

Whittier School Star Party

Presented by Amateur Telescope Makers of Boston (ATMoB) and the North Shore Amateur Astronomy Club (NSAAC) in conjunction with Project Astro - Nov 19th (rain date Nov 24th)

For more information:

ATMoB: <http://www.atmob.org>

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

Project Astro: <http://www.aspsky.org>

Project Astro is sponsored by the Astronomical Society of the Pacific with the support of the National Science Foundation and NASA. In the Boston area, project Astro is sponsored by the Museum of Science and the Smithsonian Astrophysical Observatory at Harvard University

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1.0 Observing - planets

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 astronomers call 'averted vision' you will see more (but it takes practice).

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

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? _____.

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? _____.

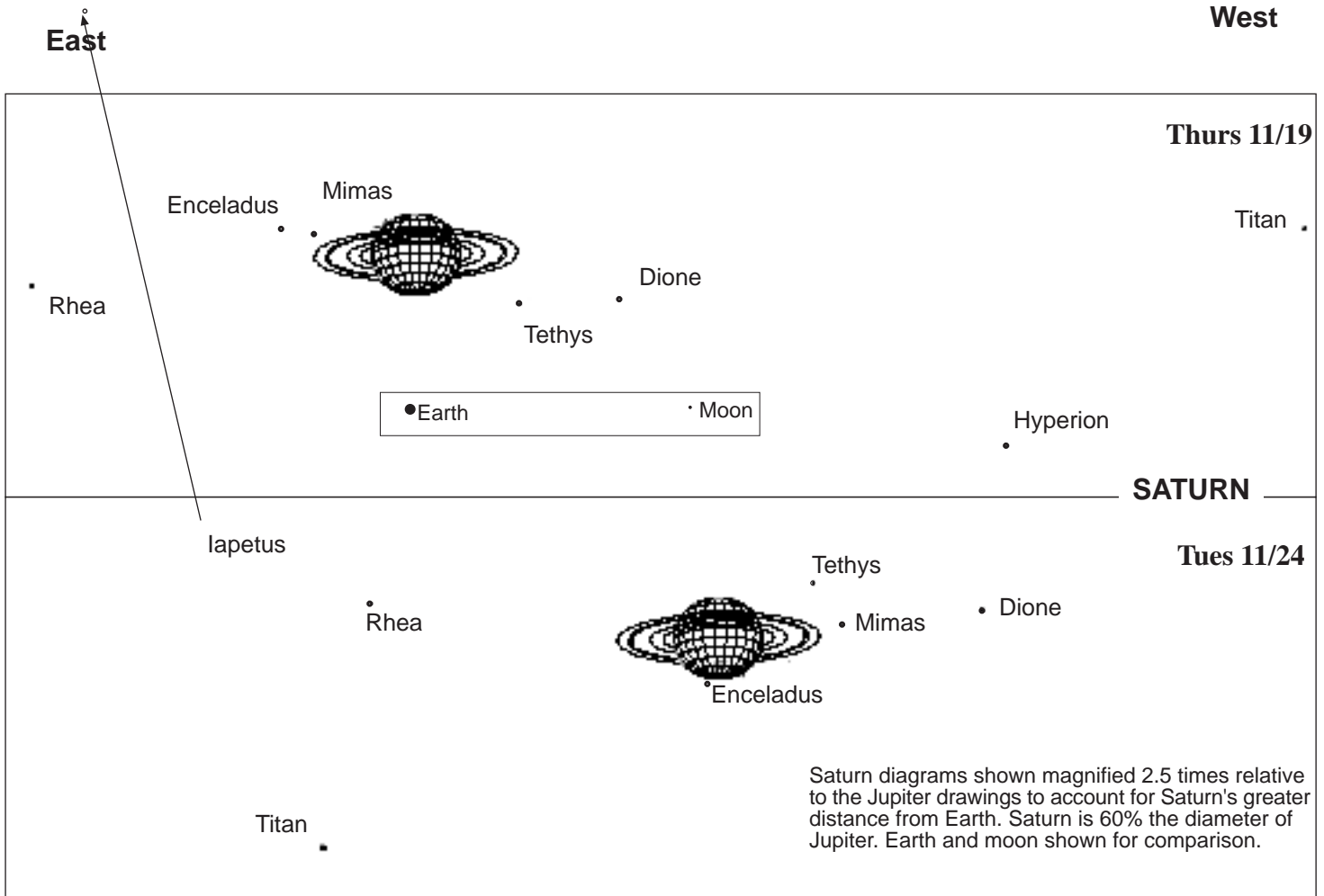
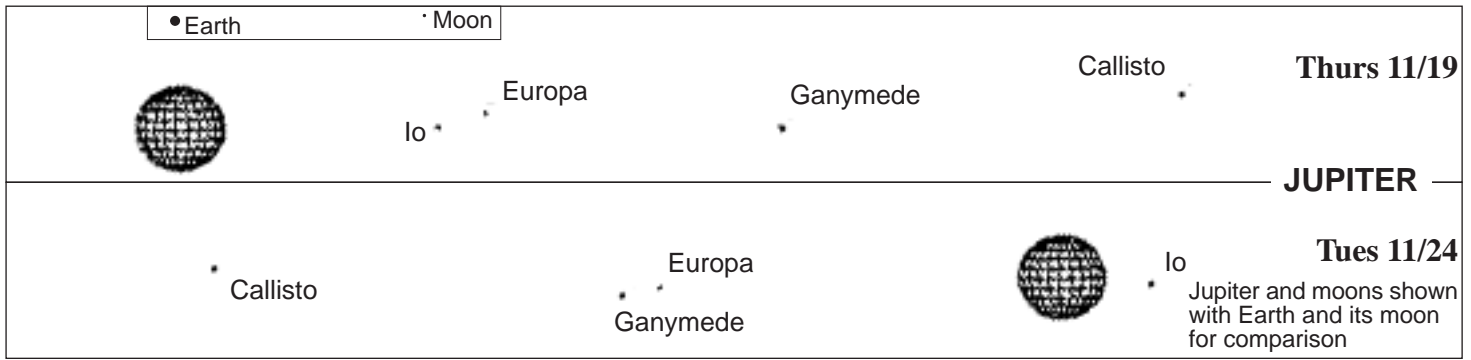
Stars spend 95% of their lives converting hydrogen to helium via nuclear fusion deep in their cores (why not at the surface? _____), which releases energy. Massive stars use up their fuel much faster - in some cases less than 100 million years. Small red dwarfs, on the other hand, are believed to be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

Based on how evolution 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? _____.

3.0 Observing - clusters and galaxies

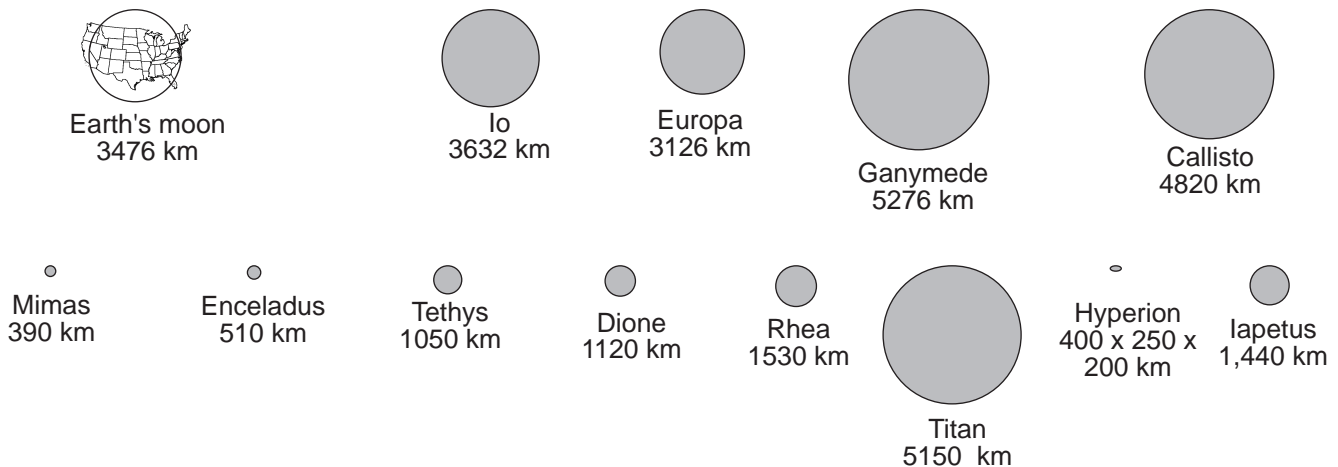
Open clusters are formed when a large cloud of galactic gas (up to dozens of light years across) condenses to form dozens or hundreds of stars at once. Open clusters orbit the galactic center in the same plane as the other stars and eventually drift apart. The ones you may see tonight range from several hundred light years away (Pleiades) 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.



Relative moon sizes

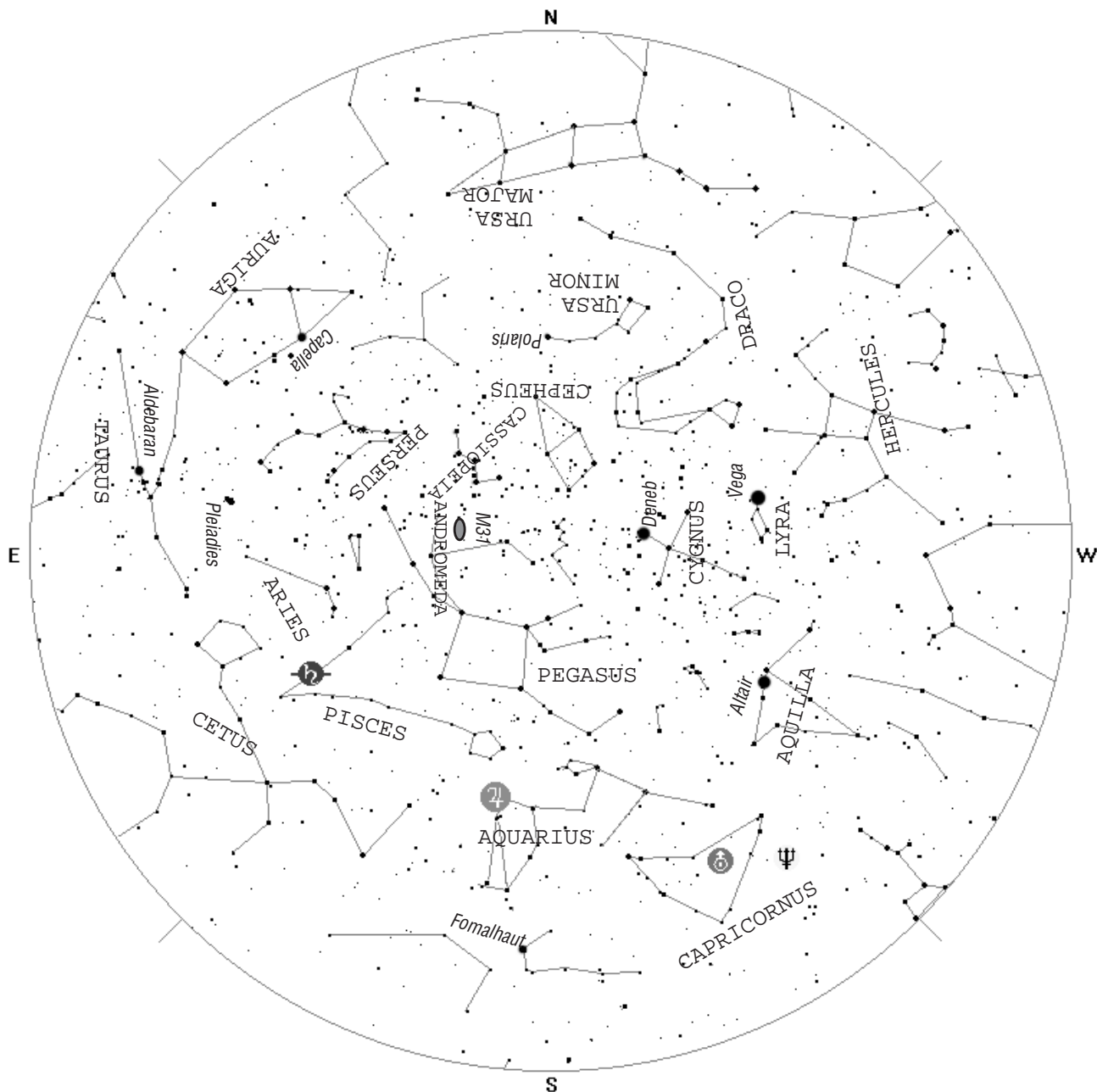
Moons arranged left to right in order of increasing distance from planet.



4.0 Star Chart

The star chart below is correct for 7PM on Nov 20th and 6PM for mid-December. Turn the map so that the edge marked with the direction you are facing is down. The stars on the horizon should look like those on the map. The center of the map is directly overhead. Try and identify the brighter stars (bigger dots on map) first. Note that the projection used to make this map makes the constellation size on the map look smaller for ones overhead versus those near the horizon.

The Milky Way is not shown but runs from horizon to horizon through Auriga, Perseus, Cassiopeia, and Aquila.



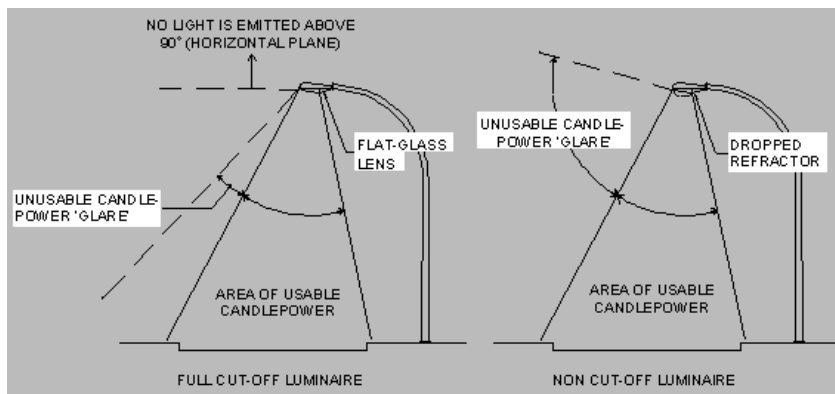
5.0 Solar System Model

Off to the side of the observing area a solar system model has been set up. Please do not touch any of the stakes as they are easy to knock over. The scale of the model is roughly correct ONLY for the spacing between planets, the scale is one centimeter = one million kilometers (1" = 1.6 million miles). At this scale the sun would be a sphere 1.4 cm in diameter - the size of a large marble. The earth would be a spec the size of a grain of sand. The model uses the same size balls for all planets, and a larger one for the sun. Note that the positioning is only approximate. Only planets visible to the naked eye are lit.

The model is oriented in the same general positions as found the night of the star party. To use the model stand near the Earth post and look towards the sun. This corresponds to noon with sun 'directly' overhead (actually, you would have to angle your head 45 degrees to correspond with our latitude). Turn 90 degrees counter clockwise - it is now 6PM. Turn another 90 degrees so the sun is directly behind you - it is now midnight. Turn another 90 degrees counter clockwise and it is 6AM. What planets are never visible at midnight? _____. Walk around the solar system and see what the view would be like from other planets.

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

6.0 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/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 therefore 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>.