How to Use a Planisphere

Introduction

A planisphere is a type of star chart that can be set to show the location of objects in the sky for any given date and time. It is small, portable and easy to use, providing a very convenient tool for identifying objects seen in the sky, or locating specific objects of interest. Planispheres are designed to be accurate for a specific **observer latitude**, but are useful over a range of latitudes. The planisphere in Figure 1 is designed to be used for latitudes from 30º to 40º North.
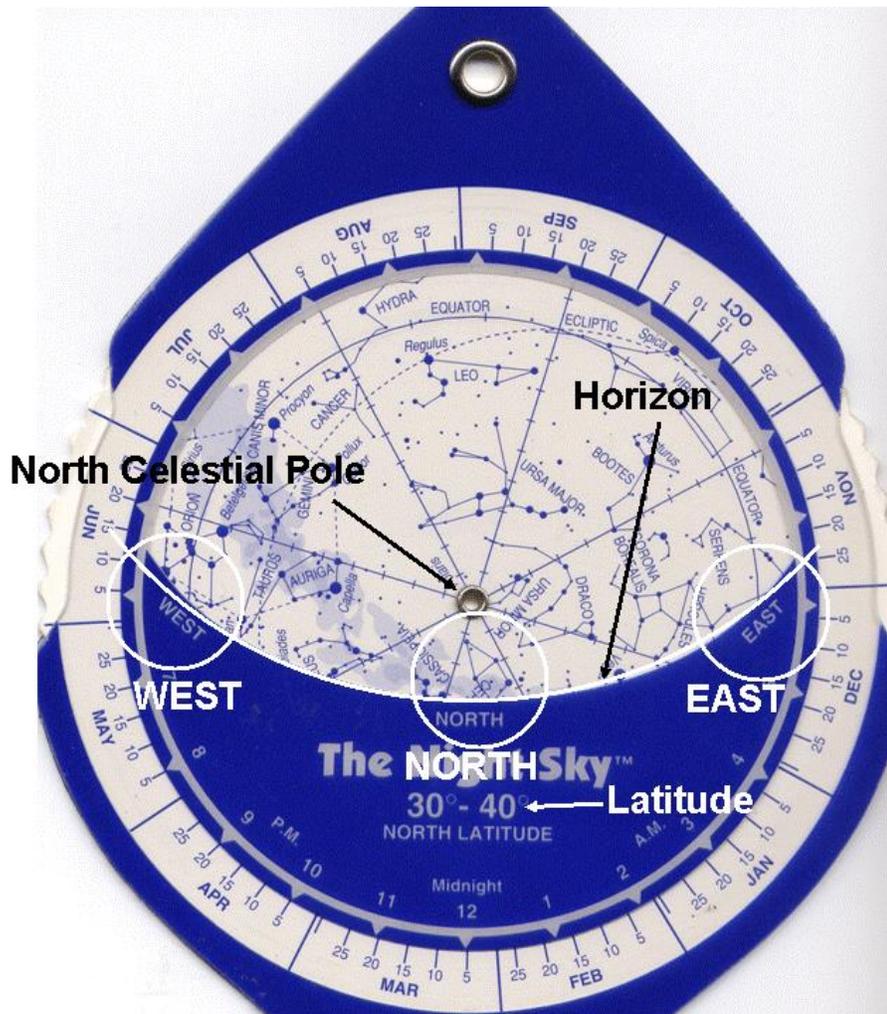

Figure 1

Basic Features

Figure 1 shows the front side of a planisphere. Bright stars, constellation outlines, and some deep sky objects are shown on the white "sky" portion of the planisphere. This "sky" can be rotated about the center of the planisphere, corresponding to the apparent rotation of the night sky about the **North Celestial Pole**. The star Polaris (the North

Star) is located in the sky very near the North Celestial Pole and can be found at the "center" of the planisphere. The solid curved portion of the planisphere which covers a portion of the bottom of the sky represents the **horizon** (where the earth meets the sky). On the front of the planisphere, the **center of the horizon** corresponds to the direction **North** (0⁰ azimuth). The right side of the horizon is the **eastern horizon** (90⁰ azimuth), and the left side is the **western horizon** (270⁰ azimuth). To use the planisphere, it must be oriented so that the planisphere horizon corresponding to the direction you are facing is at the bottom. For example, the planisphere in Figure 1 is correctly oriented for a person facing North.

Figure 2 indicates the location of several additional reference points and lines on the planisphere.
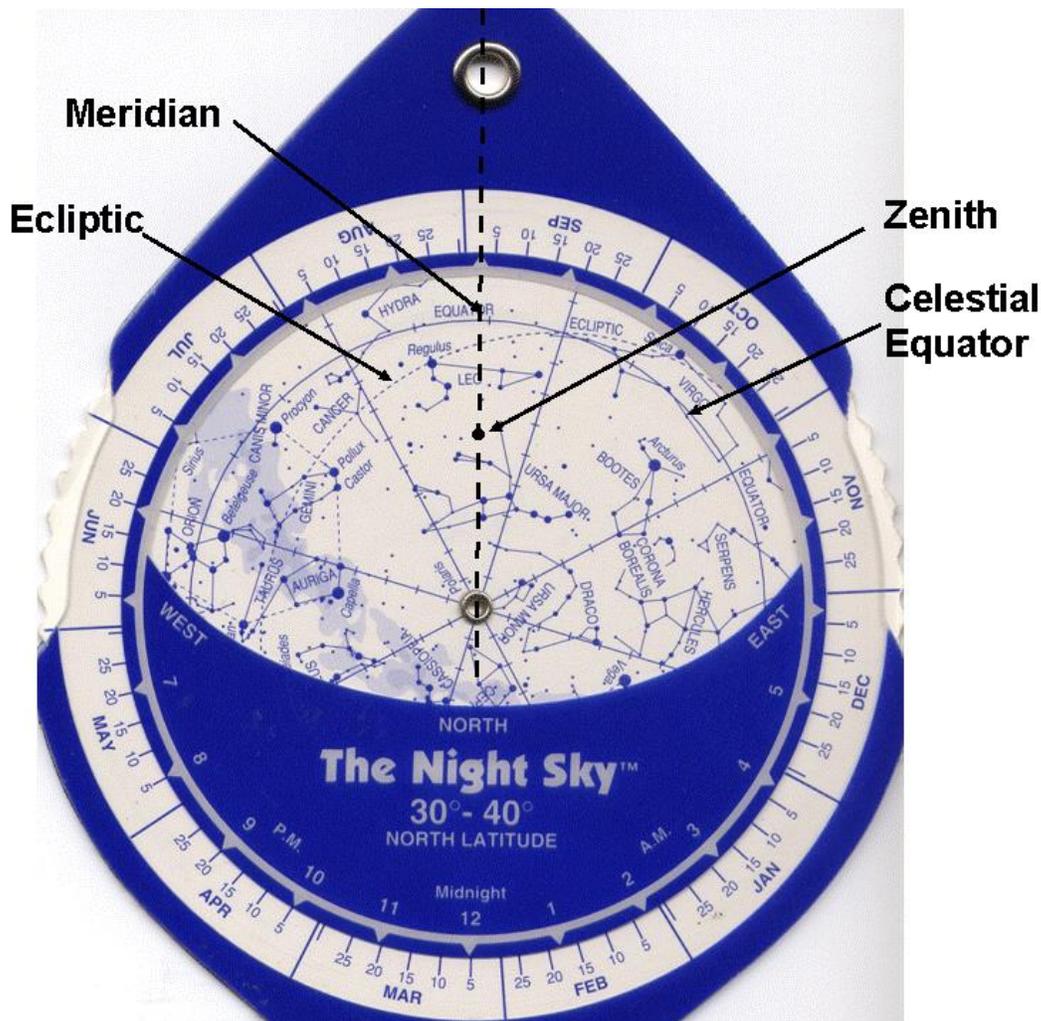

Figure 2

The **meridian** is an imaginary line that runs from the North Celestial Pole, through the zenith, to the South Celestial Pole. It corresponds to a line connecting the centers of the two "grommets" or fasteners on the planisphere. The **zenith** (the spot directly overhead

in the sky, altitude = +90°) lies on the meridian approximately in the center of the "sky". More precisely, it is located where the declination equals the observer's latitude.

Additional reference lines on the planisphere include the **celestial equator**, and the **ecliptic**. The celestial equator is the solid circular line that near the edge of the "sky". The ecliptic is the curved dashed line that intersects the celestial equator at two points (vernal and fall equinoxes).

Motion of the Sky

The "sky" portion of the planisphere can be rotated either clockwise or counterclockwise.

Figure 3

As the night sky appears to rotate around the north celestial pole due to the rotation of the earth, objects in the sky that are not circumpolar rise above and set below the horizon throughout the night. Circumpolar objects have declinations greater than (90° *minus* observer's latitude) and never go below the horizon and therefore never "set".

The direction of rotation of the "sky" is easily determined by remembering that objects rise in the east and set in the west (see Figure 3). To rotate the (facing north side) sky portion of the planisphere to correspond to the rotation of the night sky, it must be turned counterclockwise.

Using the Planisphere

To use the planisphere, it must be set to a specific date and time. The months and days throughout the year are marked on the outer edge of the moveable portion of the planisphere (the "sky") as shown in Figure 4. Standard times are indicated on the outside edge of the fixed portion of the planisphere below the horizon (add one hour to the printed times for daylight savings time). To set the planisphere to display the sky for a specific date and time, rotate the "sky" until the desired date and time are aligned. In Figure 4, one date and time at which the sky will appear as shown on the planisphere is April 20 at 9:00 PM (local standard time; 10 PM local daylight time).
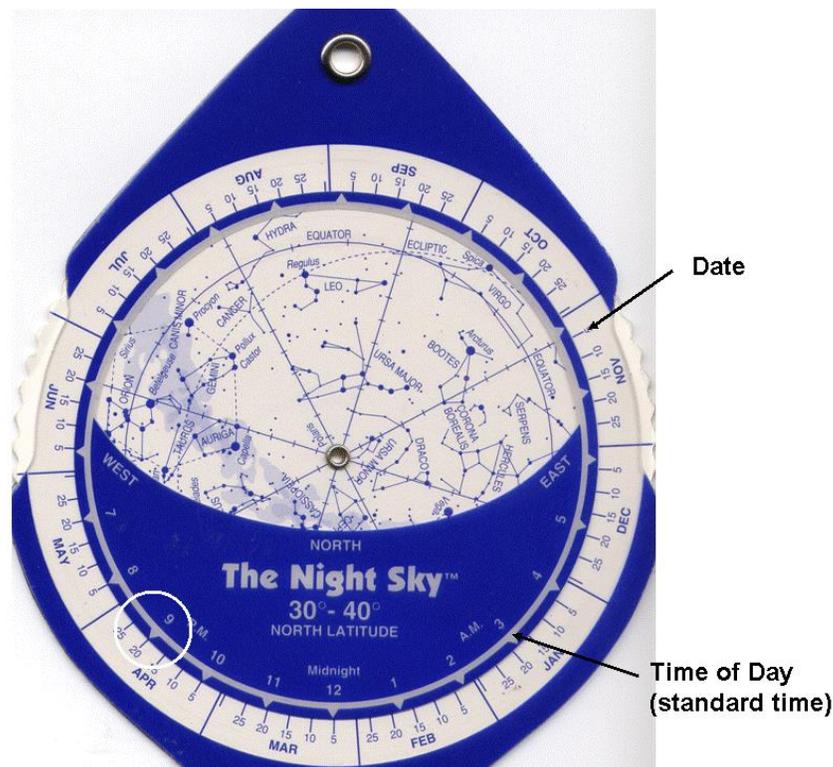

Figure 4

There are many combinations of times and dates shown on the planisphere in Figure 4 (For example: March 5 at 12 midnight, and December 18 at 5 AM. As the days progress throughout the year, the same configuration of the sky will appear at earlier times.

With the planisphere set to a specific date and time of interest, orient it with the azimuth direction (N, E, or W) that you are facing at the bottom when viewing the sky. The "sky" on the planisphere will then correspond to the night sky you are facing. To view the southern sky, the back side of the planisphere is used (see Figure 5).
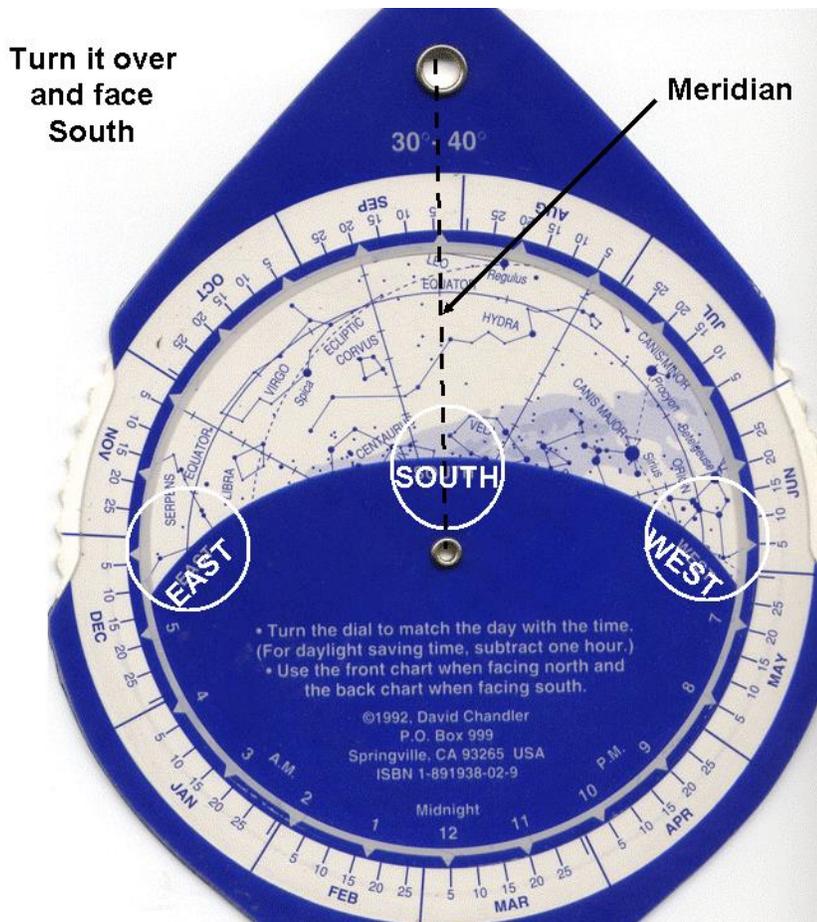
Figure 5

The back side of the planisphere provides a view of the southern sky which has less distortion than the front side. Note that when facing south, the eastern horizon is on the left side, and the western horizon is on the right side of the planisphere.

Determining Rise, Transit, and Set Times

To determine **when an object will rise** on a specific date, rotate the planisphere "sky" until the object is aligned with the eastern horizon. Then read the time of day corresponding to the specified date. Figure 6 illustrates the star Vega has just risen and is above the horizon at 9 PM on April 20. It also has just risen at Midnight on March 5.

To determine **when an object will set** on a specific date, rotate the planisphere "sky" until the object is aligned with the western horizon, and read the corresponding time for the specified date. Figure 6 illustrates that the star Rigel and the constellation Orion are setting at 9 PM on April 20.

An object is said to "transit" when it crosses the meridian. To determine when an object transits, set the object on the meridian (on the planisphere, the meridian is on a line connecting the two grommets) and read the corresponding date and time. In Figure 6,

the constellation Leo is on the meridian, and the star Regulus has just crossed the meridian at 9 PM on April 20.

Figure 6

Additional Planisphere Features

Figure 7 illustrates several additional features of the planisphere. For example, the celestial coordinate system coordinates of Right Ascension (RA) and Declination (Dec) are marked on the planisphere.

Right Ascension values are marked at one hour intervals by "tick marks" on the celestial equator. Radial lines from the North Celestial Pole mark RA values at three (3) hour intervals (0, 3, 6, 9, 12, 15, 18, and 21 hrs RA). Although the values of RA are not labeled on small planispheres, the line corresponding to **0 hrs RA** can be identified by locating the **vernal (spring) equinox**. The vernal equinox is located at the point where the ecliptic crosses the celestial equator in March. The line corresponding to a value of **RA = 12 hrs** corresponds to the **fall equinox**. The fall equinox is indicated on Figure 7. RA values increase in a clockwise direction on the celestial equator.
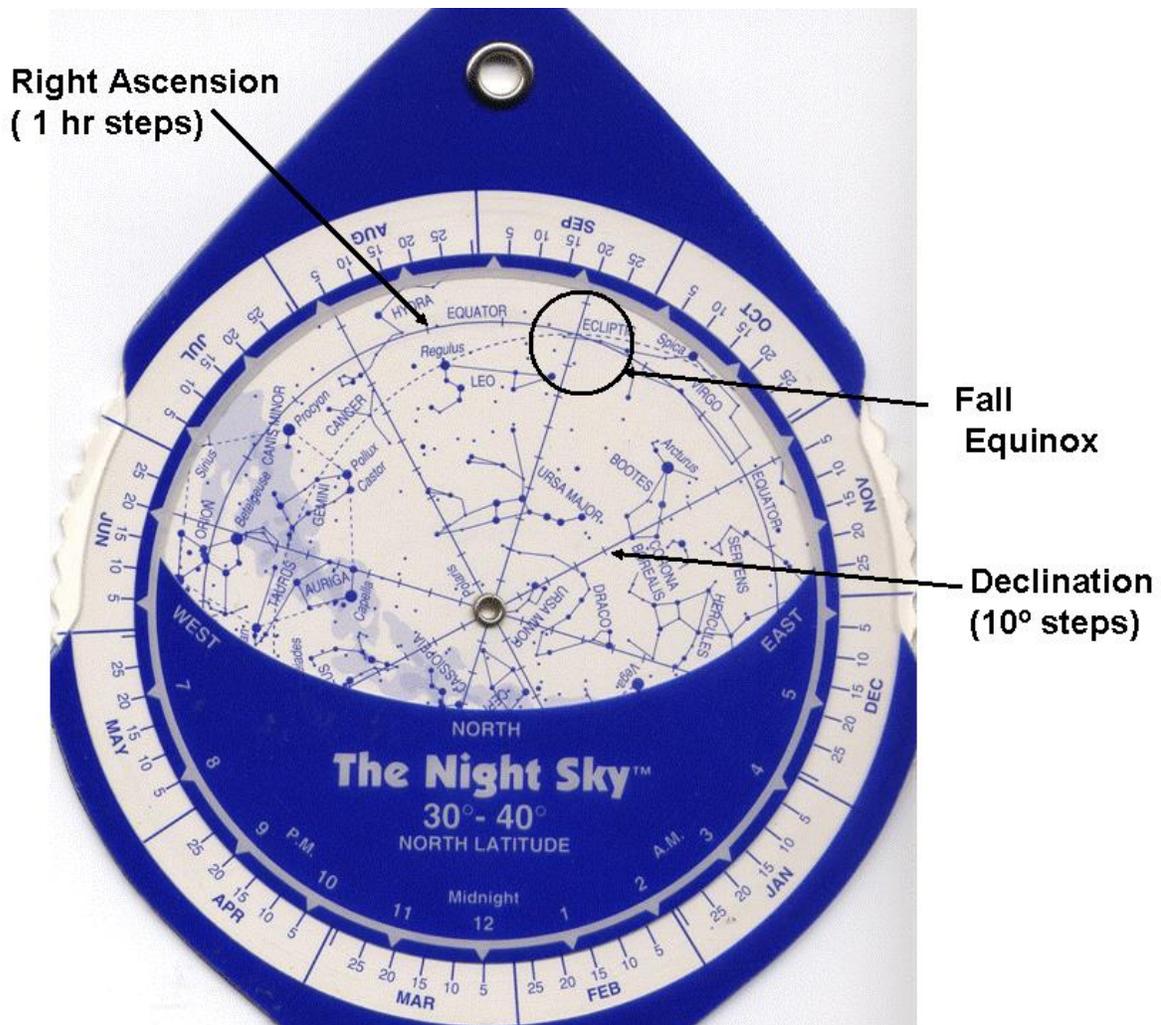
Figure 7

Declination values are marked at 10⁰ intervals along the radial lines of RA. Values of declination can be determined by remembering that the declination at the North Celestial Pole is = + 90⁰. Declination values decrease as you move away from the North Celestial Pole and toward the Celestial Equator.

As an example, using the planisphere in Figure 7, the celestial coordinates of the star Arcturus can be estimated to be approximately RA = 14 hrs 20 minutes and Dec = 20⁰.

Apparent (visible) magnitude, or brightness of stars shown on the planisphere correspond the size of the dot indicating the star. The larger the dot, the brighter the star will be in the night sky.

Finally, notice the gray "smudging" that appears in each of the figures. This "band across the sky" represents the Milky Way.