Aurora borealis—Alaska's best light show

by Candace Ward

I have always been fascinated by northern lights. However, it wasn't until my college years while on field study at Lake Clark National Park in Alaska that I actually first saw them. Late one August night I observed tremendous yellow green curtains undulating across the night sky. Since then I have been hooked on watching for auroras.

Working at the Kenai National Wildlife Refuge Visitor Center I receive many questions about northern lights. People are most interested in how they can be sure to see auroras.

Experts at the Northern Geophysical Institute, University of Alaska, offer these tips. The best time of year to check out the night sky is August 15 to April 15 when there is sufficient darkness. The best hours for aurora viewing are generally 11:00 p.m.-1:00 a.m. However, if you see bright active auroras as soon as it gets dark in the evening, it's a good bet that the auroral display will be active all night. Getting away from human created light sources and the "glow" of town will give better viewing. Checking out the night sky on clear nights optimizes viewing potential.

Interestingly, Alaska and eastern Siberia have northern lights that are typically 20-30% brighter than other displays throughout the world. Ft. Yukon, Alaska, may be the best location in the Northern Hemisphere for seeing auroras. The northern hemisphere's auroral oval, a donut shaped area centered around the geomagnetic North Pole, favors this location.

While being outdoors offers the most invigorating viewing, don't forget to look for auroral displays on night flights to and from Alaska. Carla Helfferich from the Geophysical Institute offers this advice. Try for a window seat so you can see east to northeast (the right side heading north and the left side going south). Use a blanket or jacket to block out light reflections when looking out your cabin window. Thanks to the curvature of the earth you can see auroras over 1000 miles away when you are flying at 30,000 ft. The air clarity at these high elevations will give brighter auroral viewing than on the ground. According to Neil Davis, author of The Aurora's Watcher's Handbook, at times of good visibility and auroral activity, it's possible to see almost 25% of all aurora occurring in the Northern Hemisphere on a flight between Alaska and Seattle.

Once people start watching northern lights, they become curious about what causes them. Understanding how the aurora "works" is difficult because many of the factors creating them are things we can't see.

The aurora is constantly occurring at both poles. However, it is obscured by daylight so we can only see it at night. Huge flows of electrically charged particles flow from the sun entering the earth's upper atmosphere. These flows known as magnetic storms usually focus at the poles and are pulled in by the earth's magnetic field. Occasionally these storms are larger and more intense spreading beyond the poles to lower latitudes. When this happens auroras may be seen over 60% of the earth's surface to latitudes of 30°in both hemispheres.

Mish Denlinger, who composed the website "Auroras: Paintings in the Sky," gives one of the best short explanations of how auroras happen. "Energetic electrically charged particles (mostly electrons) accelerate along the magnetic field lines of the earth into the upper atmosphere, where they collide with gas atoms, causing the atoms to give off light." The variation in colors seen in the northern lights depends upon the elevation in the atmosphere where incoming charged particles collide with particular gas molecules.

Auroras occur between 40 and 200 miles above our heads. At 180 miles above the earth, oxygen is the most common gas atom and collisions there create a rare red aurora. The strong yellow to green light that is most commonly seen in auroral displays is produced by collisions with oxygen atoms at 160 miles above the earth. Below 160 miles above the earth, nitrogen molecules bombarded by electrically charged particles emit a red light seen at the lower fringes of auroral curtain displays.

If our earth's gas composition at upper elevations were different, we would see other colors predominating in auroral displays. If our upper atmosphere contained large amounts of neon, we would see bright orange. If it contained high amounts of sodium gas, we would see a dark yellow light.

Our atmosphere does contain lighter gases like hy-

drogen and helium, but our eyes cannot always see them in the night sky. Our eyes see better in the green-yellow-orange part of the spectrum. So often good photographic film can capture magenta and purple colors in the aurora better than our eyes.

Where do these energetic electrically charged particles that create the aurora come from? Our sun produces bursts of these particles (ions) in solar flares. They travel to earth by the solar wind. The solar wind is created in the top most layers of the sun's corona and the ions it carries are pulled into the earth's magnetic field becoming magnetic storms. The solar wind also travels beyond earth to other parts of the solar system. Did you know that Jupiter and Saturn also have auroras?

Planets that have magnetic fields like Earth, Jupiter, and Saturn pull in these ions from the solar wind which collide with upper atmospheric gas molecules. These "excited" molecules emit colored light creating beautiful auroral displays.

Auroras recorded by Voyager and the Hubble Space telescope on Jupiter and Saturn are bright pink from hydrogen gas in their atmospheres. You will never see a green aurora on Jupiter or Saturn. Can you guess why? These planets have no oxygen in their atmospheres like our earth does. As we continue to study the solar system evidence of green auroras on other planets may be an indication of an oxygen atmosphere and life.

Auroras have fascinated humans on Earth for millennia. With all of the varied forms of human sky events from fireworks to space shuttle launches, it's amazing that the best light show on earth is still the aurora borealis.

To learn more about auroras, check out the following resources: An *Aurora Watcher's Handbook* by Neil Davis and the following web sites—Auroras: Paintings in the Sky at www.exploratorium.edu; Geophysical Institute, University of Alaska, site at http://www.gi.alaska.edu; and the NASA and NOAA space weather site at http://www.spaceweather.com.

Candace Ward works at Kenai National Wildlife Refuge as a park ranger specializing in visitor service and education. She enjoys observing northern lights with her husband Walter and chocolate lab, Tiaga. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at http://kenai.fws.gov.