Observing the Night Sky with Binoculars

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Rotary Club

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Black Canyon Astronomical Society (BCAS)

Topics

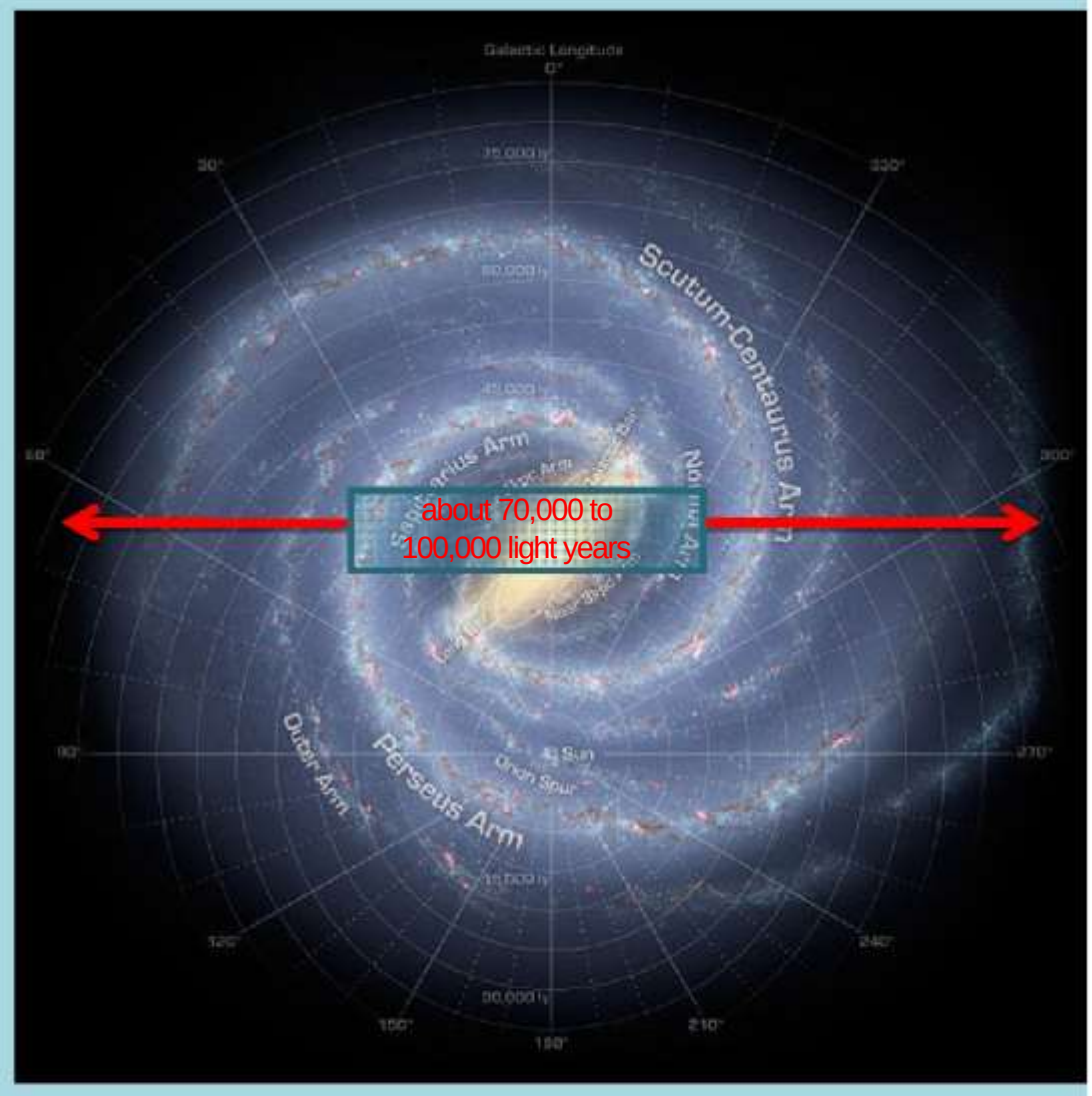
- Constellations
- Binoculars
- Objects to observe in the summer sky

What can we see in the night sky?

With the naked eye, we can see more than 2,000 stars, as well as 5 planets, the Moon, comets, meteors, the Milky Way, and a few other special objects.

With one faint exception, EVERYTHING you see with the naked eye is in our galaxy, the Milky Way.

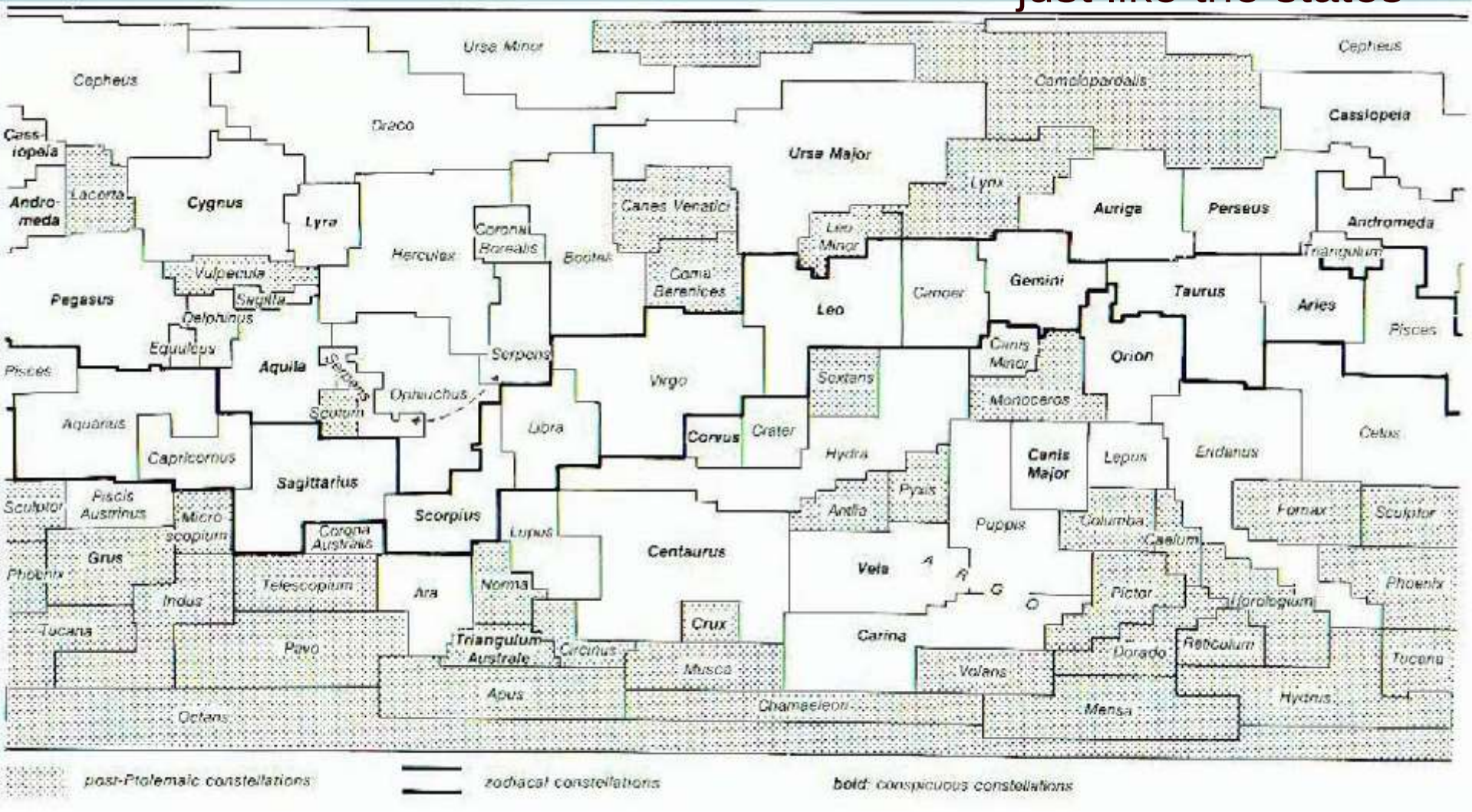
All the stars we see in the constellations are in the Milky Way.



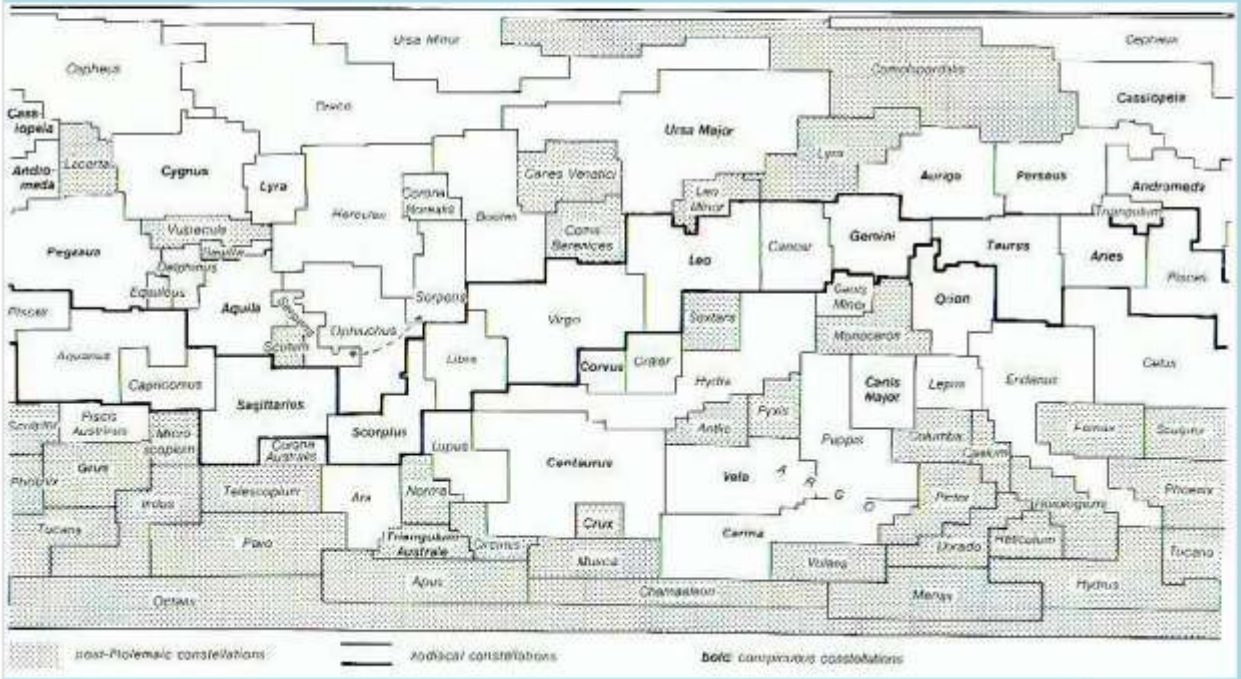
The Constellations - Map of the Sky

A constellation is a region of the sky, NOT just the stars

Constellation regions are irregular in shape, just like the states



The Constellations - Map of the Sky



- 88 official constellations cover the night sky completely.
- No gaps, similar to a map of the US.

- Each city is in only one state, except for Washington D.C.
- Each star is in only one constellation, except for the Sun.

Observing equipment

- Naked eye
  - CHEAP!
  - Limited objects
- Telescopes
  - Many styles
  - WIDE range of costs
  - Accessories, e.g. eyepieces and filters add cost and complexity
- Binoculars
  - Happy medium
  - Minimal extra requirements

Binoculars - bigger and bigger

Binocular observing

- Smaller size can be hand-held
- For large binoculars or long-term observing, a tripod is essential

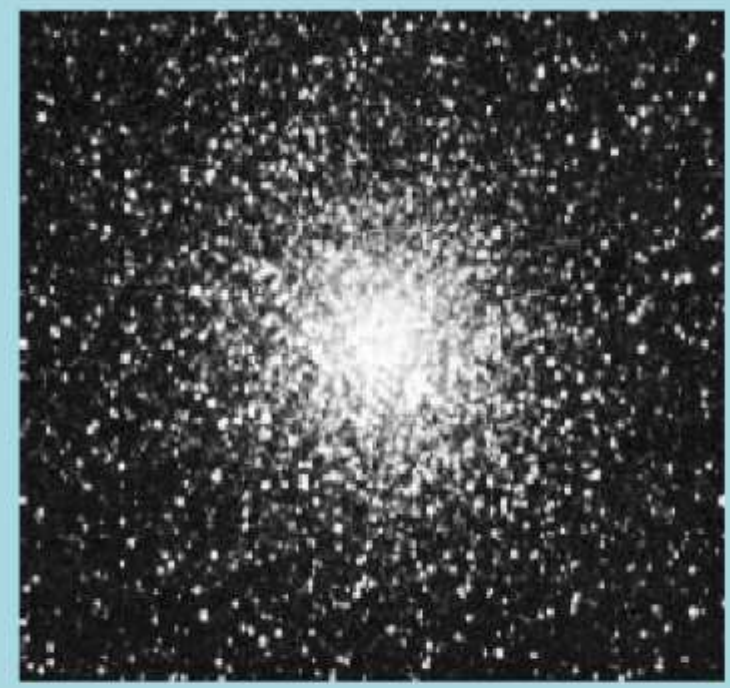
- Parallelogram mount

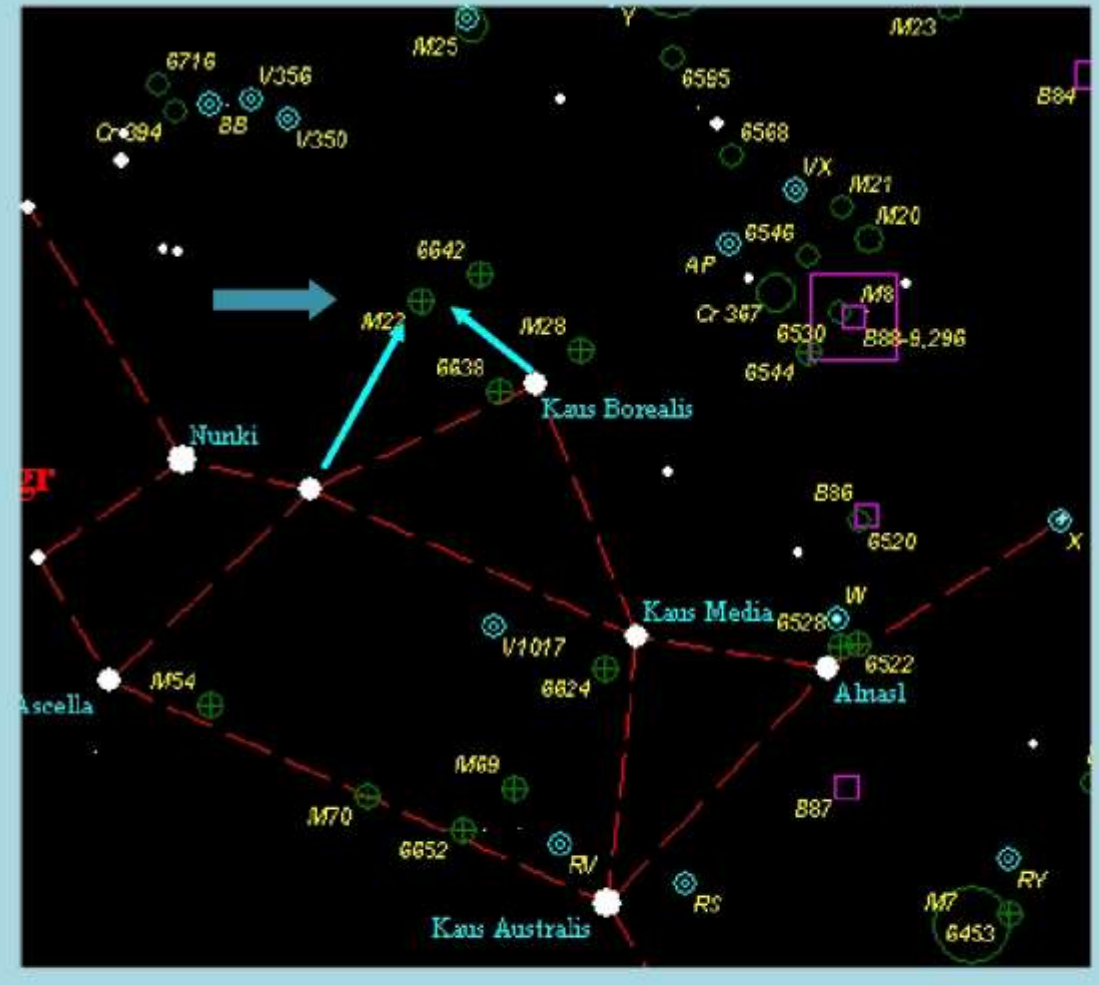
Fancier options

Some objects to observe in summer

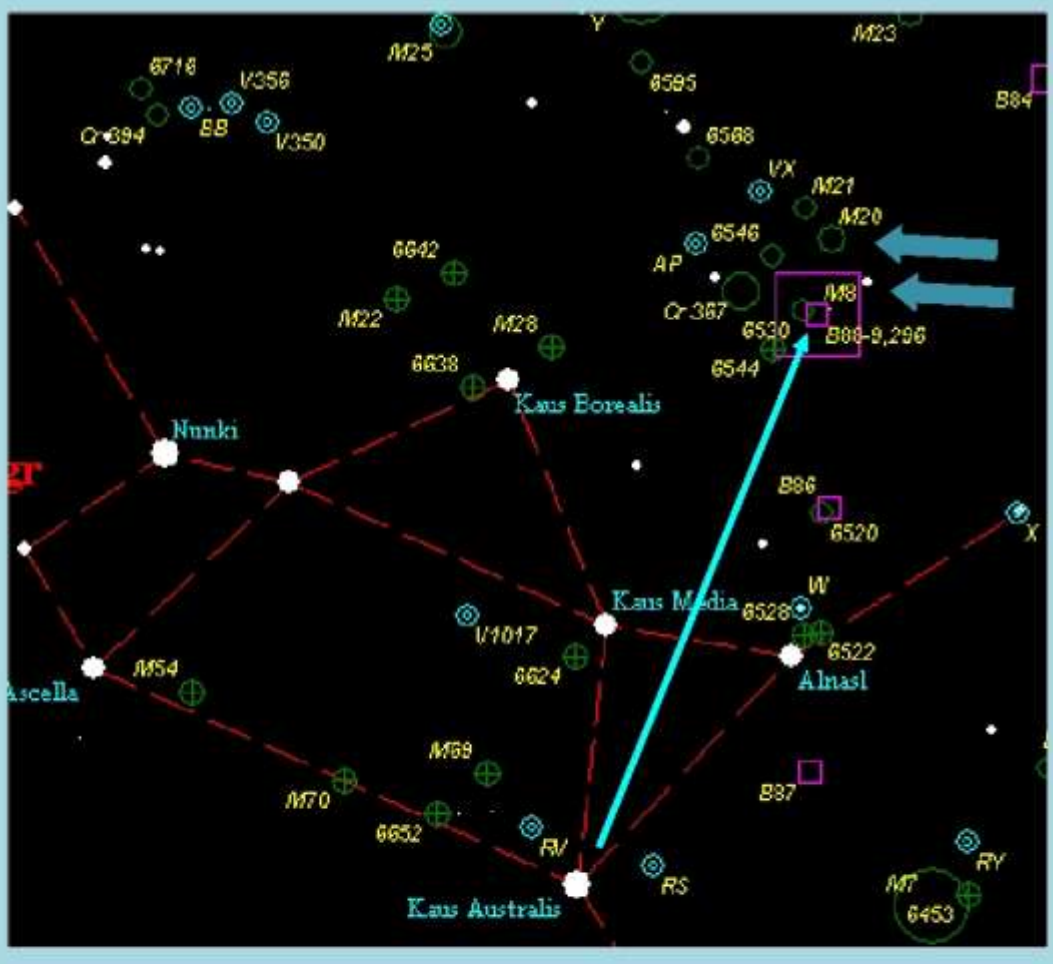
Messier 22 in Sagittarius

- Globular cluster





Messier 8 and Messier 20 - Lagoon and Trifid Nebulas in Sagittarius



- Star-forming region

Messier 24 - Small Sagittarius Star Cloud

- 600 light years distant

Antares in Scorpius

- Red giant - larger than the ORBIT of Mars
- Antares - The Heart of Scorpius

Messier 7 in Scorpio

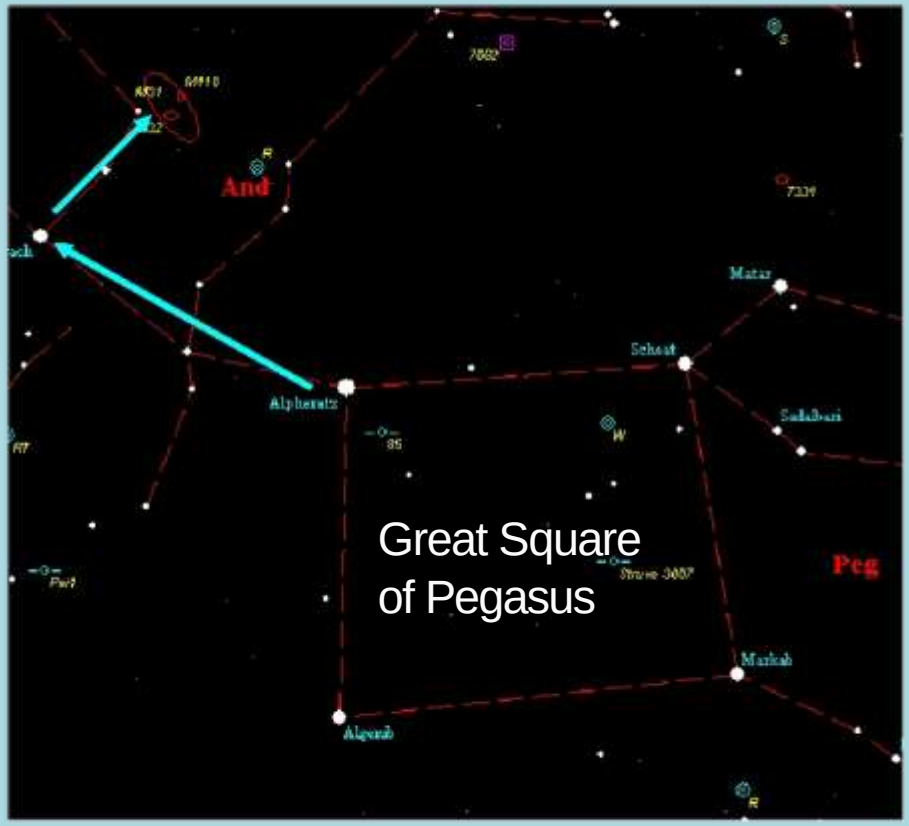
- Open star cluster
- A GREAT binocular object

The Coathanger in Vulpecula

- "Star cluster" - but only visually
- First observed in 964 A.D.

Messier 31 - Andromeda Galaxy

- Nearest galaxy to us
- 2.5 million light years away



Perseus Double Cluster

- True open star clusters
- Late night now, but wait a month

Summer observing
Sagittarius and Scorpius

If all else fails

Light Pollution

- Light Pollution is the introduction of artificial light, either directly or indirectly, into the natural environment.
- Light pollution exists in two forms:
  - Sky glow (also known as artificial sky glow, light domes, or fugitive light) is the brightening of the night sky from human-caused light scattered in the atmosphere.
  - Glare is the direct shining of light.
- Both of these forms can impact human perception of the night sky, natural landscape, and other faint features of the night.
- Light pollution tends to be most acute in urban environments, where glare can result in light trespass, have pronounced ecological effects, and potentially influence human circadian rhythms.

Light Pollution is more than just a big city problem

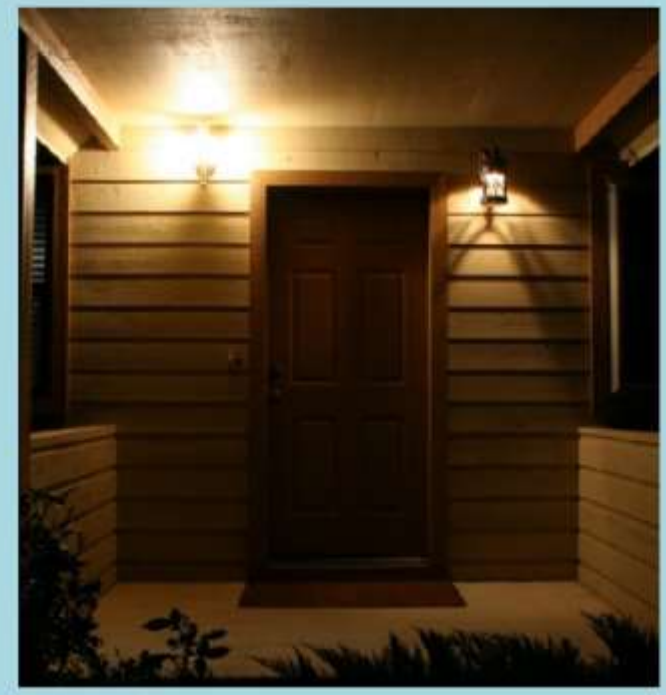
- Outdoor lighting is deemed necessary for a productive modern society, nonetheless the widespread use of artificial light has substantially altered the natural pattern of darkness.
- The brightening of the night sky is not limited to urban environments as the glow from cities has been documented by the NPS at distances over 200 miles from national parks.

Light Pollution is more than just the astronomer's problem

- Natural darkness is important for wildlife. Nearly half the species on Earth are.
- Certain migrating birds fly at night with reference to the stars and can be disoriented by lights from cities and towers.
- Sea turtle hatchlings orient toward the brightest light on the beach.
- Changes to cave environments can have a similarly disruptive effect.
- Research shows numerous connections between light pollution and species disruption.

Light Pollution is more than just an environmental problem

- ENERGY
  - 30% of all energy for outside lighting is wasted.
  - $2.2 billion for the US alone
  - Equivalent of 13 million barrels of oil
- SAFETY
  - Bright light does not increase safety.
  - Too much lighting can threaten security by compromising vision with glare and casting harsh shadows where criminals can hide. The key to being safe is having uniform lighting that allows the eye to adjust to naturally dark conditions for maximum visibility.



Best Practices

- The National Park Service recommends a six-step process for evaluating outdoor lighting in parks and protected areas. This approach can also be used in communities and urban areas.
  - Light only WHERE you need it
  - Light only WHEN you need it
  - SHIELD lights and direct them downward
  - Select lamps with WARMER COLORS
  - Use the MINIMUM AMOUNT of light necessary
  - Select the most ENERGY EFFICIENT lamp and fixture, but note that not all energy efficient lighting is night sky friendly lighting.
- For more, see www.darksky.org

Resources for Binocular viewing

- www.cloudynights.com/category.php?category_id=182
- Touring the Universe through Binoculars Atlas
  - www.philharrington.net/tuba.htm
  - Free software with emphasis on binocular objects
- www.lightandmatter.com/binosky/binosky.html
- www.uvaa.org/BinocularObjects.doc

…and Beyond

- Terence Dickinson's books
- Sky and Telescope magazine - Montrose Library: hardcopy and online References
- Astronomy magazine
- Attend a astronomy club outreach session

Additional resources - Internet

GENERAL

- http://www.lpi.usra.edu/ - Lunar & Planetary Science Institute
- http://cleardarksky.com/csk - Predicts sky conditions for various locations
- http://ned.ipac.caltech.edu/ - Database of objects, maintained by CalTech
- http://spaceweather.com - All kinds of information on space
- http://www.europa.com/~telscope/binotele.htm - Information on binoculars and telescopes
- http://www.saguaroastro.org/content/BEST-MULTIPLE-STARS.htm - Multiple stars of interest
- http://messier.seds.org/ - Messier object database
- http://meteorshowersonline.com/index.html - Meteors
- http://www.womanastronomer.com/ - Women in astronomy, past and present
- www.skyguide.org.uk/index.htm

Additional resources - Internet

GOVERNMENTAL

- http://www.nasa.gov - Main NASA site
- http://apod.nasa.gov/apod/ - Astronomy Picture Of the Day
- http://science.nasa.gov/ - NASA Science site
- http://science.nasa.gov/science-news/ - NASA News
- http://www.nasa.gov/mission_pages/sdo/main/index.html - NASA Solar Dynamics Observatory
- http://stereo.gsfc.nasa.gov/ - NASA STEREO Solar mission
- http://www.esa.int/esaCP/index.html - European Space Agency home
- http://www.eso.org/public/ - European Southern Observatory home
- http://www.usno.navy.mil/USNO/astronomical-applications/data-services/rs-one-year-us/ - Moonrise and sunrise calculator
- http://www.stsci.edu/portal/ - Hubble Space telescope site