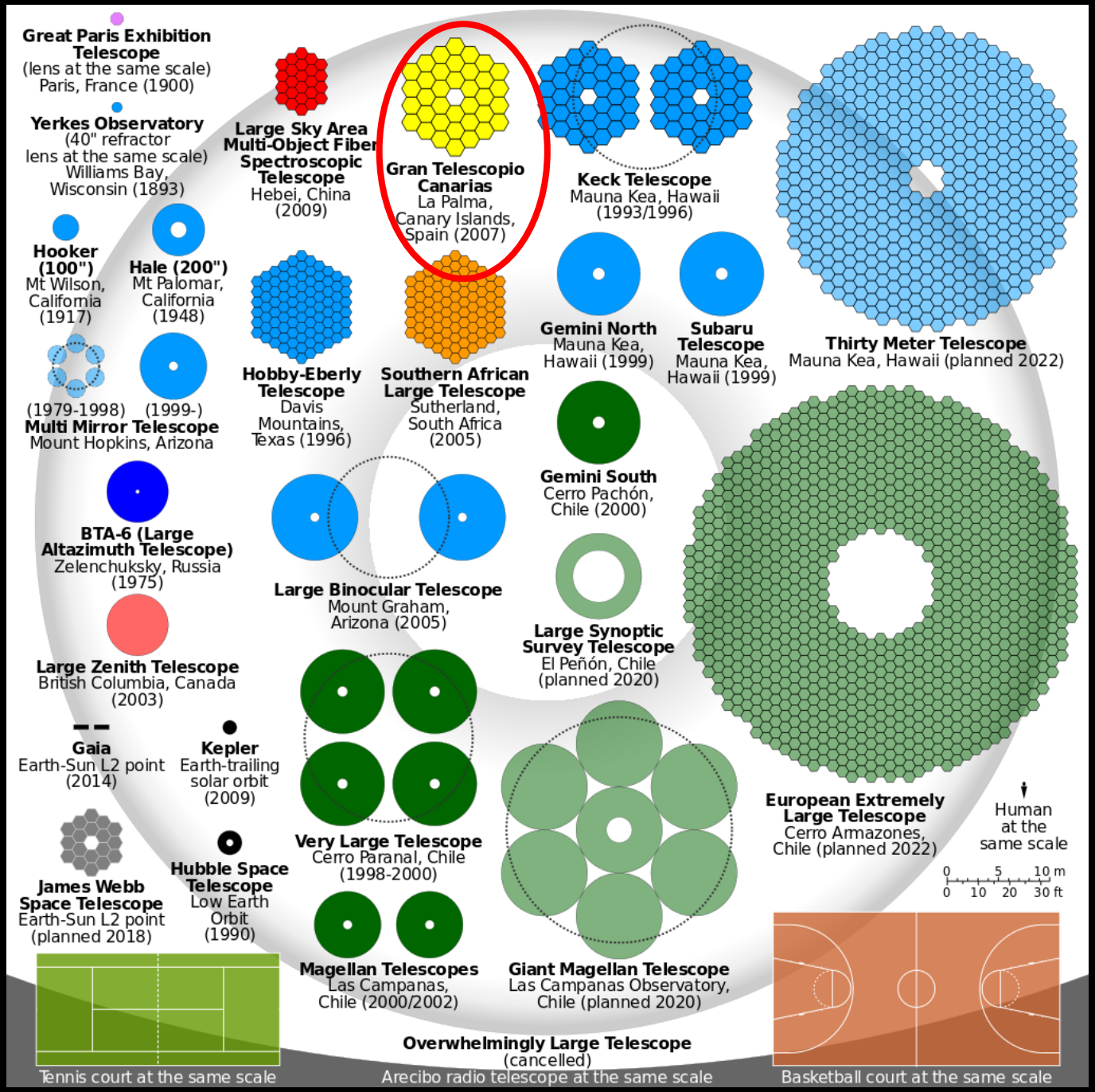


John Dobson

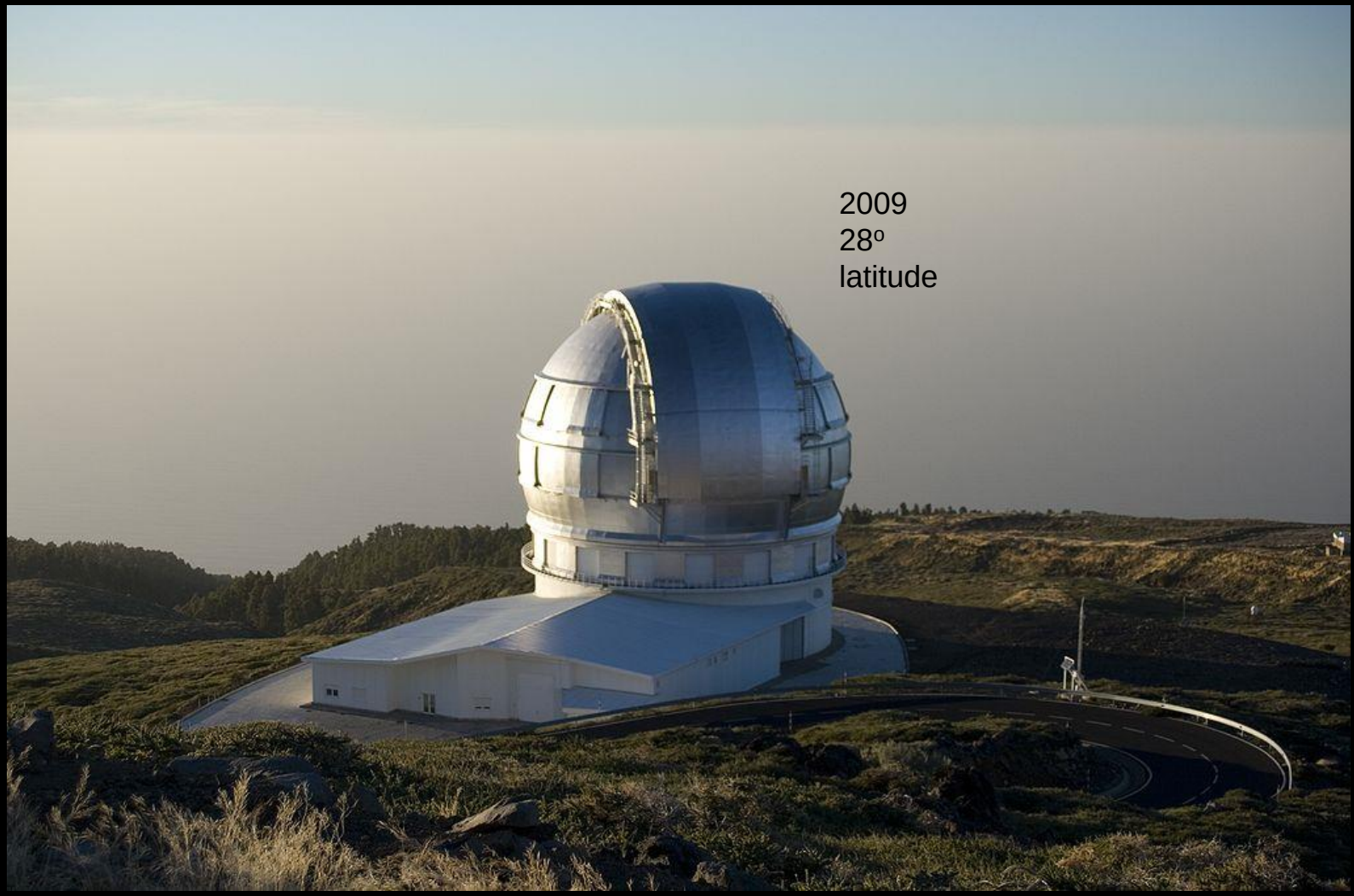

35"
F/5

Keck 10-meter

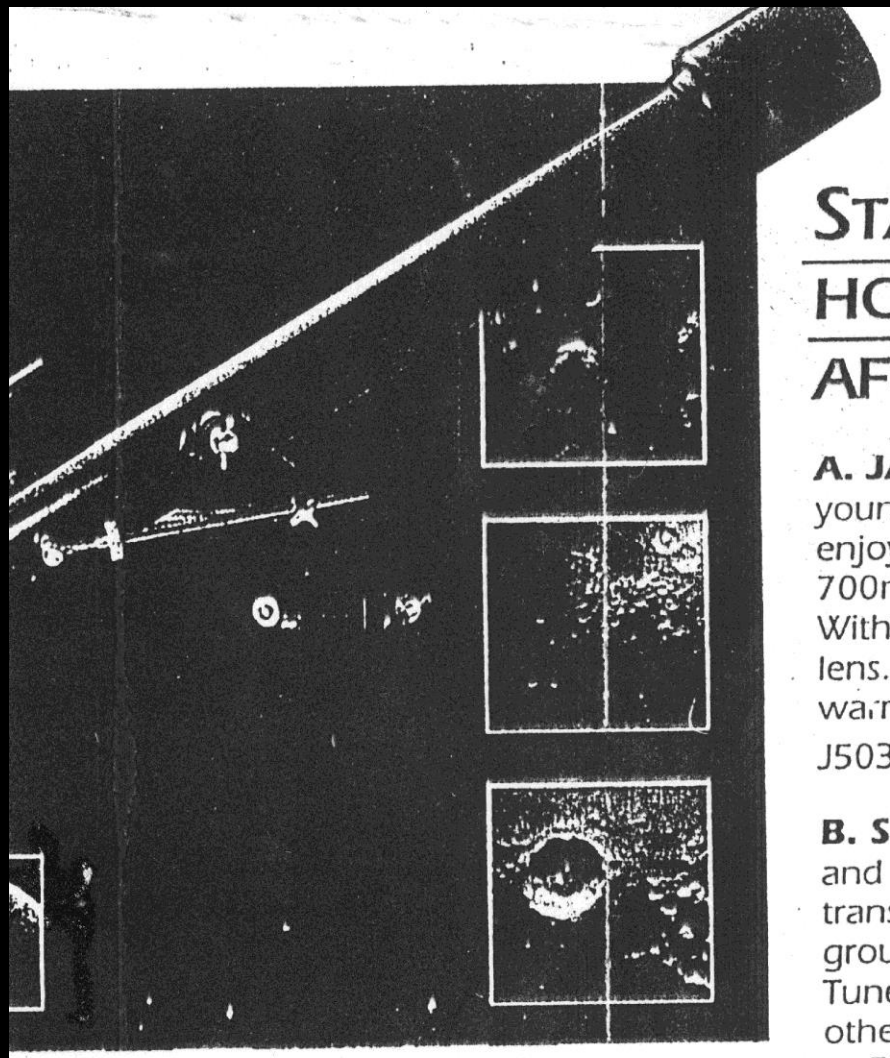



Great Paris Exhibition Telescope
(lens at the same scale)
Paris, France (1900)
Yerkes Observatory
(40" refractor
lens at the same scale)
Williams Bay,
Wisconsin (1893)
Hooker (100")
Mt Wilson,
California
(1917)
Hale (200")
Mt Palomar,
California
(1948)
(1979-1998)
(1999-)
Multi Mirror Telescope
Mount Hopkins, Arizona
BTA-6 (Large Altazimuth Telescope)
Zelenchuksky, Russia
(1975)
Large Zenith Telescope
British Columbia, Canada
(2003)
Gaia
Earth-Sun L2 point
(2014)
Kepler
Earth-trailing
solar orbit
(2009)
James Webb Space Telescope
Earth-Sun L2 point
(planned 2018)
Hubble Space Telescope
Low Earth
Orbit
(1990)
Large Sky Area Multi-Object Fiber Spectroscopic Telescope
Hebei, China
(2009)
Gran Telescopio Canarias
La Palma,
Canary Islands,
Spain (2007)
Hobby-Eberly Telescope
Davis
Mountains,
Texas (1996)
Southern African Large Telescope
Sutherland,
South Africa
(2005)
Large Binocular Telescope
Mount Graham,
Arizona (2005)
Very Large Telescope
Cerro Paranal, Chile
(1998-2000)
Magellan Telescopes
Las Campanas,
Chile (2000/2002)
Keck Telescope
Mauna Kea, Hawaii
(1993/1996)
Gemini North
Mauna Kea,
Hawaii (1999)
Subaru Telescope
Mauna Kea,
Hawaii (1999)
Gemini South
Cerro Pachón,
Chile (2000)
Large Synoptic Survey Telescope
El Peñón, Chile
(planned 2020)
Giant Magellan Telescope
Las Campanas Observatory,
Chile (planned 2020)
Thirty Meter Telescope
Mauna Kea, Hawaii (planned 2022)
European Extremely Large Telescope
Cerro Armazones,
Chile (planned 2022)
Human at the same scale
0 5 10 m
0 10 20 30 ft
Overwhelmingly Large Telescope
(cancelled)
Arecibo radio telescope at the same scale
Tennis court at the same scale
Basketball court at the same scale

Canary Islands – 10.4 meters



Chile



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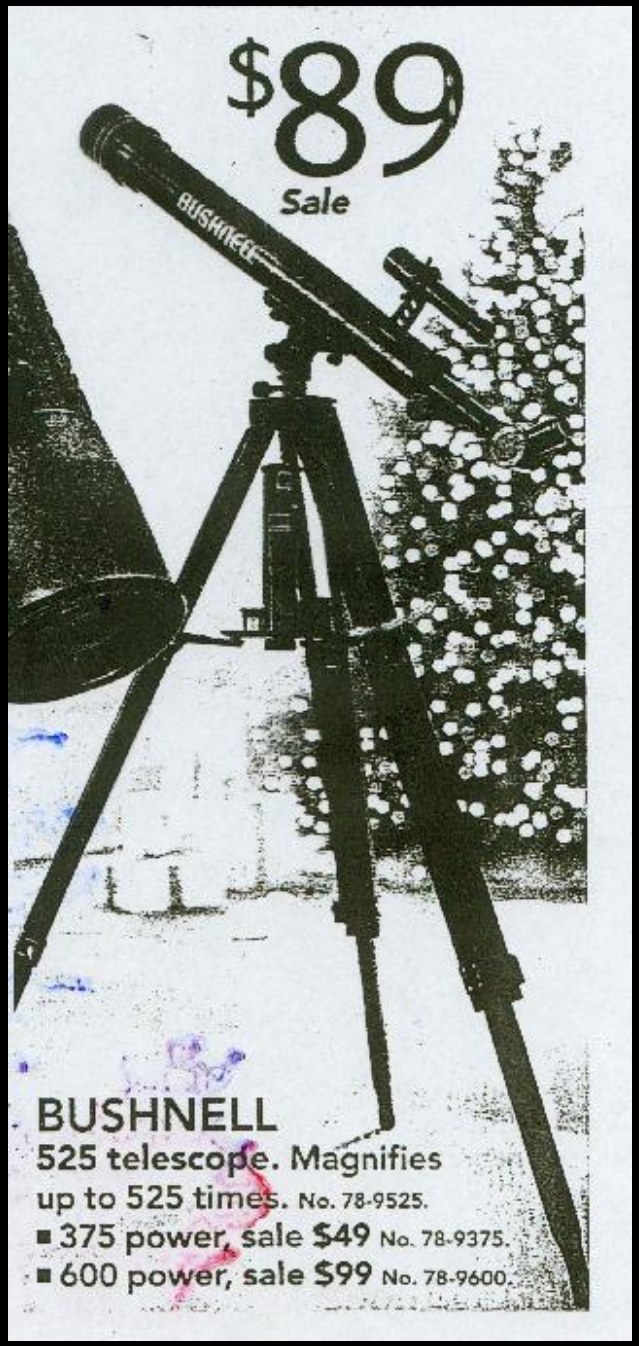
A. JASON® TELESCOPE. For the stargazer or young astronomer—an educational aid that's thoroughly enjoyed by the entire family. Features 31 to 525 power, 700mm focal length, 3.0 x Barlow lens, 5 x 24 finderscope. With 4mm, 12.5mm and 22mm lenses plus 60mm objective lens. Complete with wood tripod. Assembly required. Limited warranty. Imported. **(A)**

J5037 $139.99* **12.99** per month*

B. SEARCH MASTER™ METAL DECTECTOR. Both the ama and the professional treasure hunter will strike it rich. Featu transmitter/receiver with very low frequency circuitry and ex ground cancel-control for full-depth penetration and effective Tune it to find all metals or to reject foils, nails, bottle caps, an other decoys. Will find single coins up to 10" deep, larger obje to 5' deep. Offers 2" cleartone loudspeaker. Uses two 9V batter (included). Made in USA. **(A)**

F9656 $159.99* **11.89** per month*


400
Power
Telescope with Software
$97.82
A fun, educational hobby! 5x24 finderscope to narrow down the field. Diagonal dome and accessory tray included. Comes with EZ Cosmos software that's like having an astrological encyclopedia on disk. It'll be your tour guide through the heavens. (6330)


$89
Sale
BUSHNELL
525 telescope. Magnifies up to 525 times. No. 78-9525.
375 power, sale $49 No. 78-9375.
600 power, sale $99 No. 78-9600.

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Super-Powerful 100-BILLION MILES

DEEP SPACE TELESCOPES

not ~~$199.95~~

but only $29.95

(with 3 lens systems — telephoto, wide-angle & deep space)

This once-a-year 'Depot-Overstock' release to the public!

Brings The Moon, Distant Stars, Planets, Comets, Meteors, Even The Milky Way Into Full Close-Up View

Starting midnight tonight the Aerospace & Nautical Depot will open its warehouse doors to the public and accept orders for DEEP SPACE 100-BILLION MILES TELESCOPES. Each of these precision-engineered EXTRA LONG-RANGE TELESCOPES is equipped with 3 individual lens systems — telephoto, wide-angle and deep space probe — for clear, close-up view-range of up to 100 billion miles. Now bring the surface of the Moon, Mars, Venus, etc. right into your living room. Track comets streaking across the heavens. Be absolutely spellbound in your ringside seat as asteroids collide in fiery explosions ... see meteors flame through the skies ... in the most spectacular nighttime "fireworks show" in the world!

Machine tooled with high-impact housing and reflective lenses ... they are designed to penetrate some of the remotest sights in the universe, thousands of light years away — as giant stars and distant galaxies, such as the Milky Way are drawn into full, close-up view. It's the greatest show on earth, now being made available to the public on this once-a-year Depot Overstock Release, at the most affordable price ever!

And if you act within the next 30 days the Aerospace & Nautical Depot will also include FREE a professional astronomical tripod. But this is a one-time-only special Depot release ... once last remaining telescopes are gone ... this announcement to the public may not be repeated, so order today!

TECHNICAL SPECIFICATIONS

- **Tripod mounted**
- **3 interchangeable eyepieces — 20X, 30X, 40X for wide-angle, telephoto and deep probe viewing**
- **Full rotary focusing controls for both primary and secondary body cylinders**
- **45° astronomical field mirror**
- **Lens hoods**
- **Multi element optical system for sharp image quality**
- **Both exit pupil lenses and objective high-impact lenses engineered for maximum transmissions**
- **Total spectrum clarity for both night and day viewing**

priority order form

Aerospace & Nautical Depot
Lens & Scope Division, Dept. TL250
405 West Fairmont Drive, Tempe, AZ 85282

Please send me ____ (limit 3) 'TELESCOPE' at $29.95 each . . . $ _____

Shipping & handling: $3.00 per 'TELESCOPE' . . $ _____

FL residents add 6% sales tax . . . . . $ _____

Total . . . . . $ _____

Enclosed is my check or money order for . . . . . $ _____

Please charge to my: ☐ Visa ☐ M/C ☐ Discover

Credit Card # _____

Exp date: _____ Signature _____

Telephone (_____) _____

Print Name _____

Address _____

City _____ State _____ Zip _____

To avoid disappointment or future regret you must place your order immediately. There is a STRICT LIMIT OF NO MORE THAN 3 PER ORDER, no exceptions. Not affiliated with any government agency. The deadline expires September 30, 1999. Results vary depending upon weather and eyesight. FREE Technical support for Depot customers 1-941-302-6751.

Big Scope, Smaller Price: The Classic XT10 is Back!

Orion® SkyQuest™ XT10 Classic Dobsonian

Level 3

Just $549 for the critically acclaimed SkyQuest XT10? No way!

Way. The classic XT10 is available once again, and it's more affordable than ever. Now you can enjoy radical resolution for a radically low price. You'll see details in deep-sky objects you never thought possible, all with the smooth point-and-view simplicity that SkyQuests are famous for.

Our classic XT10 is loaded with outstanding features that competing models can't touch. Like a Pyrex primary mirror, for starters. It's a 10" (254mm-diameter) parabolic mirror made from low-expansion Pyrex glass for superior thermal stability, and center-marked for easier collimation. The aluminum mirror cell is a high-ventilation Orion design for efficient mirror cool-down. The 2" aluminum rack-and-pinion focuser is itself collimatable and accepts both 2" and 1.25" eyepieces. And only SkyQuest Dobs sport a navigation knob for easier slewing of the telescope.

The XT10 is a paragon of solid construction. The enameled steel tube (black) rides on a rock sturdy base equipped with a beefy carrying handle. The motion is fluid and easy on both axes, aided by our innovative Correctens on system, which ensures smooth manual tracking and critical tube balance. (We've seen a lot of very poorly executed, inferior imitations of this on the market, so beware!) Also standard with the XT10 are a big 9x50 finder scope, two Sirius Plössl eyepieces, eyepiece rack, hard dust cap, and quick-coll mat on cap.

If you're ready to go deep into space without going deep into your bank account, consider the classic SkyQuest XT10! One-year limited warranty.

#9810 **$549** [$35.50]*

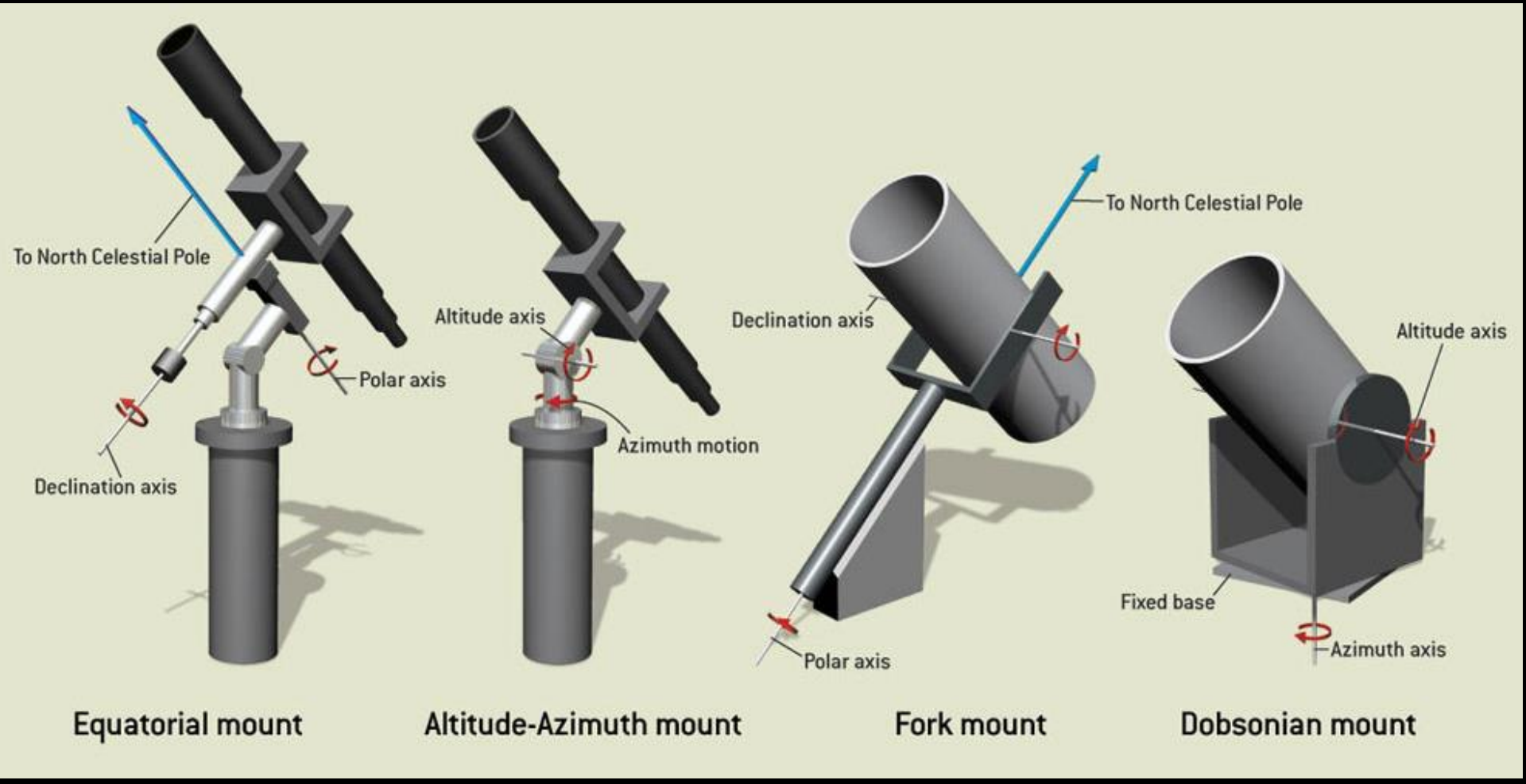
Superior Pyrex® optics! Compare to the competition.

Free! TheSky Astronomy Software $49.95 Value

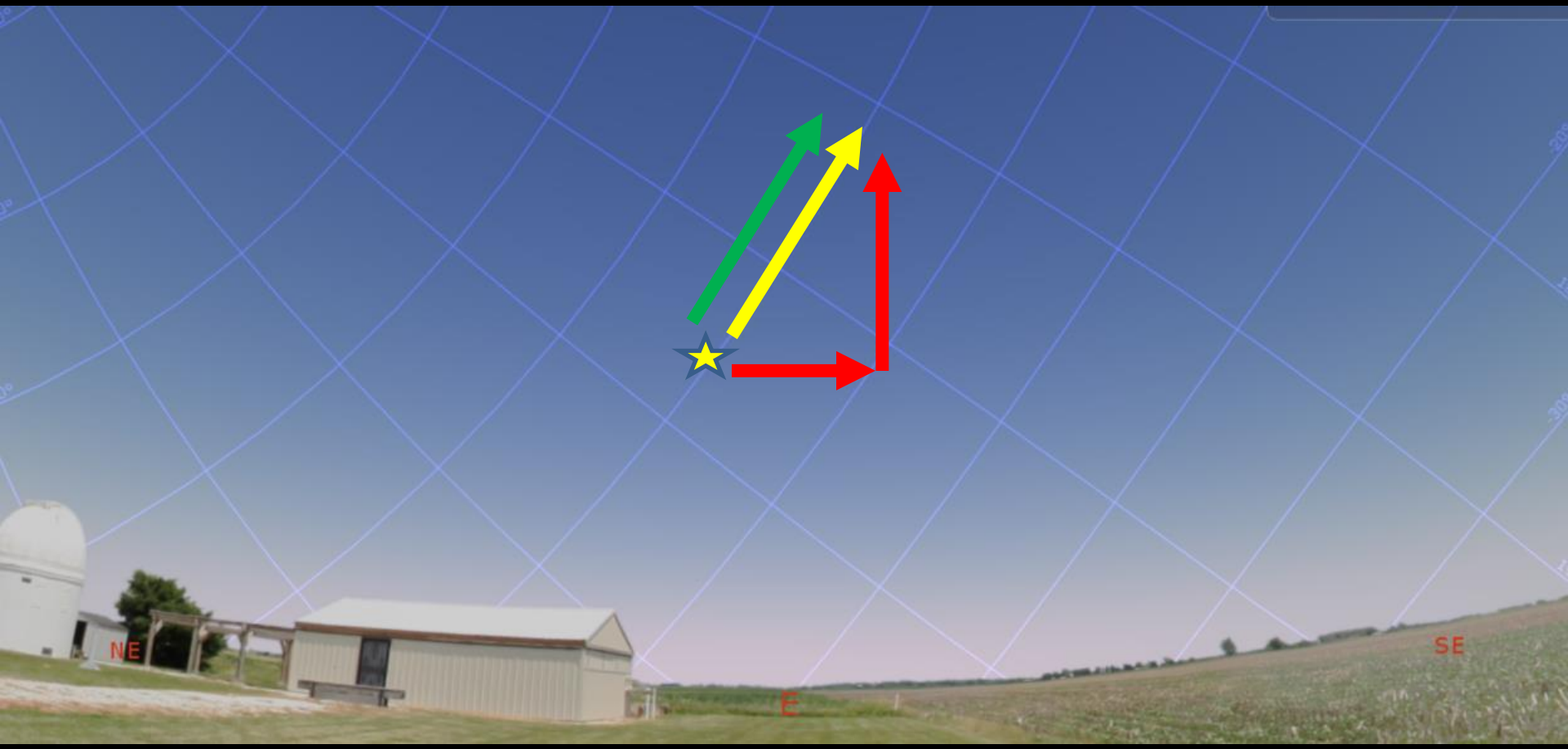
Specifications	SkyQuest XT10 Dobsonian
Primary mirror diameter	254mm
Light grasp	78.5 sq. in.
Focal length, f ratio	1200mm, f/4.7
Eyepieces/st	Sirius Plossl 25mm, 10mm
Magnification w/ incl. eyepieces	48x, 120x
Highest theoretical magnification	500x
Finder scope	9x50
Mount type	Dobsonian
Other included items/features	Collimation cap, eyepiece rack
Optional electronic drive	No
Weight, assembled	55.0 lbs

*Due to its product size, please add one amount to the standard shipping and handling charge listed on the order form.

Telescope mounts



Looking east



Alt-Azimuth Mount **Equitorial Mount**

So . . . .consider the following . . .

- Cost
- Interest level
- Experience (beginner?)
- Portability
- Purpose (deep sky? Planets? Photography?)
- Observing site

“What is an easy way to find your way around the sky?”

“Go-to” and “push-to”

“Go-to” and “push-to”

“Smart Telescopes?”

Thoughts . . .

- Start out with the lowest power (magnification) eyepiece
- Large focal length eyepieces = lower power
- Lower power = larger field-of-view
- Remember to focus!
- Are the optics aligned (“collimated”)?
- Collect as much light as your wallet will allow
- “Test drive” a telescope before you buy (if possible)
- Start in light-polluted skies and learn some bright stars
- Be careful cleaning optics as lenses/mirrors are coated
- Binoculars first?

Companies

- Celestron & Meade
- B & H Photo
- Orion Telescope & Binoculars (www.telescope.com)
- Adorama
- “Cloudy Nights” (used equipment)

CU Astronomical Society

- Began at the Champaign Park District in 1986
- Built an observatory southwest of town in 1992
- Currently 50+ members
- Outreach to the community (“Market at the Square,” public open houses, observing in the parks & preserves, dome open houses, etc)

Test Drive? Star Parties


ROCKY MOUNTAIN STAR STARE
RMSS
http://www.rmss.org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