

On the SCOPE skies

By representing our view of space as a celestial sphere, we can create an astronomy coordinate system.

The celestial sphere—that imaginary space around the Earth containing all the visible stars, planets, and other celestial objects—is all around us, but seldom understood. Throughout the coming year, this column will focus on certain parts of the celestial sphere, especially the points where the seasons start.

The Sun and the seasons

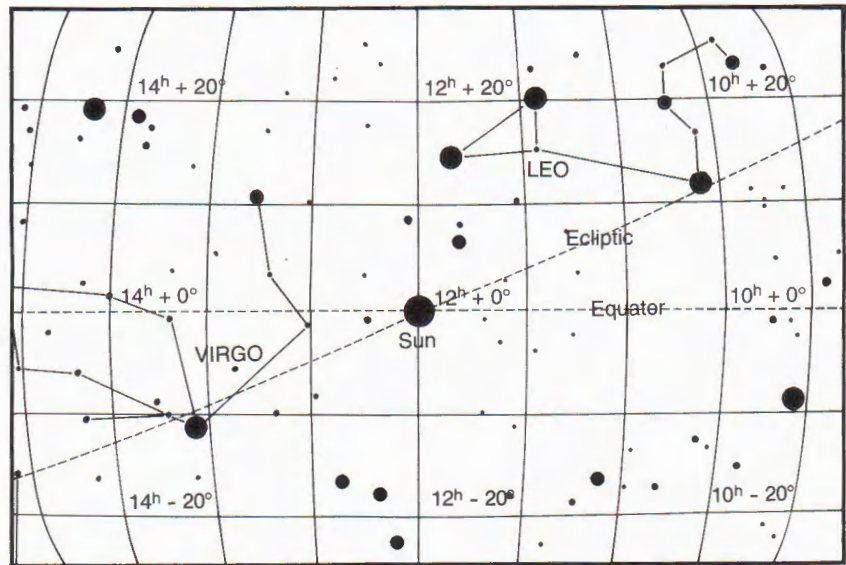
The fall season for the Northern Hemisphere starts at the autumnal equinox on September 23. What does it mean when we say that a season starts? The answer to this question, in part, is based on a system of grid lines that, while similar to latitude and longitude, are not on the surface of the Earth.

These lines are the celestial, or sky, grid and are literally an extension of the Earth-surface grid system into the sky. When we can extend the Earth's equator skyward, it becomes the sky equator, dividing the sky around us into a northern and southern half. Further divisions of the sky equator are known as lines of declination, whereas on Earth these are parallels of latitude.

The celestial sphere is also divided into 24 sections similar to meridians of longitude. However, these lines are known as hour circles of right ascension, or hour circles. Hour circles are numbered from 0 to 23. The intersection of these hour circles and lines of declination determines a celestial object's coordinates on the celestial sphere.

For example, the Sun passes through the 0-hour circle at the start of spring, and it passes through the 12-hour circle at the start of fall. This is only a partial description of the Sun's location during a transition, as where along the hour circle is also needed. Is it north or south of the sky equator, and if so, by how much? This information, the object's hour circle and declination, are enough to locate its position on the celestial sphere. However, an additional line can be added to

Figure 1. Position of the Sun at the Autumnal Equinox



Art by Max-Karl Winkler

the celestial sphere to show the daily changes in the Sun's position in the sky throughout the year. This line, known as the ecliptic, represents the path the Sun seems to follow throughout a year. The Sun seems to move eastward along the ecliptic, with respect to the stars in the background, because of the Earth's orbital motion about the Sun.

Figure 1 shows a portion of the celestial sphere and grid system of hour circles and lines of declination. The Sun is located at the point where the ecliptic crosses the sky equator. At this intersection, the Sun has coordinates of 12 hours, 0 degrees. This, then, is when fall starts. While these figures give its coordinate position, the Sun can also be described in terms of the constellation it is in (actually in front of), as viewed from Earth. Thus, at the start of fall (September), we would say the Sun is in the area of Virgo.

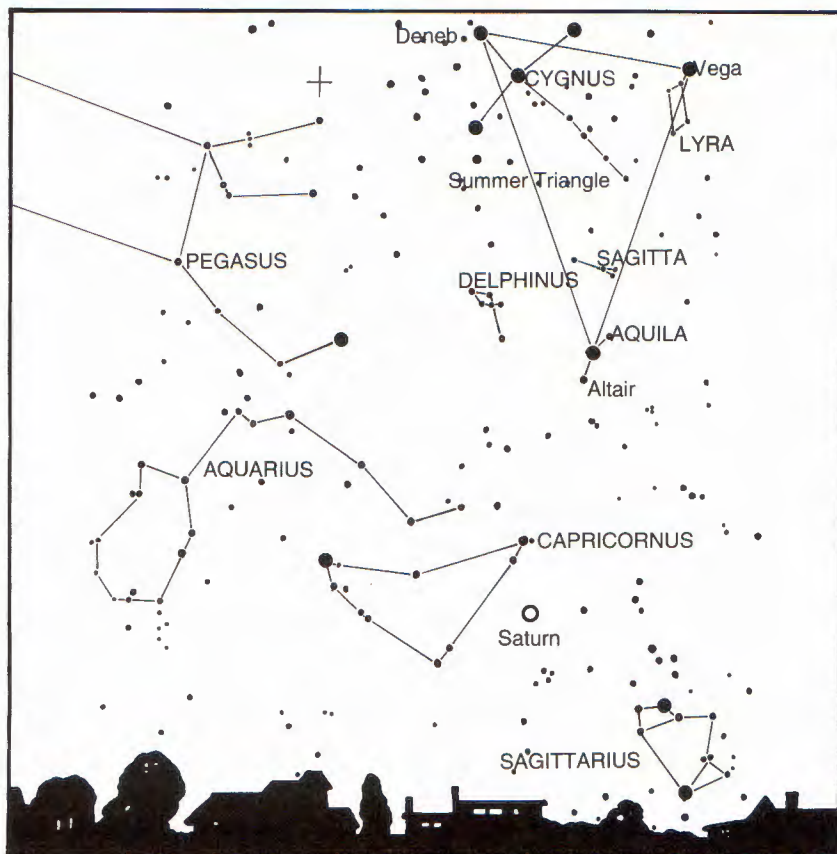
"Equinox" is derived from the Latin, meaning equal night, and when it occurs, the Sun rises due east and sets due west everywhere on Earth except near the poles, giving us 12 hours of daylight and 12 hours of nighttime. During the summer, the Sun rises in the northeast and

sets in the northwest, and during the winter, the Sun rises in the southeast and sets in the southwest in the Northern Hemisphere.

The sea goat and other myths

Throughout last year, teachers have asked to learn about the skies further ahead of time. In response, this column will now focus on the skies in the upcoming month. Thus, the focus of this month is on the October skies.

During the fall, Capricornus, the grinch-shaped constellation, beams down on us from above. Capricornus is sometimes known as the sea goat because of its association with the mythical character Pan. According to myth, Pan, disguised as a goat in order to hide from the demon Typhon, was resting in a field along a river. Suddenly Typhon appeared, and Pan instinctively dove into the water and changed into a fish. This all happened so quickly that Pan's change was incomplete. His body from the waist down had become fishlike while the rest of his body remained in human form. Pan's sudden flight gave rise to the word "panic."



LOOKING SOUTH ABOUT 9 P.M. ON OCTOBER 15

Higher in the sky, above Capricornus, is a trio of bright stars forming a star pattern known as the Summer Triangle. These patterns—shapes or pictures that people readily identify—are not official constellations and are referred to as asterisms. The highest point in the Summer Triangle is the star Deneb, which is the tail of Cygnus the Swan; lower toward the west is the brightest of the trio, Vega, which is in Lyra the Harp; and about halfway between the head of the Goat and Vega, down towards the southern horizon, is Altair in Aquila the Eagle.

In some myths, Aquila served as an agent of the god Jupiter, carrying out various deeds and tasks. For his faithful service, Jupiter placed the eagle in the

sky to honor him. In other cultures, however, the stars of Aquila are seen differently. In parts of India, for example, the three main stars of Aquila are depicted as two baskets suspended at the ends of a shoulder board. The same three stars, in the Hindu religion, are seen as footprints left by Vishnu as he walks across the sky. (Vishnu and Shiva are the two main Gods in the Hindu religion, and Vishnu looks after mankind's welfare. In times of disaster, he sometimes descends from the heavens to help us.)

Bob Riddle is the planetarium director for the Kansas City School District at Southwest Magnet Math & Science High School.

Moon phases

September

Third Quarter - September 1
New Moon - September 8
First Quarter - September 15
Full Moon - September 23

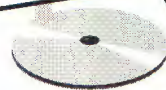
October

Third Quarter - October 1
New Moon - October 7
First Quarter - October 15
Full Moon - October 23
Third Quarter - October 30

Correction

The May column refers to a diagram of the four-day-old moon south of Jupiter, Venus, and Mars, which was omitted. The included diagram, the star chart, depicts the sky during mid-May.

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