

## Navigating the Night Sky – Student Guide

In this activity you will learn how to use and read star maps and planispheres so that you can find stars and constellations in the sky at night.

### Part I: Getting to know the star map - inside

Compare the two star maps:

What changes between the two maps?

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What remains constant?

Identify features of a star map:

How are the constellations labeled? \_\_\_\_\_

How are the stars labeled? \_\_\_\_\_

What do the symbols mean? \_\_\_\_\_

Why are the stars different sizes on the map?

Identify limitations of a star map:

Do the constellations near the horizon on the star map look like the constellations in the sky? If not, how do they look different? \_\_\_\_\_

How does the star map represent the apparent brightness (magnitude) of stars?

When does the star map most accurately represent the sky?

### Part II: Looking at the Star Wheel (or Planisphere) - inside

Build your Star Wheel (or begin with your Planisphere).

Write down some of the things that are different compared to star maps:

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\_\_\_\_\_

\_\_\_\_\_

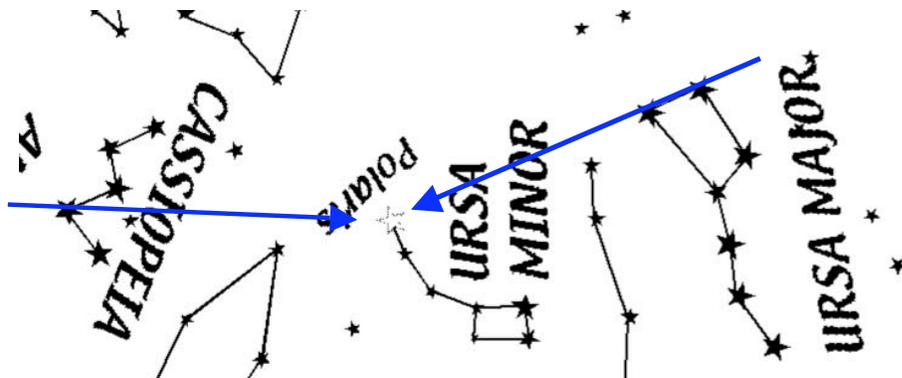
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### Part III: Using the Star Wheel (or Planisphere) - outside

#### First Challenge:

Find Polaris (North Star) in the sky using the surrounding constellations as guides. (The stars at the end of the bowl of the Big Dipper (Ursa Major) point towards Polaris.)



**Hints for finding Polaris in the sky:**

Polaris's apparent brightness is bright, but not blazing in the sky like Sirius or Venus, so it isn't the brightest star in the sky. But you can use the Big Dipper (Ursa Major) or Cassiopeia constellations to guide your eyes to Polaris.

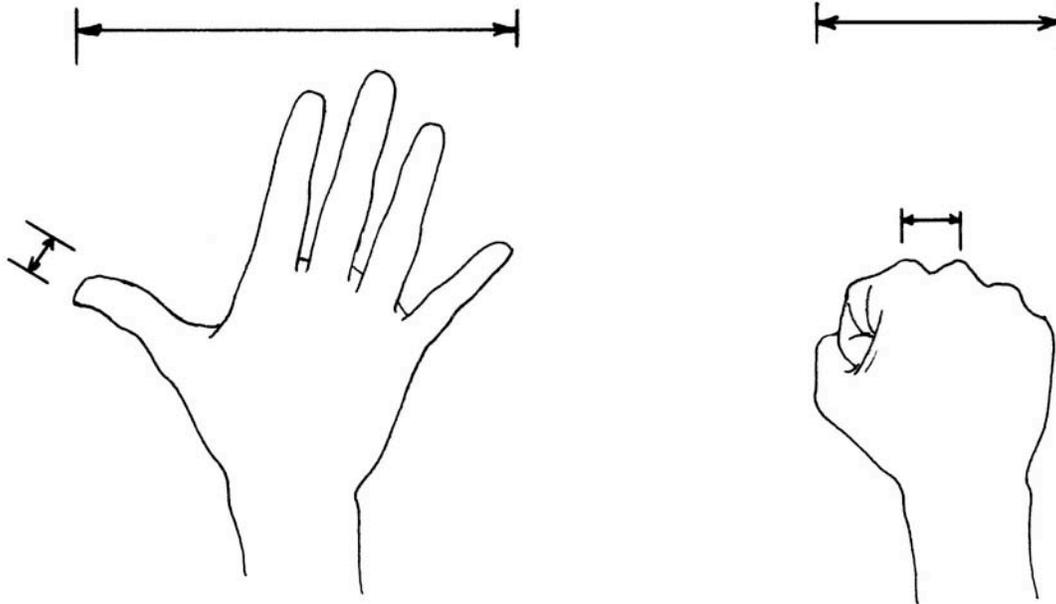
**Polaris: so what?**

Polaris is special because at this time, Earth's rotation axis points toward it (within one degree). As a result, Polaris doesn't appear to move at all. The other stars appear to do circles around Polaris, and the stars in Polaris's vicinity do not set for observers in northern latitudes.

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**Astronomy with your fingers:**

- Stretch your arm out.
- Spread your hand. From the pinky fingertip to the thumb tip is about 20 degrees in the sky.
- Each finger is about one degree.
- Make a fist – that's 10 degrees across, and the distance between adjacent knuckles is about 2 degrees.



Estimate the size of the bowl of the Big Dipper and Cassiopeia.

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**Second Challenge:**

Find these stars in the sky and on your Star Wheel for the season you are observing.

**Autumn: September 20:**

Arcturus, Antares, Vega, Altair, and Deneb

**Winter: December 21**

Altair, Deneb, Aldebaran, and Capella,

**Spring: March 20**

Aldebaran, Capella, Rigel, Betelgeuse, **Sirius**, Procyon, and Regulus

**Summer: June 21**

Regulus, Spica, Arcturus, Antares, and Vega

*Note: these stars are selected by the date about an hour past sunset. The stars are listed in order from east to west in the sky.*

**Part IV: Using the Star Wheels or Planispheres (20 minutes) – inside**

Complete the following activity using your Star Wheel:

1. When is each star highest above the horizon in the sky?
  - Note the direction of the star in the sky: over which horizon would you look for the star to be highest in the sky? (North, South, East, West...) \_\_\_\_\_
  - Other questions to consider: Is this the same for every star? Is there a trend to where the stars are at their highest on the Sky Wheel? ...on the night sky outside? (*The local meridian is the imaginary line that goes through the North Pole, the zenith, and the South Pole. Stars have their highest possible altitude the moment they rotate past the meridian. This is a star's transit.*)
  - Label the blank column "Transit."

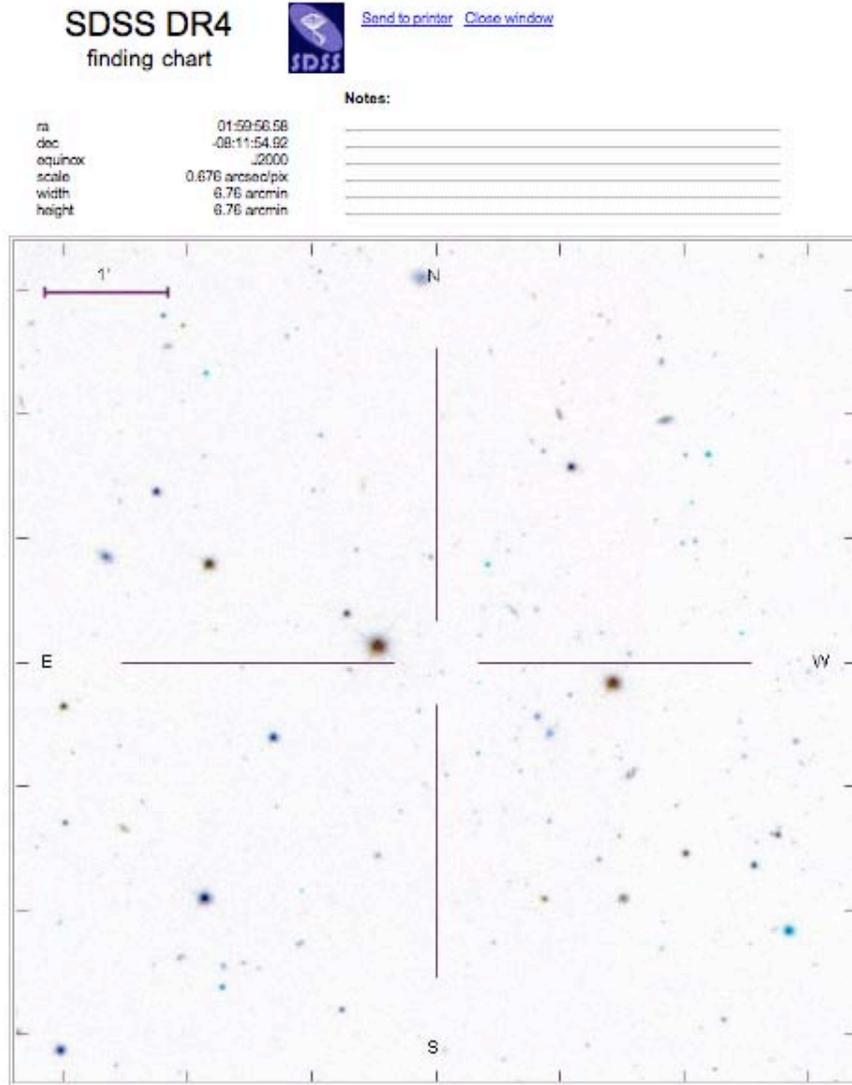
2. In the table below: For the current season, fill in the time of day when each star rises, transits, and sets. If the time cannot be determined because it is between 6 a.m. – 6 p.m. (daytime), write "N/A" (though you can figure it out if you think about it).

Star	Date	Rise		Set
<b>Autumn Bright Stars (Sep 22 – Dec 20)</b>				
Aldebaran				
Altair				
Rigel				
Sirius				
<b>Winter Bright Stars (Dec 21 – Mar 20)</b>				
Regulus				
Sirius				
Rigel				
Aldebaran				
Procyon				
<b>Spring Bright Stars (Mar 21 – Jun 20)</b>				
Arcturus				
Procyon				
Sirius				
Spica				
Regulus				
<b>Summer Bright Stars (Jun 21 – Sep 21)</b>				
Spica				
Altair				
Arcturus				
Antares				

Note: We have not taken Daylight Saving Time (commonly mispronounced "Savings") into account here. During Daylight Saving Time (mid March through early November), we would add one hour to the times on this table. While using the Star Wheels (or planispheres) outside, we would subtract one hour from our watch to set the wheel to be the most accurate representation of the stars we actually see (i.e. At 10 pm we would set the wheel to 9 pm).

**Part V: Flat star maps and narrow fields of view**

This is a real astronomical star chart from the Sloan Digital Sky Survey



Although you can see 180 degrees of sky when you stand outside, a telescope captures only a very small piece of the sky. Each degree has 60 minutes of arc. The scale in the upper left shows the size of 1' - one minute of arc (also called an arcminute).

- How big is the entire field that is shown? \_\_\_\_\_
- The bowl of the Big Dipper has about 55 square degrees. How many of these Sloan fields would you need to study the entire of the entire bowl? \_\_\_\_\_