θ_0 is the temperature of the surroundings, and a is a constant. The "obvious effects" are effects of *relative* radiation, just as obvious mechanical effects are effects of relative velocity. θ^4 is (so far) unobservable *absolute* radiation, and is analogous to (so far) unobservable absolute velocity.

The relativistic form of the Doppler equation gives limiting velocities of $\pm c$. It must do this because it is made to conform with a definition of velocity (namely, ds/dt) which demands those limits. When I spoke of "a measurement of velocity in terms of the Doppler effect" I was imagining a *definition* of velocity measurement in terms of the relative change of wave-length. This would, of course, not lead to the ordinary relativistic equation, but to $d\lambda/\lambda = v/c$, where c is a constant. Such a definition would, fundamentally, be as legitimate as the canonical one, and would enable us to describe the same phenomena, but the description would, of course, be different.

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A Solar Halo Phenomenon

A PHENOMENON which I have not seen described before occurred in a part of the horizontal ring of a solar halo on August 9, 1944. It consisted of dark bands moving like waves through the very bright ring. The sky was very clear at Cambridge on the morning of that day when a cloud trail was formed by an aeroplane. The trail moved from north-west in an easterly direction. At 11.20 a.m. a section of the horizontal mock sun ring appeared in that part of the cloud which in the north-east had the same altitude as the sun. As the cloud moved on, being steadily deformed and taking the shape of the letter *S*, the halo shifted slowly from left to right.

About a minute later, I noticed dark bands crossing quickly through the brightness of the halo. They were of various grades of darkness and could not be seen continuously. Each band was about $\frac{1}{2}°$ in width and seemed to be perfectly straight. The distance between two adjacent bands was approximately $\frac{1}{2}$–1°. The middle one of a batch of bands was usually the darkest, the brightness of the brilliant mock sun ring being reduced by more than 75 per cent, while the accompanying bands were less dark. The best description of the phenomenon I can give is by comparing it with the rippling of the smooth surface of a lake by an occasional breeze. The bands moved from right to left and their speed seemed very high, approximately 5° per second, that is, very much faster than that of any cloud seen in the sky on that day. They gave the impression of being lower than the halo.

I called a second observer who independently noticed the phenomenon after I had directed his attention to the spot. A description was given in the words: "It is as if the ether waves have become visible".

At 11.25 a brilliant mock sun appeared on the right of the sun. The 22° halo developed and at 11.30 a mock sun could be seen on the left. However, no dark bands were visible in them. Later, a part of the horizontal ring appeared in another cloud trail at 11.45 a.m. The bright patch was this time in the north-west. First one dark band moved quickly through the patch in a northerly direction, taking about $\frac{1}{2}$ sec. to cross it. A few seconds later a whole batch of waves followed, going in a slightly different direction. Then lower clouds covered this part of the sky.

In attempting an explanation of the phenomenon three points will have to be kept in mind. First, the mock sun ring is a halo of the reflexion type produced by ice crystals the side faces of which are orientated in vertical planes and act as mirrors. A slight variation in the direction of the axes of the crystals has a marked effect on the appearance of the halo. I have seen fluctuations of brightness in another reflexion type halo before, namely, in the pillar above and below the sun, but the phenomenon described above is quite different. Secondly, the artificial cloud was less thick than a natural one. A high percentage of the ice crystals situated in the line of sight could therefore be affected simultaneously. Thirdly, different wind directions at various heights at the time of observation were revealed by clouds. Directions noted were north-west, north-east and south-west at ground-level. The deformation of the originally straight aeroplane trail to an *S*-shaped figure proves that the cloud was at a height where two different air currents came into contact. A disturbance may have been caused at the surface of contact, thereby affecting the orientation of the axes of the ice crystals. The swinging of the crystals about their position of equilibrium may have produced the observed optical effect.

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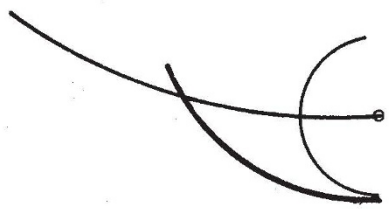
ON August 9, at 0900 G.M.T., numerous aeroplane vapour trails had spread out into wide belts of apparently cirrus cloud. Two mock suns were then visible, one at about 22° from the sun and one nearly opposite to it and at about the same height above the horizon as the sun. These mock suns disappeared after a few minutes.



At 10.30 G.M.T. portions of three halos appeared in the artificial cirrus. The first was probably the 22° halo, the second a concave arc of contact with it, and the third an arc of much greater radius which passed through the sun.

In the case of the two smaller halos the red colour was on the inside. The arc passing through the sun was colourless. The halos were very transient and I had no time to photograph them or to take angular measurements.

The accompanying diagram illustrates the approximate arrangement of the halos.

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