

Collins School Star Party - Oct. 5, 1999

Presented by the North Shore Amateur Astronomy Club (NSAAC)

For more information: NSAAC: <http://www.star.net/people/~nsaac>

1.0 Using a telescope

Close one eye (use your hand if it's easier) and look straight down into the eyepiece. The most sensitive spot of your eye is slightly off center (Why? _____) - using what astronomer's call 'averted vision' you will see more (but it takes practice), particularly when looking at dim objects.

Do not lean on or bump the telescope. The objects you will view tonight will be magnified from 50 to about 250 times. Why do we not magnify things more? _____

2.0 Observing - stars

With stars, the color of their surface (called the photosphere) is directly related to their temperature. This in turn can help scientist determine the mass of a star. What color are the coolest stars? _____ The hottest? _____. The human eye is most sensitive in the yellow-green area, which is close to the 'yellow' color of our sun. If we had evolved on a planet around a massive star, what 'color' would our eye's see best? _____.

Stars spend 95% of their lives converting hydrogen to helium via nuclear fusion deep in their cores (why not at the surface? _____), which releases energy. Massive stars use up their fuel much faster - in some cases less than 100 million years. Small red dwarfs, on the other hand, are believed to be able to last for 100's of billions of years.

Based on how evolution most likely took place on Earth, why is it unlikely that life would exist around massive stars? _____ How old is our sun, and when will it run out of hydrogen? _____.

The eventual fate of a star is determined by its mass. Our own sun, when it enters the helium burning phase, near the end of its life, will become a red giant, with a size larger than Venus' orbit. After running out of helium, the solar atmosphere will drift away into space and form a planetary nebula, like the Ring Nebula in Lyra (M57). A small white dwarf star will be left behind. Larger stars end their life more spectacularly, with an explosion called a super nova.

3.0 Observing - clusters and galaxies

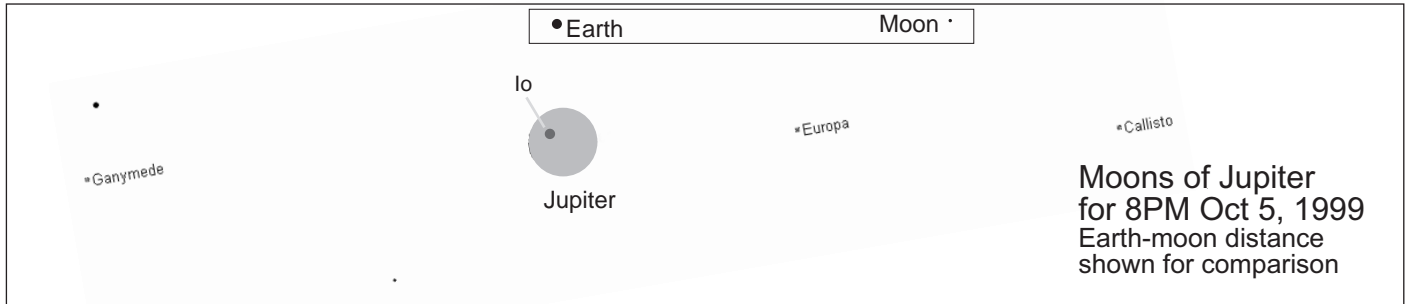
Open clusters are formed when a large cloud of galactic gas (up to dozens of light years across) condenses to form dozens or hundreds of stars at once. Open clusters orbit the galactic center in the same plane as the other stars and eventually drift apart. The ones you may see tonight range from several hundred light years away to almost ten thousand (double cluster in Perseus). Globular clusters are larger groupings (tens of thousands to a million) of stars that formed outside of the galaxy and 'orbit' around the center of the galaxy. The ones you may see tonight range from 20,000 to 60,000 light years away.

Galaxies are large groupings of stars containing millions to hundreds of billions of stars. Our own Milky Way galaxy is somewhat flat with a spiral shape and a bulge in the middle. The Milky Way is about 75,000 light years in diameter and averages 3000 light years in thickness (outside the center bulge). The Andromeda Galaxy (M31) is very similar to our own and is the most distant object that can be seen with the naked eye (a little over 2 million light years away). From the light polluted suburbs of Boston we can only see the central portion. Very large telescopes are needed to make out individual stars. In addition to spirals, galaxies have elliptical and irregular shapes, but detail is only visible in photographs.

4.0 Observing - planets

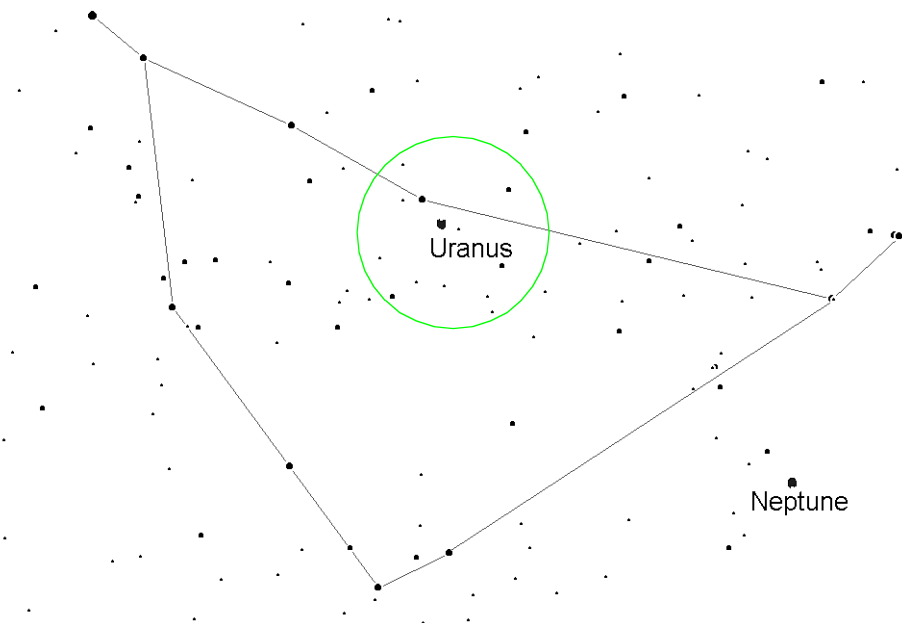
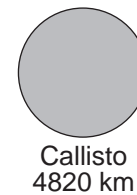
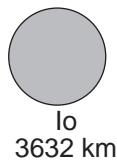
Jupiter and its moons. Use the chart below to identify the moons, how many can you see? (depending on the telescope, the image may be inverted, flipped, or both). Jupiter _____.

Look for the horizontal bands of clouds on Jupiter - how many different ones can you see? _____. What colors are they? _____. The colors of objects help scientists determine what something is made of. (more precisely: what something is NOT made of. Why? _____). Do any of the moons have a different color? Which ones? _____.



Relative moon sizes

Moons arranged left to right in order of increasing distance from planet.

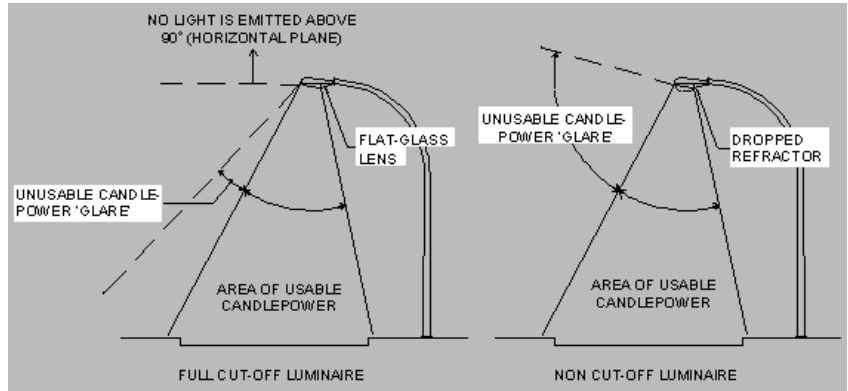


Mars is visible in the west right after sunset. It is near the constellation Sagittarius. Over the course of October you will see its position change relative to the stars of Sagittarius. Venus is currently visible in the morning, shining brightly in the east before dawn.

Uranus and Neptune are just about due south at dusk, in the constellation Capricornus. Uranus can be seen in binoculars, but a telescope is required to see it as more than a greenish point of light. With the chart at left and using the brightest stars as a guide, see if you can find Uranus with binoculars. The circle is 5 degrees wide and represents the view through typical binoculars.

TABLE 1. Planetary inf

Planet	Distance from sun (M km)	Orbital period (years)
Mercury	58	.24
Venus	108	.62
Earth	150	1
Mars	228	1.88
Jupiter	778	11.9
Saturn	1427	29.5
Uranus	2869	84
Neptune	4497	165
Pluto	5900	248



Full cut off vs. bad street lights

5.0 Light Pollution

Light pollution is a problem in just about all urban and suburban areas. Broadly defined, light pollution is unwanted or wasted light, and comes from street lights, businesses, and private residences. It's estimated that in the US alone over \$1 billion per year is wasted in this manner (and half of this amount is your tax dollars for street lights). Bad lighting presents a driving hazard (glare), more so for older drivers. Poorly designed outdoor lighting actually decreases security, and there is little data to suggest that excessive lighting makes anything safer - at best it only addresses our silly and ages old fear of the dark.

The night sky is one of the most magnificent natural wonders that can be shared by all of mankind - yet light pollution has needlessly ruined the view for most of the population.

In simple terms, any outdoor lighting fixture that you can see the bulb in is a badly designed (or installed) fixture. Try walking outside at night shining a flashlight directly in your face and you'll see why. Light that goes out sideways (or up!) represents wasted light (and wasted \$).

The solution is simple - use what are called full cut-off light fixtures. At home, use sensor lights that only come on when someone is present. The electricity saved more than makes up for the slightly higher price of the fixture, and this style of lighting has a higher 'security' value. For more information see <http://www.darksky.org>.

Many towns in both Massachusetts and across the country have enacted ordinances to reduce light pollution to save money and restore the night sky. A bill before the state would require state funded projects to use energy efficient non-polluting fixtures. For more information on that pending legislation, see <http://www.atmob.org/DarkSky/DarkSkyBill.html>.