Mountain Skies

September and October, 2000

In the evening sky, Venus and Mercury emerge from behind the sun, but are difficult to see in the bright twilight. On September 20, the two "inferior" planets (inferior because their orbits are closer to the sun than Earth's) will be gathered with Spica (SPIKE–a) in Virgo. To find Spica, start at the handle of the Big Dipper, follow its arc in an "arc to Arcturus," (ark-TEW-russ), then continue in a "spike to Spica" (*cf.* Mountain Skies, May/June 1999).

In October, Venus moves into Libra, passing within a degree of Zuben Elgenubi (*cf.* Mountain Skies, July/August 1999) on October 6. At this point, Mercury, which has been keeping pace with Venus, stalls in the sky and starts moving toward the sun as it moves to pass between the Earth and sun on October 30. Venus continues to move eastward away from the sun, passing into the head of Scorpius on October 20, and coming to within 4° of Antares (an-TARE-eez) on October 26.

On that day, Venus will set an hour and a half after sunset at 6 p.m., but it will be only 10° above the horizon so it will not be easy to see. On the 29th, the crescent moon will be 6° northwest of Venus (to its right looking west). Look for them due southwest between 6 and 7 p.m. Then remember to turn your clocks back an hour before you go to bed!

Rising in the east is a truly beautiful gathering of stars and planets. The Pleiades (PLEE-a-deez) star cluster, Saturn, Jupiter, the Hyades (HIGH-a-deez) star cluster, and Aldebaran (al-DEBB-a-ran, "the Follower" and the red eye of Taurus the Bull) rise in that order in the ENE between 10 p.m. and midnight on September 1. They are 30° above the horizon by the time they cross the eastern meridian, the line from due east to the zenith as shown in Diagram 1. By October first, they rise between 8 and 10 p.m. On October 29, the Pleiades rise as Venus and the crescent moon are setting, and Aldebaran rises just before 8 p.m.

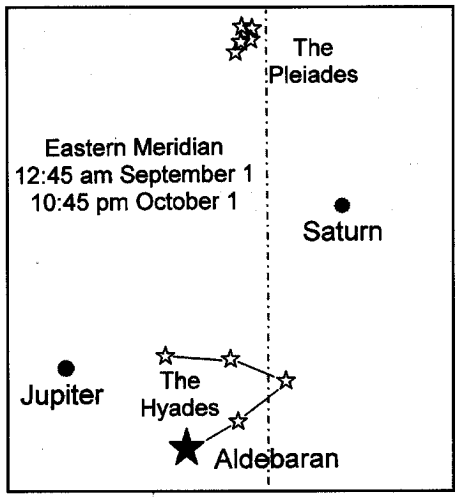

Diagram 1: The Pleiades, Hyades, Aldebaran, Jupiter and Saturn rising in the eastern sky. The planets' positions are shown on October 1, 2000.

Giant worlds

As September begins, Jupiter is lined up as part of the vee of the Hyades and both Jupiter and Saturn are moving eastward with respect to the stars. Careful observers will be able to detect the motions of these giant worlds fairly easily in the rich star fields of Taurus. On September 12, Saturn is stationary in the sky, then begins its retrograde motion to the west that will continue into 2001. The retrograde motion is due to Earth's faster orbital speed that makes the planets appear to move backwards as we pass them in our orbit.

As we pass Jupiter and Saturn in our orbit, we also begin to catch up to Mars, which passed behind the sun on July 1. It rises earlier and earlier as the sun rises later and later. Thus Mars is moving fairly rapidly with respect to the stars. In early September it is west of the Sickle of Leo (*cf.* Mountain Skies May/June 1999). It passes less than a degree NNE (left in the sky) of Regulus (REG-you-luss) on September 16, hangs just below the waning crescent moon on September 25 and just right of it on October 24. As we all wake up to standard time on October 30, Mars is within a degree of Zavijava (ZAVE-ee-JAVE-a, "zave" and "jave" rhyme with "have") in Virgo, just southeast (right in the sky) of Coma Berenices (*cf.* Mountain Skies May/June 1999).

High in the early evening skies of autumn are the cosmic birds of the summer triangle shown in Diagram 2, dominated by Cygnus the swan winging her way south along the Milky Way as though migrating to a warmer climate for the coming winter. Flying with the swan are Aquila the eagle and Vega, the brightest star in Lyra the lyre, whose name means "swooping eagle" (*cf.* Mountain Skies September/October 1999). Within the Summer Triangle are two small but distinctive constellations, Sagitta (sag-IT-ta, the arrow) and Vulpecula (the little fox). Other tiny constellations that provide a challenge for observers are Delphinus (the dolphin), which is quite obvious once you see it, Equuleus (ee-KWOOL-ee-us, the foal), which requires quite a dark sky to see,

and Scutum (scoo-tuum, the shield), a little less challenging than Equuleus. With a chaise lounge, a light blanket and a pair of binoculars, this rich part of the sky can be wonderful to explore.

Fuzzy blurs

Besides the stars, there are also many fuzzy blurs of light in this region. Sprawling across the Milky Way, the summer triangle is rich in stars, but also in the stuff of stars: the birthing chambers, nurseries and tombs of the active stellar metropolis of the galactic spiral arms. In binoculars or small telescopes, these objects are faint blobs best seen with averted vision, out of the corner of your eye as you sweep the field with your eyes, and aided with just a bit of imagination! Through the electronic eyes of the Hubble Space Telescope (HST), however, they are revealed to be incredibly beautiful regions where gravity, matter and nuclear forces dance to create and destroy stars and planets while enriching the galaxy with all the elements heavier than hydrogen of which our world and ourselves are made. In *A Star is Born*, a video in the Solar Empire series from The Learning Channel, the narrator says, "But look to the night skies. It is a forest: stars in all stages of growth. Here are the solar seeds, shoots, saplings, and decayed wood. Together they tell the 10-billion-year life story of our sun."

The summer triangle and the Milky Way to the south, into Sagittarius and Scorpius (*cf.* Mountain Skies July/August 1999) is the densest part of this forest. In Cygnus, the Northern Coalsack is part of a stretch of dark nebula (nebula simply means "cloud," but scientists feel smarter speaking Latin) where dust and gas block the light of the stars beyond it. This is where the solar seeds are lurking and growing in the dark as slight density enhancements in the clouds' collapse under the relentless pull of gravity to dense, hot nodules. These become stars when their cores heat to 10 million degrees and hydrogen begins fusing to helium.

Since stars form in complexes of molecular clouds, young stars first emerge in clusters such as the Wild Duck cluster in Scutum. This cluster is 6000 light years away, contains about 2900 stars and was recently estimated (by the distribution of the population of stars, old stars show different qualities than young stars) to be 250 million years old. To put the age in perspective, the sun takes about 250 million years to orbit the center of the galaxy, making this cluster a galactic yearling! On Earth 250 million years ago, today's continents were united in the great continent of Pangea, the Appalachian mountains were as impressive as the Canadian Rockies, the Adirondack dome was still 50 million years in the future, and the dinosaurs were just beginning to come into their own.

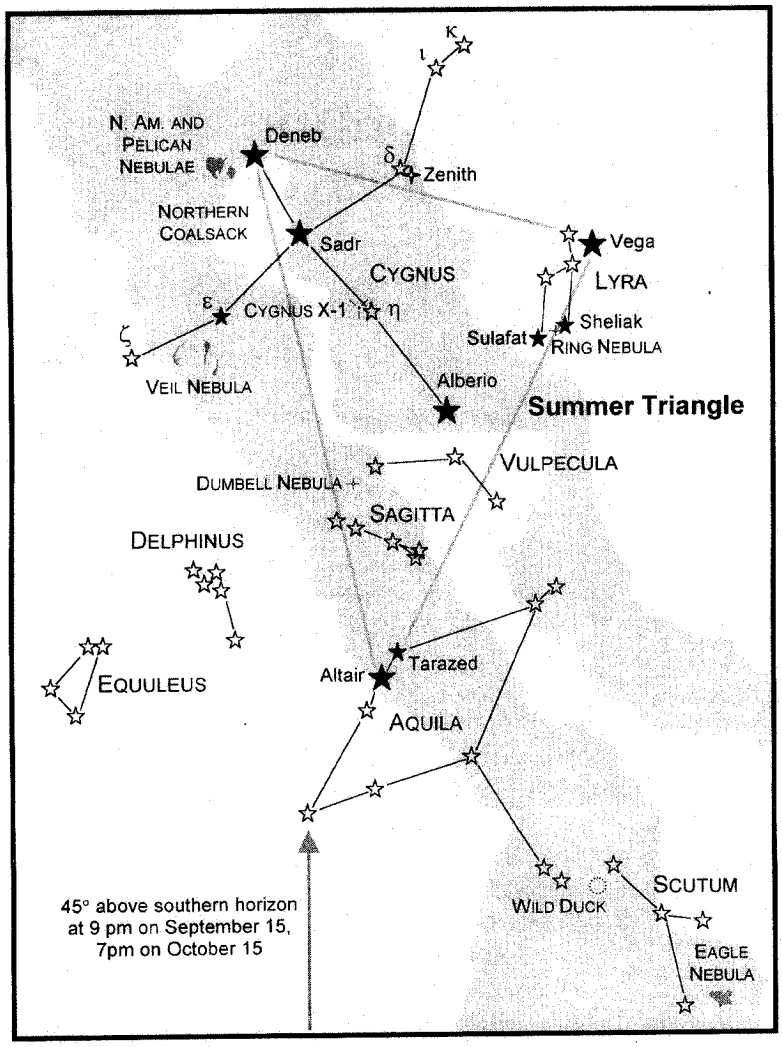

Diagram 2: The cosmic birds of late summer.

The decaying wood of the stars is represented by three nebulae in this neighborhood. Small stars like Sol, our own sun, end up blowing off their outer layers when they run out of nuclear fuel. The remnants of these explosions are called planetary nebulae because they have the appearance of disks when viewed through a telescope. With sharp eyes and a very dark sky you may be able to see the ring nebula with good binoculars, but I have been successful only with a small telescope. The deaths of larger stars are violent explosions known as supernovae.

The Veil Nebula, also known as the Cygnus Loop, tucked under the eastern wing of the swan and covering a patch of sky six times larger than the full moon, is the remnant of a star that exploded 15,000 years ago. HST images <http://oposite.stsci.edu/pubinfo/PR/95/11.html> reveal the blast wave from this explosion still interacting with the environment. —*Aileen O'Donoghue*