

of orientation of the elementary pyramids might be regarded as evidence of some modification of the crystalline structure by the action of the ultra-violet radiations.

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* In orthodox romanization, Chung Shêng-Piao.

¹ de Gramont, A., *Rev. d'Optique*, **10**, 213 (1931); and "Recherches sur le Quartz Piezoelectrique" (1935), 31.

² Eck, J. B., and Menabrea, J., *C.R. Acad. Sci.*, **200**, 1610 (1935).

A Solar Halo Phenomenon

SIMILAR phenomena to those described by G. H. Archenhold¹ were observed in France during the War of 1914-18 near the fighting zone, and there are records of similar waves observed during this War². Some of the records are, however, scattered in publications not accessible to me at the present time.

A probable explanation of this phenomenon is that it is caused by acoustic waves from explosions passing through a cloud of ice crystals. The explosions might be so distant that they may not necessarily be heard at the point of observation. The perfect straightness of the bands observed by Archenhold supports this view of their distant origin. The observed very high velocity of about 5° per second agrees well with the velocity of sound at the height at which ice clouds are forming. The spacing of the bands of $\frac{1}{2}$ -1°, when compared with their speed, corresponds to the frequency of 2.5-5 cycles per second, which also corresponds to the fundamental frequency of sound caused by heavy explosions.

Ice crystals floating in air are usually oriented with their greatest cross-section perpendicular to the direction of the field of gravitation, that is, platelets have their six-fold axis of symmetry vertical, needles have it horizontal. The mock sun ring is usually produced by the reflexion of light on the vertical side faces of the plates, but it might be produced sometimes by the vertical end faces of the needles. The passage of the sound waves through the cloud would produce a movement of the air relative to the crystals, due to their inertia. This would have also an orienting influence on the floating crystals, which should tend to orientate themselves with their greatest cross-sections perpendicular to the direction of the sound. The presence of the sound waves will thus disturb the vertical orientation of the crystals, and dark bands would appear in the reflexion halo approximately in the zones of maximum acceleration of the sound waves, that is, there will be two fringes for each wave-length.

The disturbances could not be explained as due to the discontinuity of the wind speed at the surface of contact of two different air masses, as such disturbances usually travel at considerably lower speeds than the speed observed by Archenhold.

It would be of great value if any additional information could be procured concerning the height of the aeroplane cloud trails formed during August 9 (not necessarily at Cambridge), and concerning any heavy explosions heard south of Cambridge.

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¹ Archenhold, G. H., *Nature*, **154**, 433 (1944).

² *Flight*, Aug. 8, 1940. *Times*, Aug. 31, 1944.

THE phenomenon of moving dark bands travelling across a solar halo, as reported by Mr. G. H. Archenhold¹, seems to be linked with the optical effect of blast such as results from the explosion of bombs, etc.

An account of moving dark bands passing across cirrus cloud was given by a special correspondent of *The Times* in the issue of August 31, the date of the occurrence being August 9, and the locality of the observance of the occurrence as southern England.

It would be interesting to know from Mr. Archenhold whether any gunfire was heard on the morning in question.

The optical effects of blast from flying bombs have been reported by other observers and myself within recent weeks and have appeared in the columns of *Engineering*, *The Aeroplane* and *The Times*.

In my own experience, the moving dark bands have been observed on very low stratus cloud.

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¹ *Nature*, **154**, 433 (1944).

Abnormal Paranthelia

TWICE within the last year I have observed a paranthelion bearing about 165° from the sun—a position in which the paranthelion does not seem hitherto to have been reported.

The features common to the two appearances were as follows. The sky in the neighbourhood of the phenomenon was a dilute blue with wisps of cirrus. A region of the sky, covering about 3° of altitude and 5° of azimuth, was singled out by the fact that whenever a wisp of cirrus drifted into it the cloud became brilliantly luminous, without colour, and remained so until it left the region; blue sky within the region was not differentiated from that without. The centre of the region was, as nearly as could be estimated by eye, at the same altitude as the sun and approximately 15° eastward of the position which would have been occupied by the anthelion, had one been present. There was, however, no trace of anthelion, nor of any other paranthelion. Each appearance lasted some twenty minutes from the time of first observation.

The distinguishing details were as follows.

	I	II
G.C.T. of first observation	11.50; Sept. 24, 1943	11.10; Aug. 9, 1944.
Place	Moulisford Down (51° 32' N., 1° 11' W.)	Reading (51° 26' N., 0° 57' W.).
Sun's altitude (computed)	38½°	53½°.
Bearing of centre of luminous region	160-165° E. of sun.	165-170° E. of sun.
Weather	Brilliant sunshine; no cloud beyond that described below; sky-blue very little diluted; wind S.W., force 2 at ground; some cumulus blew up shortly afterwards.	Bright sunshine; much cirrus; lower cloud types in other parts of sky; sky-blue much diluted; wind N.W., force 1 at ground.
Other contemporary meteoroptical phenomena	None.	Traces of parhelic circle between 100° and 160° E. of sun.

On occasion I no other meteoroptical phenomena were seen on the same day. On occasion II, Mr. R. Adcock and Mr. M. Barker, who directed my attention to II, reported having seen a parhelic (III) (? colourless), 46° E. of sun, at 9.15 G.C.T. on the same day. Unfortunately, no instruments were available for any of these observations, so that the azimuths are rather uncertain; III was carefully aligned on marks which were measured later.