Because of the difficulty in projecting the spherical sky onto a flat map, there are various ways to represent the stars on paper. One of the most useful is the "SC001" chart. This map covers the equatorial region of the celestial sphere. The north and south polar regions are represented in SC002 and SC003 charts, respectively. These charts may be confusing at first glance, as there is no horizon or "landmarks" with which to orient yourself (it's a map of the sky!). They are however, very useful for learning the spatial relationships between celestial objects.

First, wrap one end of the SC001 chart around so that it meets the other side. This is the central portion of the celestial sphere with the polar caps chopped off (see below). Now look at the chart and notice the heavy line across the center of the chart. This represents the celestial equator. Recall this is the line that divides the sky into north (+) and south (-) declinations (DEC) in the same respect the equator divides the Earth into north and south latitudes. Along the sides of the map are numbers running from 0 at the equator to $\pm 60°$ at the top and bottom. These are the declination markings and they stop at 60° rather than going to 90° to prevent severe distortion of the map near the poles (this is where the SC002 and SC003 charts are necessary: they're the polar caps that are chopped off – 60° up to 90° in both the north and south hemispheres). Every tick mark of declination on the SC001 chart is equal to one degree. Recall that each degree can be further subdivided into 60 minutes of arc and each arcminute into 60 arcseconds. For example, the bright star Antares in the constellation Scorpius can be found at DEC = -26°25'55".

Along the bottom of the chart you will notice a series of twenty-four hour numbers followed by the letter "h" which stands for "hours." These hour marks represent hours of right ascension (RA), which are analogous to lines of longitude on the Earth. If you face the north celestial pole, the stars will rise (ascend) on your right; hence the term "right ascension." Since the entire sky goes over our heads once per day, it is measured more conveniently in time than degrees. And because the rotation of the sky is a full 360°, each hour of right ascension corresponds to $1/24^{th}$ of a circle, or 15 degrees. Each degree of sky, therefore, moves past a stationary point in four minutes. Every tick mark between the hour marks on the chart is equal to 5 minutes. Antares has RA = $16^h29^m30^s$.

Now wrap the chart back around itself again like before and tilt it about 23° like the Earth. The celestial equator should now be tilted about 23° from the floor and the other line (that was wavy when the chart was opened up flat) should now be a line parallel with the floor. This is the ecliptic. That is, the apparent path of the Sun on the sky during the course of the year. The dates along the ecliptic tell us when we can "see" the Sun in that position in the sky. For instance, find the date November 20 along the ecliptic and notice that it is very near the constellation Scorpius. On November 20^{th}, the Sun is said to be in Scorpius, which simply means that Scorpius will not be visible because the Sun lies between the Earth and that constellation.

Also along the bottom of the SC001 chart are a series of dates. These represent the date at which the stars above on the chart are at the meridian at 8pm local time. Remember that the meridian is the line that runs from the north celestial pole to the south celestial pole and passes through the zenith (directly overhead). The meridian is important because it can give us a frame of reference for locating constellations in the sky. For instance, locate today's date along the bottom of the chart (you will have to approximate where it is if it is not explicitly labeled). Then imagine a line drawn from the RA mark just above the date, vertically to the top of the chart. This is the meridian for that date at 8pm local time. If you were to go outside on that date at that time, the stars that fall along the meridian you just "drew" would be visible along the meridian of the sky.

Since we see the stars moving from east to west during the course of an evening, a star one hour west of the meridian at midnight should have crossed the meridian one hour before,

at 11pm. You can also work backwards to determine what date and time a particular star will be in a good observing position.

It's also important to know how much of the sky you should be able to see and which stars are visible. Consider this: at any given time, half of the Earth is in darkness and half is light. There are 24 hours of RA; half of 24 is 12. So, you can see about 12 hours of RA at any given time during the night. Since the meridian divides east and west, you can see about 6 hours of RA to the east and 6 hours to the west of the meridian.

Another frame of reference previously mentioned is the zenith, which is directly overhead. If you know what should be overhead before you go outside to observe, finding things will be much easier. You can locate your zenith on the star chart by intersecting the meridian with a line of declination equivalent to your latitude on Earth.

You should now have enough information to navigate through an SC001 chart. If you are still confused, ask your instructor, a classmate, or try the semi-interactive tutorial on the web located at http://www.physics.csbsju.edu/astro/SC1/SC1.01.html.

The SC001 chart, in conjunction with your planisphere, are extremely powerful tools for navigating the night skies, tools that you will likely find handy long after you have finished this course.

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