Astro 101 – Lab #1

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 how the position of the Sun changes over thousands of years.
3) Learn about the North Star and how it changes with time.
4) Learn about the motions of the Sun and the planets through the sky.

Setup

This lab will be performed in the Stellarium (version 0.10.2 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
- 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. Stellarium may not run properly on Windows Vista. 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 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

- 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)

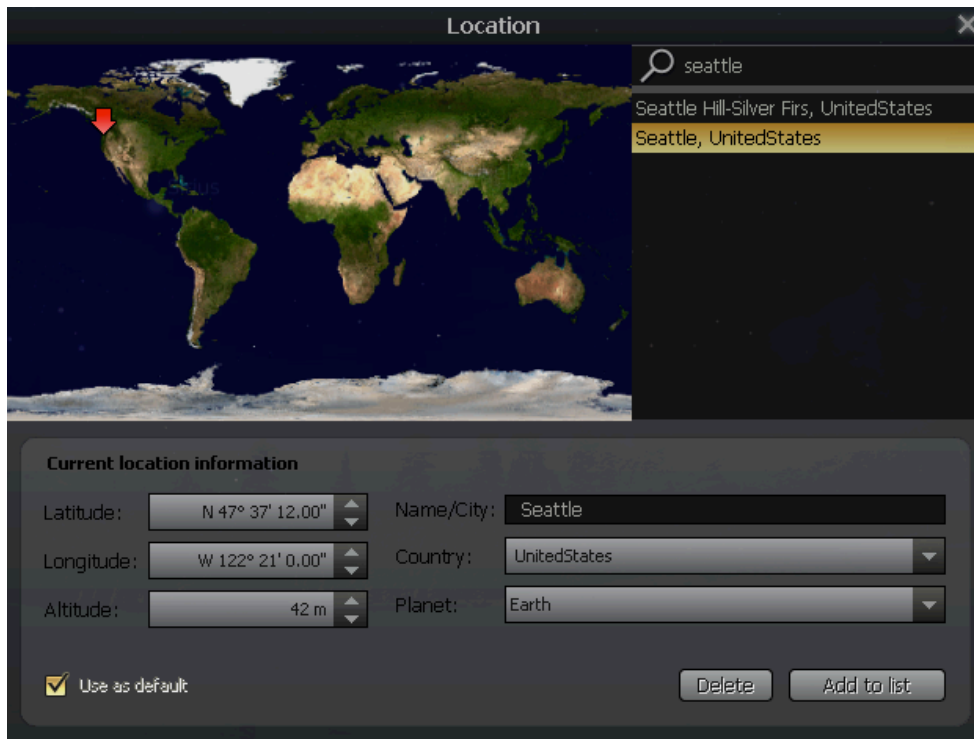When the mouse is moved to the left, lower half of the screen, the **Left**-*Toolbar* becomes visible.
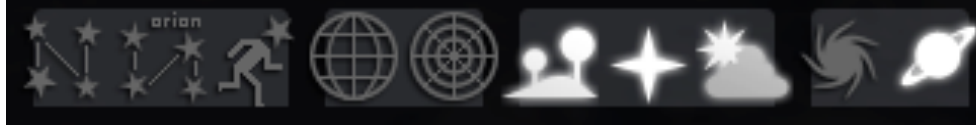
Set Location:

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 ✕ to close the *Location pop-up window*.

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:

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

1a) Change the date/time to 2017-04-15 at 20:45 by using the arrow buttons on the *Main-Toolbar.* Look around the sky and list all of the planets (not dwarf planets) that you can see at this time:
_____
(Hint: If you cannot see any planets, click on the *Planet icon* on the *Main-Toolbar* to toggle on the planet labels)

1b) *Zoom in* on the largest planet visible in the sky on 2017-04-05 at 20:45. Zoom in to see a 0.2° FOV (field of view).
List four of its moons: _____ _____ _____ _____

1c) Turn on the *Constellations* and the *Constellation Names* by clicking the buttons on the *Main-Toolbar*. *Zoom out* so that you have a 100° FOV (field of view). The planet in (1b) is found in the zodiac constellation _____.

1d) Advance time to observe the planet in (1c) moving across the sky until it sets in the West. The planet is found in the zodiac constellation _____.

2) Position of the Sun through time

Date and Time

1980 / 1 / 1   12 : 0 : 0

Click on the clock icon on the **left**-toolbar to bring up the *Date and Time popup window*.

The values for year, month, day, hour, minutes and seconds can be modified by typing in new values, by clicking the up and down arrows above and below the values, and by using the mouse wheel.

2a) Set the time back to your date of birth. Write down the month/day _____ /_____

2b) Locate the Sun (you may need to toggle off the *Ground* and toggle off the *Atmosphere* to see the Sun).

➤ In the box, draw **3** constellations (the constellation that the Sun is in and the **Zodiac** constellations that are in front of and behind the Sun constellation).

➤ Write down the names of the three constellations.

➤ Draw in the position of the Sun.

Draw the **3 Zodiac** constellation star patterns precisely

Do not draw more than 3 constellation star patterns

2c) Set the time back to Ancient Greece, around 500 BC (enter -500 in the **year** field in the *Date and Time pop-up window*). Keep the day and month the same. Locate the Sun and within the three constellations you drew above in (2b), draw in the new position of the Sun and write down the year.

2d) Set the time to 4500 AD. Keep the day and month the same. Locate the Sun and within the three constellations you drew above in (2b), draw in the new position of the Sun and write down the year.

2e) Explain why the position of the Sun changes over the course of thousands of years:

_____

_____

Set the time back to the present day by pressing the *current time & date* button on the *Main-Toolbar*.

3) The North Star

3a) Press the *Equatorial grid* button to draw the grid lines. Locate the position of the North Star and zoom in to a 20° FOV.   The point where the grid lines converge is called the _____ _____ _____. Roughly, about what **year** will Polaris be closest to the center position: _____ (Hint: advance time forward or backward, by using the *Date and Time popup window,* to find out). Why is Polaris used as our north star even though it is not located at the center position?

_____

_____

3b) Set the time back to 2850 BC (type in -2850 in the *Date and Time popup window*) during the Ancient Egyptian times. What was their North Star: _____ (the **previous** North Star)

3c) In the box, draw the position of the **previous** North Star (at the center of the box), the Big Dipper, the Little Dipper, and Polaris (you may need to zoom out to a 60° FOV to see both asterisms). Label the **previous** North Star and Polaris.

3d) Advance time by pressing the *advance time* button on the *Toolbar* to observe how the stars in both asterisms move over the course of one night. **Draw arrows** to indicate their direction of motion over one night.

Draw the asterisms precisely (pointer stars should line up)

4) Motion of the Sun

4a) Set the time to 12:00pm on June 1, 2010 by using the *Date and Time popup window*. Which constellation is the Sun in: _____

4b) On this day, the Sun will *rise* in the ***constellation*** _____ and *set* in the constellation _____ (you may need to toggle on the *Ground* to see sunrise and sunset)

4c) Roughly, about how long will it take the Sun to move into the next constellation: _____ days

4d) The Sun will move into the constellation: _____

4e) Why does the Sun appear to move from one constellation to another during the time you specified in **part 4c**? _____

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