

and occurs simultaneously with it only on some rare occasions. At 5.50 p.m. both "mock-suns" and arc were visible. The brilliancy of the arc varied from minute to minute, and it lasted altogether for 15 minutes. When one "mock-sun" flared bright, the opposite arm of the arc became also bright, and *vice versa*. Having observed on that occasion the close alliance between these two parts of halos, it then became my practice to look for an arc when "mock-suns" appear, and in this way I have more frequently observed them than I could otherwise have done, though they do not always appear together. During the twenty years that have elapsed I have observed altogether about a dozen arcs, some bright, others feeble. One which I saw at 8.50 a.m. on March 3, 1917, was intensely bright, and in addition to the arc there were at times faint cross-bars, of which the sun was at the intersection. The frosty air at the time was foggy or hazy. Within the concavity of the arc was a fluorescence of the ultra-violet rays.

*Sun Pillars.* On Feb. 17, 1899, I observed a perpendicular shaft of light or sun pillar rising from the sun, which was shining dimly through a thick stratum of haze. The parts of the pillar fluctuated in brightness like the streamers of an aurora, and at about the same rate. It appeared to be evident from this fluctuating example of halo that there is a resemblance between halos and auroras in their formation. The drift of the streamers in the aurora are probably due to motion of the snow dust in the very highest part of the atmosphere, the same substance that visualizes halos. This halo in 1899 first brought to my attention the probable intimate connection between halos and the electro-magnetic forces in the higher parts of the atmosphere, and since then I have been able to pursue the subject with more advantage.

The altitude of at least some sun pillars would seem to be very great, as one indicated that I saw on March 7, 1912, at 6.50 a.m., just before sunrise. A shaft of strong light rose from the horizon, showing where the sun might be expected to rise, and in addition to being intense, it was crimson-colored, having the same tint as the clouds have at that time when the sun's rays are