

## Astro 102 – Lab #2

### Lab objectives

- 1) Learn how to use the Stellarium planetarium program by becoming familiar with the user interface and configuring the planetarium to your present location on Earth
- 2) Learn about the constellations in the Orion region of the sky
- 3) Learn about the stars in the Orion region of the sky
- 4) Plot stars on an H-R Diagram

### Setup

This lab will be performed in the Stellarium (version 0.16.1 or newer) planetarium program. You can access the Stellarium Planetarium program on specific computers at the following computer labs

- OC Bremerton: ST 122 Computers: 1-4 and 41-50
- OC Poulsbo: OCP 106 Computers: 11-13
- OC Shelton: OCS PA2 Computers: 1-2

or you can download a free copy at <http://www.stellarium.org/> (Windows, Mac OS and Linux versions of the program are available). Instructions for installing the program and system requirements can be found in the user's guide. If you encounter some problems, try downloading a different version of Stellarium by clicking on the "**older releases**" link. You can access the user's guide from the link on the Stellarium homepage.

### 1) Learning the user interface and setting up your home location

- Start up the Stellarium program.

To look around the sky, point the cursor to a location on the sky, left-click and hold down the button, then drag the cursor around. Use the mouse scroll wheel (or Page Up/Down) to zoom in and out.

At the bottom left of the screen, you can see the *Status Bar*. This shows the current observer location, field of view (FOV), graphics performance in frames per second (FPS) and the current simulation date and time. If you move the cursor over the *Status Bar*, it will reveal the *Main-Toolbar* which provides additional controls.

To advance time forward and backward, click on the arrow buttons on the toolbar. From left to right, the buttons will



buttons on the

- Decrease the rate at which time passes and move back in time (click **multiple times** to increase the speed)
- Make time pass as normal
- Return to the current time & date
- Increase the rate at which time passes (click **multiple times** to increase the speed)

When the mouse is moved to the left, lower half of the screen, the **Left-Toolbar** becomes visible.



Set Location:

Click on the compass icon on the **Left-Toolbar** to bring up the *Location pop-up window*. Type *Seattle* in the search window and then click on the Seattle option.

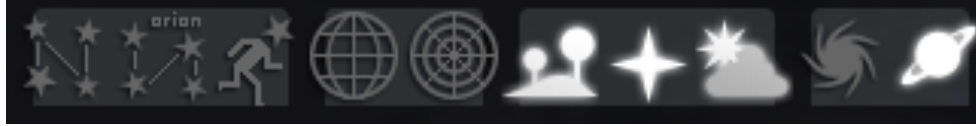
Click on the X to close the *Location pop-up window*.

The screenshot shows a 'Location' pop-up window with a close button (X) in the top right corner. On the left is a world map with a red arrow pointing to the Pacific Northwest of North America. On the right, a search bar contains the text 'seattle' and a magnifying glass icon. Below the search bar is a 'Reset Location List' button. The main area of the window displays 'Current location information' with the following fields:

Latitude:	N 47° 36' 22.35"	Name/City:	Seattle
Longitude:	W 122° 19' 55.45"	Country:	United States
Altitude:	56 m	Planet:	Earth

At the bottom, there is a 'Return to default location' button, a checkbox for 'Use current location as default' (which is unchecked), and a checked checkbox for 'Get location from Network'. To the right of these are 'Delete' and 'Add to list' buttons.

*Main-Toolbar* (move the mouse over the *Status Bar* on the bottom of the screen):



From left to right, the buttons will start the following actions:

- *Constellations* - Draws the constellation lines
- *Constellation Names* - Draws the name of the constellations
- *Constellation Art* - Superimposes artistic representations of the constellations over the stars
- *Equatorial Grid* - Draws grid lines for the **RA/Dec** coordinate system
- *Azimuth Grid* - Draws grid lines for the **Altitude/Azimuth** coordinate system
- *Ground* - Toggles drawing of the ground. Turn this **off** to see objects that are **below the horizon**
- *Cardinal Points* - Toggles marking of the **North, South, East** and **West** points on the horizon
- *Atmosphere* - Toggles atmospheric effects. Most notably makes the **stars visible in the daytime**
- *Nebulae & Galaxies* - Toggles on/off labels to mark the positions of Nebulas and Galaxies
- *Planet* - Toggles on/off indicators to mark the position of **planets**

Information about the other buttons can be found in the user's guide.

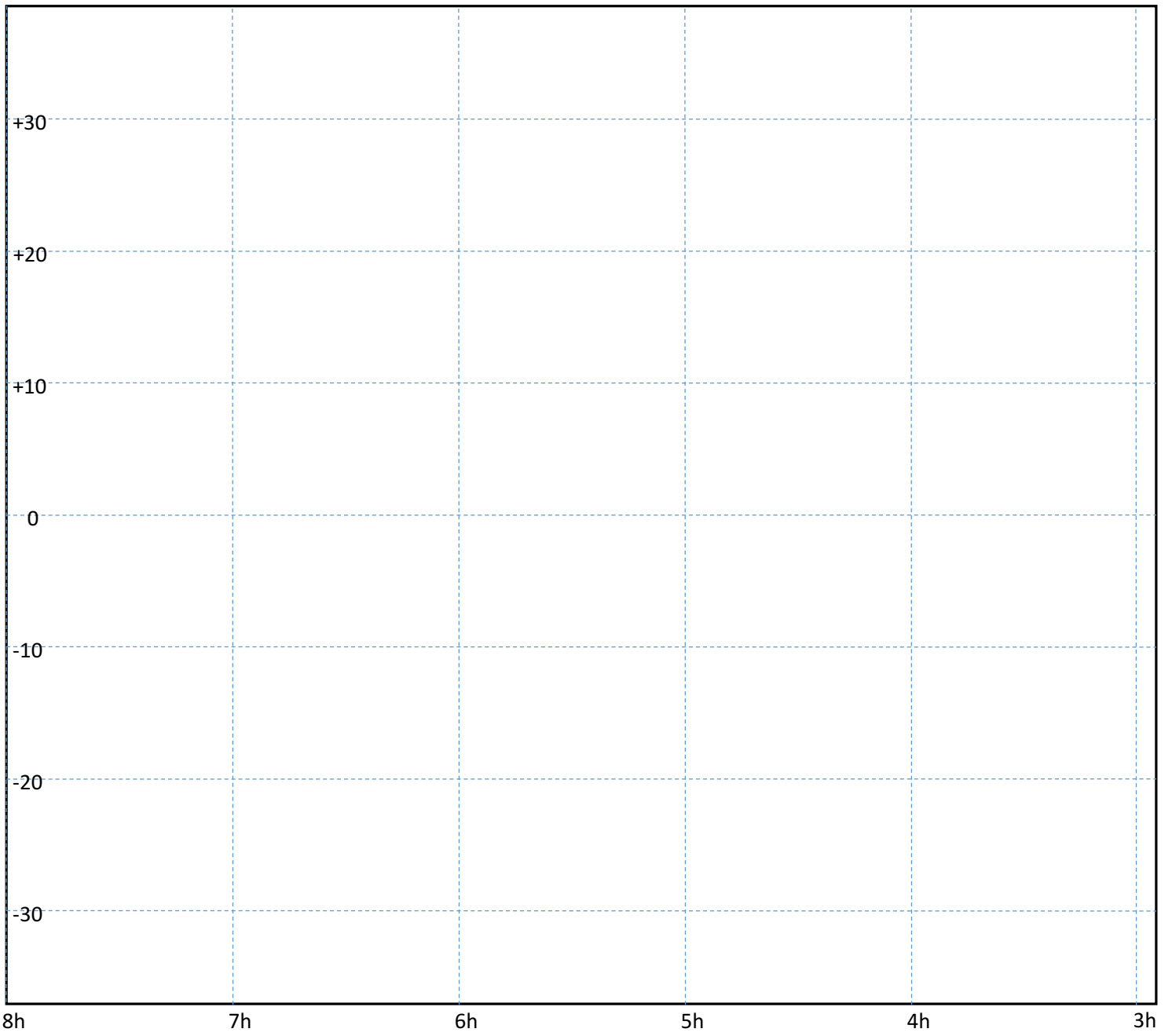
Click on each button to see what action they perform. Click again to toggle the option off.

## 2) Constellations in the Orion sky

2a) Advance time to around 21:00 by using the arrow buttons on the *Main-Toolbar*. Click on the *Constellations* Icon and *Constellation Names* Icon on the *Main-Toolbar* to see the constellations in the Orion region of the sky. Slowly adjust the time until you can see Orion located due South. In the large box on the next page, plot the stars and draw the connecting lines for the following constellations: Orion, Canis Major, Canis Minor, Taurus and Gemini. (Draw the constellations precisely) Click on the *Equatorial Grid* Icon on the *Main-Toolbar* to bring up grid lines to help align your drawings. (Note: you can project the sky using a 'Cylinder' projection to see rectangular grid lines. Click on the 'Sky and viewing options' Icon on the *Left-Toolbar*. Select the 'Markings' tab at the top of the *View popup window*. Then select the *Cylinder* option at the bottom of the new window.)

2b) Label the constellations names and label the main stars: Betelgeuse, Bellatrix, Rigel, Sirius, Procyon, Pollux, Castor and Aldebaran.

2c) Starting from the constellation of Orion, use the Orion *pointer stars* to draw dashed (- - -) lines to connect to the following stars: Sirius, Procyon, Castor and Aldebaran. (Reminder: pointer stars consist of 2 or more stars and the pointer stars will roughly align to the connecting star.)



### 3) Stars in the Orion sky

Stars can be classified by their surface temperature and brightness. The *spectral type* of a star can provide this information. Point the cursor directly on the star and left-click to bring up this information. Fill out the table with the spectral class and luminosity class of the stars. Read over the Spectral Classification and Luminosity Class sections in your textbook to learn about what these letters, numbers and Roman numerals mean. If you see 'm' at the end of the spectral type, it means the star has enhanced metal features. If you see 'var' at the end of the spectral type, it means the star has variable spectral features.

Star	Spectral Class	Luminosity Class
Sun	G2	V
Betelgeuse		
Bellatrix		
Rigel		
Sirius	A0	V
Procyon		
Pollux		
Castor		
Aldebaran		

### 4) H-R diagram

4a) Using the spectral class and luminosity class in the table, plot the stars in a H-R Diagram in the box. Label the star names. Look at Figure 17.18a in your textbook as a guide and draw in the main sequence line and the lines for luminosity class IV, III, Ib and Ia.

4b) Using the H-R Diagram, roughly estimate Aldebaran's brightness.

Aldebaran is about \_\_\_\_\_ brighter than the Sun.

4c) Using the H-R Diagram and Figure 17.18a, roughly estimate the surface temperature of Aldebaran.

About \_\_\_\_\_ K

