Stellarium Activity #4 — Phases of Planets
in conjunction with “Motion of Planets” plots

Between each of the following exercises, you may wish to return to “now” (press “8”), to restore the proper speed of time (press “K”), or to reset other settings.

(6 pts.)

1A. Phase of Venus
• Turn off the atmosphere, ground, and fog. Choose “Equatorial” mode.
• Use the “find” button to find Venus, then press “space” to center & track on it. Zoom WAY in until you can see the planet’s face clearly.

Predict:
Look at the relative position of Earth, Sun, and Venus on your Motions of Planets plot. Predict what the phase of Venus should be from mid-August through mid-December 2011.

Observe:
Change the date to (approximate) August 15, 2011 (near the start of our semester). Sketch the phase of Venus here. Does it agree with your prediction?

Let time move forward to (approximately) October 15, 2011 (near the middle of our semester). Again, sketch the phase of Venus here. Does it agree with your prediction?

Let time move forward to (approximately) December 15, 2011 (near the end of our semester). Again, sketch the phase of Venus here. Does it agree with your prediction?

1B. Apparent Size of Venus
Finally, did Venus’s apparent size in Stellarium appear to grow or shrink from mid-August to mid-December 2011? Why do you think this happened? Explain: how does this relate to the relative positions of Earth and Venus on your Motions of Planets plot?
2A. Phase of Mars
• Turn off the atmosphere, ground, and fog. Choose “Equatorial” mode.
• Use the “find” button to find Mars, then press “space” to center & track on it. Zoom WAY in until you can see the planet’s face clearly.

Predict:
Look at the relative position of Earth, Sun, and Mars on your Motions of Planets plot. Predict what the phase of Mars should be from mid-August through mid-December 2011.

Observe:
Change the date to (approximately) August 15, 2011 (near the start of our semester). Sketch the phase of Mars here. Does it agree with your prediction?

Let time move forward to (approximately) October 15, 2011 (near the middle of our semester). Again, sketch the phase of Mars here. Does it agree with your prediction?

Let time move forward to (approximately) December 15, 2011 (near the end of our semester). Again, sketch the phase of Mars here. Does it agree with your prediction?

2B. Apparent Size of Mars
Finally, did Mars’s apparent size in Stellarium appear to grow or shrink from mid-August to mid-December 2011? (This may be a subtle effect to see… you may wish to extend a few months in either direction to see the August-through-December trend.) Why do you think this happened? Explain: how does this relate to the relative positions of Earth and Mars on your Motions of Planets plot?
(6 pts.)

3A. Phase of Jupiter

• Turn off the atmosphere, ground, and fog. Choose “Equatorial” mode.
• Use the “find” button to find Jupiter, then press “space” to center & track on it. Zoom WAY in until you can see the planet’s face clearly.

Predict:
Look at the relative position of Earth, Sun, and Jupiter on your Motions of Planets plot. **Predict** what the phase of Jupiter should be from mid-August through mid-December 2011.

Observe:
Change the date to (approximately) August 15, 2011 (near the start of our semester). Sketch the phase of Jupiter here. Does it agree with your prediction?

Let time move forward to (approximately) October 15, 2011 (near the middle of our semester). Again, sketch the phase of Jupiter here. Does it agree with your prediction?

Let time move forward to (approximately) December 15, 2011 (near the end of our semester). Again, sketch the phase of Jupiter here. Does it agree with your prediction?

3B. Apparent Size of Jupiter

Finally, did Jupiter’s **apparent size** in Stellarium appear to **grow** or **shrink** from mid-August to mid-December 2011? (This may be a subtle effect to see… you may wish to extend a few months in either direction to be able to see the January-through-May trend.) **Why** do you think this happened? **Explain:** how does this relate to the relative positions of Earth and Jupiter on your Motions of Planets plot?
4. Inferior vs. Superior Planets

Think about what you have just observed, and about the geometric arrangement of the Earth, the Sun, and each planet.

a. (2 pts.) What is the full range of phases that you would expect to observe for any inferior planet? (Inferior planet = a planet whose orbit is closer to the Sun than Earth’s orbit.) Describe how these phases should relate to the inferior planet’s distance from Earth. (I.e., which phase should the planet have when it is closest to Earth, and appears largest? Which phase should it have when it is farthest from Earth, and appears smallest?) Include sketches if you wish.

b. (2 pts.) What is the full range of phases that you would expect to observe for any superior planet? (Superior planet = a planet whose orbit is farther from the Sun than Earth’s orbit.) Describe how these phases should relate to the superior planet’s distance from Earth. (I.e., which phase should the planet have when it is closest to Earth, and appears largest? Which phase should it have when it is farthest from Earth, and appears smallest?) Include sketches if you wish.

c. (2 pts.) Make a prediction about the range of phases of a planet you have not yet looked at… say, Mercury, or Saturn. Then use Stellarium to “observe” the planet, let time vary forward/backward, and see if you are correct!

Prediction:

Observations: