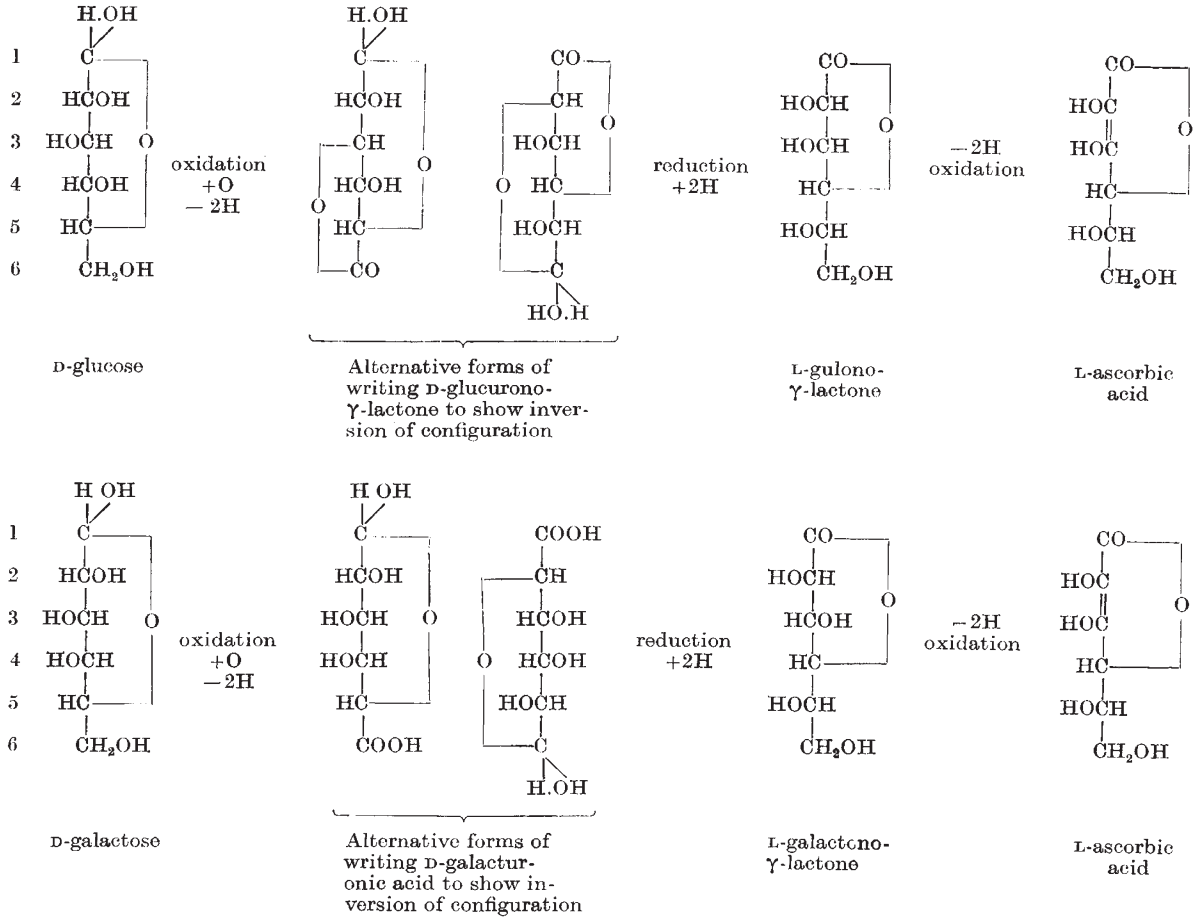

the animal. There is thus no indication which of our postulated reaction sequences is the more important.

Other mechanisms whereby hexoses might be transformed into L-ascorbic acid, involving L-glyceraldehyde, L-sorbose, D-sorbitol and D-gluconic acid, have not been found in cress seedlings or in the rat.

This work will be published in detail elsewhere.

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Dec. 6.

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Light Pulses from the Night Sky associated with Cosmic Rays

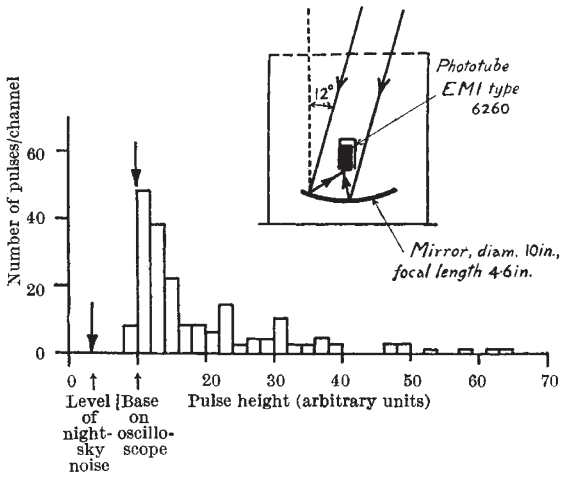
In 1948, Blackett[1] suggested that a contribution approximately 10^{-4} of the mean light of the night-sky might be expected from Čerenkov radiation[2] produced in the atmosphere by the cosmic radiation. The purpose of this communication is to report the results of some preliminary experiments we have made using a photomultiplier, which revealed the presence of light-pulses of short duration correlated with cosmic radiation.

A photomultiplier was mounted with its cathode at the focus of a parabolic mirror (see diagram, inset), the field of view of this 'telescope' being approximately ± 12° from the zenith. The output of the photo-tube was connected to an amplifier with equal differentiation and integration time-constants of 0·032 μsec. The apparatus was mounted in a field adjacent to this establishment at the centre of a square array of sixteen Geiger–Müller counters (each of area 200 cm.²; the sides of the entire array were 180 metres) designed by Cranshaw[3] for studies of extensive air-showers. The results obtained were as follows.

(*a*) On the night of September 25–26, the pulses were first observed visually on the oscilloscope and were seen to be several times the mean height of the noise pulses due to the general night-sky illumination. Photographs of the pulses were taken and a pulse height distribution plotted (see graph). With the bias arbitrarily set at three times the night-sky noise, 97 pulses were recorded in 100 min.

Artificial night-sky noise was then produced by means of a small lamp inside a lid placed over the telescope. In 50 min., no noise build-up pulses were observed at the same bias and gain conditions.

(*b*) Three-fold coincidence pulses corresponding to showers detected by the extensive shower array were used to trigger the time-base of the oscilloscope, and the light pulses (if any) displayed on the *Y*-plates.



In nineteen such showers there was no evidence of any having associated light pulses.

(*c*) On the night of October 14–15, we decided to trigger the oscilloscope from the light pulses (again selected to be greater than three times night-sky noise) and display the pulses from all the sixteen single counters from the extensive shower array on the *Y*-plates. Out of fifty time-bases triggered (in 58 min.), eighteen had single Geiger–Müller pulses at the same point on the time-base; two had a coincidence between two Geiger–Müller tubes, one corresponding to three Geiger–Müller tubes and one to four Geiger–Müller tubes. This rate of observing Geiger–Müller pulses on the time-bases associated with light-pulses (when the association is to within 3 μsec.) is approximately a thousand times the accidental coincidence-rate. Moreover, the fact that all the Geiger–Müller pulses occur at the same point on the time-base and correspond in some instances to more than one counter being discharged strengthens the correlation between them and the light.

(*d*) On October 22, a night of complete cloud, when the cloud-base was known to be between 4,000 and 9,000 ft., pulses at about half the rate were observed under the same conditions of gain and bias.

The conclusions are: (i) a large fraction of the light pulses observed are directly correlated with the cosmic radiations; (ii) none of the light pulses may be attributed to spurious effects, for example, high-tension breakdown, electromagnetic pick-up or noise pile-up; (iii) from the steepness of the front of the electrical pulse, it is deduced that the duration of the light pulses is less than approximately 0·2 μsec.

The negative result of experiment (*b*), in which we observed no light pulses on the nineteen time-bases triggered from the showers, may be accounted for by the smaller angle of acceptance for the light by the telescope than for showers by the Geiger array.

Some of the light pulses observed may result from relatively soft showers high in the atmosphere from which only a few particles survive at sea-level. There is no evidence in the experiments carried out so far to show that the light is, in fact, Čerenkov radiation rather than light produced by ionization. A series of experiments is planned to investigate the exact nature of the phenomenon.

The above experiments were undertaken following a discussion with Prof. P. M. S. Blackett, to whom we are grateful for his continued interest. We wish to thank Mr. W. J. Whitehouse and Dr. E. Bretscher for their encouragement, and Dr. T. E. Cranshaw for the use of the extensive shower array.

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Determinations of Size of Particles with the Electron Microscope

A method recently reported by Timbrell[1] for the determination of particle-size with the light microscope has been applied with slight modification to size determinations of textile-bonding agents with the electron microscope. These materials are dispersions of spherical polymer particles having sizes in the range 0–0·2 μ. The normal method of size determination involves measurements on photographic plates obtained at known magnification using a transparent graticule. This method, which is tedious, may be subject to errors due to fatigue of the operator; and the method described has been found much more rapid and reliable.

The photographs of the dispersion are obtained in the usual way with the electron microscope, and the plates are trimmed with a glass cutter so that they can be placed in the holder of an ordinary slide projector. The projected beam is intercepted and deviated on to a screen by a front-aluminized glass mirror which can be oscillated about a vertical axis. Size discrimination can then be made as in Timbrell's method, by the number of overlapping areas present on the screen, each representing a particle with a diameter larger than the amplitude of the oscillation. All the determinations made to date with the instrument have been obtained by counting overlapping areas for various settings of the amplitude control, thus giving the cumulative size-distribution curves.

It has been found advantageous to increase the visual effect of an overlap area by introducing a colour contrast in the following way. A circular sheet of 'Perspex' was dyed in two operations so that one half was red and the other half green. This was then

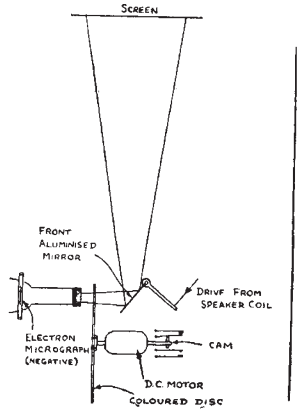

Fig. 1

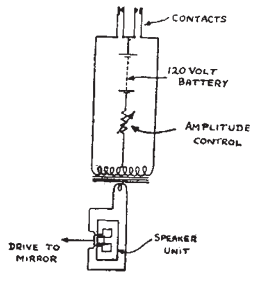

Fig. 2