



Northern Lights

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KEOEIT

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The title is often the most difficult part of an article. *Aurora borealis* or northern lights would have been fine, but only keoeit, an Eskimo word, evokes mystery, legends and romance. The Inuit believed the aurora to be the torches of spirits, guiding souls to a land of happiness and plenty. The Indians of the Pacific coast thought it was the cooking fires of Eskimos, boiling whale blubber. My grandfather explained it as a reflection of the sun off the polar

icecap. For two thousand years men have marvelled at the northern lights, but it has only been in the last few decades that physicists have been able to offer a scientific explanation.

The earth is like a magnet, with a magnetic field extending between the polar regions (Fig.1). When we speak of auroral activity, we are indirectly speaking about the sun. Disturbances in the sun's atmosphere, known as flares and prominences,

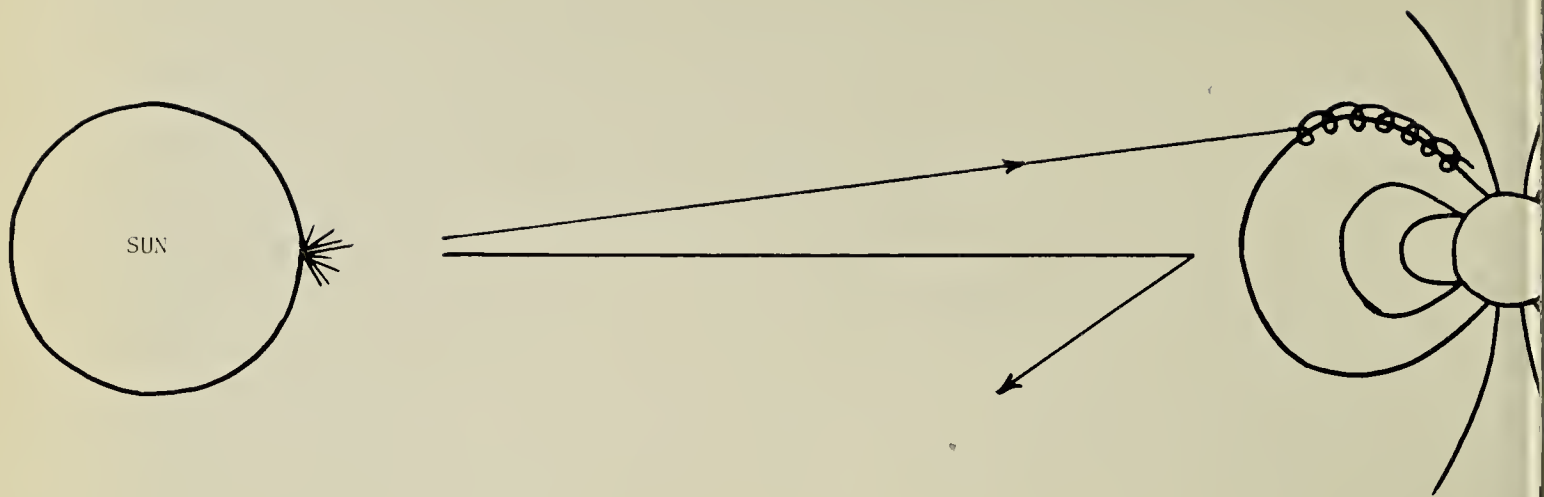


Fig. 1: The earth's magnetic field determines the destiny of solar particles. Annual frequency of visible auroras in varying latitudes.

produce showers of electrically charged particles (mainly protons and electrons) that storm the earth. The showers of particles are most frequent and intense when groups of sunspots appear on the sun's surface. The destiny of these particles is dependent on the angle at which they encounter the earth's magnetic field. Those that strike at right angles, as occurs at the equator, are deflected back into space. Those striking northern latitudes are parallel to the magnetic field and succeed in penetrating the upper atmosphere. Once within the atmosphere they collide with molecules of nitrogen and oxygen. With every collision the molecules absorb energy. When they return to normal, the energy is dissipated as visible light. Voilà, the *aurora borealis*. Therefore, the greater the sunspot activity, the greater the production of protons and electrons and the more spectacular the aurora. Also, highly energetic particles may overcome the magnetic field at low latitudes, explaining the periodic occurrence of "lights" in southern regions. An aurora in the north will always have a counterpart in the southern hemisphere. Captain James Cook called this the *aurora australis*.

Anyone who has witnessed the

northern lights can testify to their changeable mood. Colour, form and intensity continually fluctuate. Occurring at an altitude of 60 miles, or 100 kilometers, the predominant colour is yellow-green with highlights of red and blue. The aurora is not totally sporadic but follows an annual pattern. The months surrounding the equinoxes (March-April and September-October) are peak periods. At these times the earth's axis is at right angles to the earth-sun direction, so that the sun is directly overhead at noon on the equator, and the poles are equally distant from the sun.

The existence of "auroral sounds" was debated for years. The early Arctic explorers described it as "a soft swishing sound" and the Inuit compared it to the sound of reindeer joints. Recently, infrasonic waves have been identified, but these are imperceptible to the human ear.

The aurora presents a special challenge to the photographer. Conventional light meters are hopelessly inadequate, since a bright aurora is only 1/500 as intense as a bright sunset. Rural areas avoid the glare seen over cities and are preferable for viewing as well as photography. Try f4, 30-60 seconds with a film rated at ASA 200.

A conquest of geomagnetism and nuclear physics, the *aurora borealis* no longer puzzles the minds of men. But what of mystery, legends and romance? How do we react now, for example, to Robert Service's speculations in his "Ballad of the Northern Lights":

Some say that the Northern Lights
are the glare of the Arctic ice

and snow;
And some that it's electricity, and
nobody seems to know.
But I'll tell you now-- and if I lie,
may my lips be stricken dumb--
It's a mine, a mine of the precious
stuff that men call radium.
It's a million dollars a pound, they
say, and there's tons and tons in
in sight.
You can see it gleam in a golden
stream in the solitudes of night.



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