

## **Northern Lights – Luminous Emissaries from the Arctic Skies**

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Even in Oregon, we can experience a microcosm of the Arctic during those rare occasions when strong geomagnetic storms, push the aurora down from the far north to light up our night sky. Likewise, when we hike above timberline in one of the several high peaks we venture into arctic microclimates and find plants adapted to this environment. A chance encounter of the Northern Lights from the top of one of Oregon's high mountains is unforgettable. Since we are then able to see hundreds of miles to the north, the base of the aurora can be perceived tracing the curvature of the earth.

Auroral light is an example of what is called gas fluorescence. We see examples of this everyday with neon lights, fluorescent bulbs, and gas lasers. Different characteristic colors are given off by different gases when electrons of those gases are excited to higher energy levels by an outside energy source (such as high voltage) then fall back to their normal energy state. This process is interrupted if the gas molecules are too closely spaced, i.e., they need a partial vacuum to operate such as a vacuum tube or the rarified atmosphere 40 or more miles above the earth. The most common colors given off by the gases in the upper atmosphere are green and red from oxygen and blue and red from nitrogen.

If we could see the invisible geomagnetic forces and the very sparse but rapidly moving plasma emitted by the sun interacting with the planets in the solar system, it would remind us of a living system. The planets with their own strong magnetic field and atmospheres such as Earth, Jupiter, Saturn and Uranus would have gossamer fish-like tails that trail away from the solar wind emanating from the Sun. Even though the solar wind is traveling at very high velocities – 400 to 2000 kilometers per second – it still takes from one to three days for this wind to reach Earth from the surface of the Sun. It takes a full year for it to reach the heliopause where the pressure from the solar wind is balanced by the galactic winds from other stars. As it passes each one of these aforementioned planets, it can cause brilliant auroral substorms to occur. Sometimes the end sections of the geomagnetic tails of planets will break off and form planet-size gossamer bubbles of plasma enclosed by a magnetic field or “plasmoids” that drift off into space. When there is a very strong and long duration eruption of plasma from the sun, this “gust” of solar material and magnetism will eventually bounce back from the heliopause. This was detected by the Viking I satellite as it approached the edge of the solar system

Because it takes from 16 to 48 hours for these Coronal Mass Ejections of CME's to reach earth, we actually have time to prepare to view the likely auroras if they are earth-directed. This is because there is usually a large x-ray flare that signals the release of the CME which takes about 8 minutes for this to reach us since it is traveling at light speed.

Fritjof Capra in his book, [The Tao of Physics](#), brings up the interesting discovery that the thoughts of the experimenter can actually influence the outcome of an experiment in subatomic physics. Those cultures that have lived in the northern latitudes such as the Inuit, have also observed that the Northern Lights seem to follow their thoughts, especially when circle ceremonies are performed. Instead of witnessing the events of collisions of subatomic particles in bubble chambers in a physics research center, they are witnessing the effect of their collective consciousness on the sub-atomic particles of the aurora in the huge expanse of the sky.

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