IN NORTHERN SKIES

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Sunday morning, December 4, 1977 — calm, clear, and very cold after a furious all-night blizzard — will be remembered by many because of its brilliant sundogs and prismatically radiant solar halo. Prompt radio comment on this unusual display alerted viewers in Regina and surrounding areas; but few, it seems, noticed the spectacular sky show which peaked later in the day, in an area centering around Indian Head and Balcarres.

In Indian Head, people returning from church at 1:00 p.m. noticed two bright concentric solar halos, with sundogs of blazing brilliance which occurred where the halos were intersected by a luminous white line running through the sun parallel to the horizon. At the same time, other groups of people on the north side of town were startled to notice three large, luminous orbs, like ghostly moons, spaced out along a broad, ethereally delicate band of white light which curved around the northern sky, till lost from sight behind intervening trees and buildings.

Also around 1:00 p.m., sky watchers in the Qu'Appelle Valley and the Red Fox Valley, ten miles north and south of town respectively, saw the halos, sundogs, and luminous white line, but the eerily beautiful display in the northern sky was hidden from them by the valley rim.

At all these points, those who chanced to look overhead saw a spectrum crescent, like a shallow, inverted, and very radiant rainbow, with its red outer curve toward the sun and almost touching the upper rim of the outer halo. Its arc, if extended, would appear to encircle the zenith.

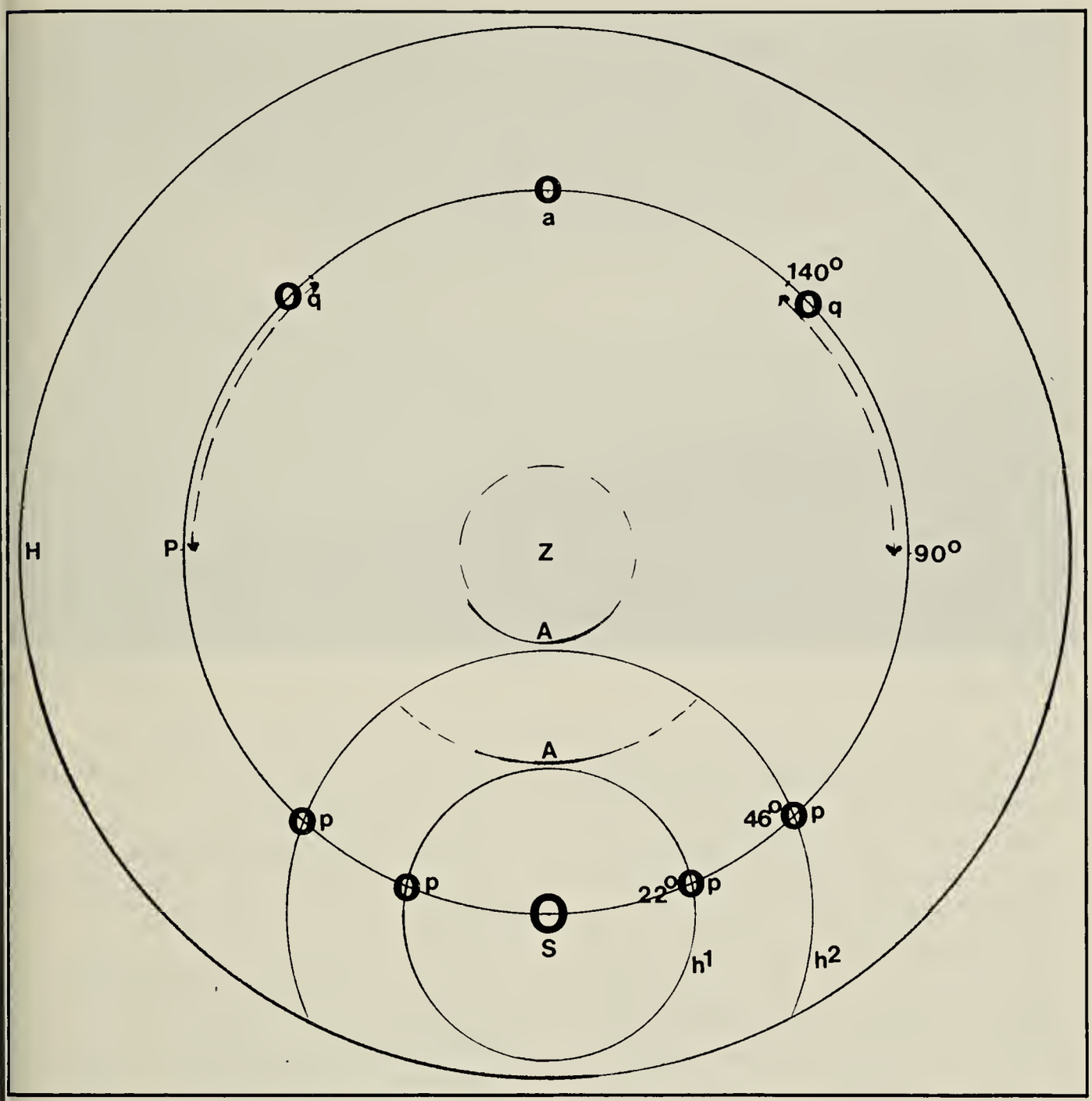
One final observation: as the su swung westward and sank lower, th whole formation moved accordingl This was around 2:00 p.m. when th spectacle began to disintegrate.

Several Natural History Societ members, comparing notes late found that, like the six blind men o Hindustan, each had seen somethin different but no one had seen th phenomenon in its entirety, though family on a farm had seen both no thern and southern aspects. Th missing link was that luminous whit line; did it really form a complet circle?

The answer, finally tracked down *Encyclopaedia Britannica* und "halo", is yes! And the accompanyin diagram contained every detail ob served at Indian Head on December 1977.

The diagram used here is based o the one in the *Encyclopaed Britannica,* slightly simplified, and wit the key tailored to the requirements o this article. According to the e cyclopaedia article, "halos of we developed form are rare, except polar regions . . . though only in ver exceptional circumstances are all th parts visible." The exceptional ci cumstance on December 4, 1977 mu have been the extraordinary number o frost crystals in the atmosphere in th wake of the previous night's blizzard.

The lower half of the diagram show the features observed in the souther sky on that date. The sun, or luminar (S) is encircled by the inner and oute halos (h^1, h^2), having radii about 2 degrees and 46 degrees from the su The inner halo exhibits confuse spectrum colors with a decided red tin



Zenith view of a complex solar display.

S — Sun
H — Horizon
Z — Zenith
P — Parhelic circle
A — Arcs
h^1 — inner halo
h^2 — outer halo
p — parhelia (beside sun)
a — anthelion (opposite sun)
q — paranthelia (beside anthelion)

on the inside, the outer halo is broader and less bright. The luminous white line passing through the sun and parallel to the horizon (H) is the *parhelic circle* (P), on which a number of images of the sun appear. Four of these are the parhelia (p), commonly called mock suns or sundogs, but the images at 46 degrees are very rare. Also observed on December 4, 1977 was the zenith spectrum arc (A), but other arcs shown in the diagram were not noticed at that time.

The upper portion of the diagram shows the three luminous orbs strung out like beads along the northern portion of the parhelic circle, which were observed by those who had a clear view of the northern sky. The

First Parhelia *Joan Halford*

encyclopaedia refers to these figures as "images of the sun and the two bright inner parhelia"; they may appear as orbs or, more commonly, as mere patches of light.

The centre orb is the *anthelion* (a) literally 'opposite the sun', which remains fixed in the anti-solar position. The two flanking orbs are the *paranthelia* (q) literally 'with the anthelion', which are situated from 90 degrees to 140 degrees from the sun along the parhelic circle. The encyclopaedia states that the paranthelia are at 90 degrees at sunrise, and move away from the sun as it rises higher, but omits comment on the time or circumstances under which they will reach 140 degrees.

The article concludes with detailed explanations of how various solar displays are created by the reflection and refraction of light in mega-millions of frost crystals of specific types. The lay reader may not be able to follow, but the imagination is fired by the vision of an infinity of light rays shuttling through a cosmic crystal loom, on their appointed task of revealing the order and beauty inherent in all creation.

"The heavens declare the glory of God; the firmament showeth his handiwork."

Leaving this field to the physicists and poets, we turned to a more practical line of research. Just how rare are solar displays of this type? We live in a northern land, are familiar with Eskimo lore and the tales of trappers, gold seekers, and polar explorers; yet only one of our group had ever seen or heard of solar displays, aside from sundogs and "a ring around the sun". (And moon too, of course — all solar displays have their lunar counterparts.)

This man recalled for us a boyhood memory of a striking solar display seen on the rim of the Qu'Appelle Valley while he was hauling straw in the bitter winter of 1916. Lying back on his load for warmth, he became aware of a sky filled with circles, crosses, and areas of light centering around an overhead rainbow. His lasting impression was of the order and symmetry of the design,

Overhead Arc *Ernie Buglass*

and the radiance of the zenith spectrum.

He also possesses the diary of a young English emigrant to the Qu'Appelle district, which contains entries and diagrams dated February 19 and February 25, 1887, describing zenith and horizon rainbows, double halos, four mock suns, and what was probably a fragment of a parhelic circle. The diarist refers to his diagrams as 'imperfect' sketches.

Further enquiries brought out the interesting testimony of a family who, for three generations now, have been seeing double sundogs, triple 'moons', and zenith rainbow arcs — south of Balcarres in 1916, at Cadillac 40 miles south of Swift Current in 1942, and at Indian Head and Balcarres on December 4, 1977, when from both points 'they saw the display in its entirety, including the elusive parhelic circle.

From this scant evidence one cannot make any pronouncement on the rarity or otherwise of solar displays; but it may be deduced that (a) they are very easily missed, (b) they are more likely to be noticed if one knows of their existence, and (c) they may not be as rare as the powers of observation in the average human.

The *Scientific American,* April 1978 issue, brought fascinating additional information in an article, "Atmospheric Halos", by David Lynch. This author's expression of doubt about the actual existence of the 46-degree parhelia, coupled with indistinct photos taken in the Antarctic and at the observatory in San Diego, cause one to wonder if perhaps Saskatchewan, with its big, clear, northern sky, just may have a ring-side seat on these rare and beautiful sky shows.

Physicists have been delving into this natural mystery since Rene Descartes first suggested, in the seventeenth century, that solar and lunar displays are caused by the action of light in frost crystals. Poets have expressed their wonder at least since the time of the Hebrew psalmists. But a child, enchanted by the sight, is content to croon, "Seven suns around the sun, and a rainbow on top!"