LETTERS TO THE EDITORS

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Unit for Solar Radiation Work

In solar radiation work the unit called the gram calorie per square centimetre per minute is very frequently used; for longer time intervals, such as an hour or day, for example, the gm.cal./cm.^{2}/hr. or gm.cal./cm.^{2}/day is used, when appropriate. These units are somewhat cumbersome to write and even more awkward to say.

A more convenient unit is therefore needed. According to Linke[1] the 'langley' has been proposed to designate the gm.cal./cm.^{2}/min., in honour of Dr. Samuel P. Langley, who, as the first director of the Astrophysical Observatory of the Smithsonian Institution, contributed greatly to the study of solar radiation and its depletion by various gases in the earth's atmosphere.

However, in view of the need of considering longer time intervals than a minute, it is herewith proposed that the 'langley' be defined as the gm.cal./cm.^{2}, where 'gm.cal.' denotes the 15° C. gm.cal. It is also proposed that the written abbreviation of 'langley' be 'ly'; to shorten the word in other ways might tend to confuse it with other units.

Having adopted the new unit, we may now speak of the 'langley per minute', the 'langley per hour' (and so forth), which will be written as 'ly/min.' and 'ly/hr.'

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Linke, F., Vorbereitende Betrachtungen, "Handbuch der Geophysik", **8**, Lf. 1, 30 (Berlin, 1942).

Observations Underground of Penetrating Cosmic Ray Showers

Measurements have been made on two types of penetrating event in our laboratory on Holborn Tube station. The laboratory is approximately 100 ft. under clay. The measurements were as follows.

(*a*) *Penetrating Showers.* For these measurements, a seven-fold counter arrangement was used, illustrated in Fig. 1. This is identical with that used by Jánossy and Broadbent[1] in their study of these showers at sea-level at Manchester. There are three trays of eight counters each. The top tray is divided into three independent groups, while the middle and bottom trays are each divided into two groups as shown. Seven-fold coincidences, consisting of the simultaneous discharge of at least one counter in each group, were recorded. Between the top and middle, and middle and bottom, trays are lead screens 15 cm. thick, so that in order to produce genuine seven-fold coincidences, at least two particles capable of penetrating 30 cm. of lead must occur simultaneously. In our arrangement, the ends and sides of the set were screened with 10 cm. of lead to eliminate counter coincidences that could have been caused by showers produced by electrons knocked-on by mesons with their axes at a large angle to the vertical. The top layer of lead, for the production of showers, was 5 cm. thick. With this thickness of producer, Jánossy and Broadbent recorded a rate of 0·4 coincidences per hour at sea-level. In 45 days, we have not recorded any penetrating showers underground.

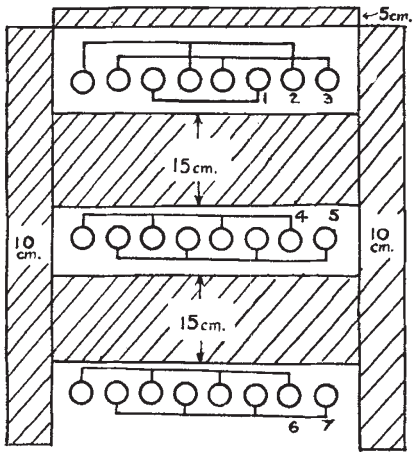

Fig. 1.

Periodical checks of the satisfactory operation of the apparatus were performed.

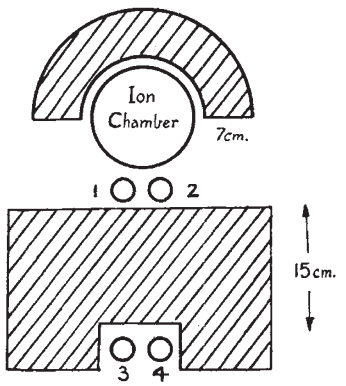

Fig. 2.

(*b*) *Penetrating Bursts.* The apparatus for these measurements is indicated in Fig. 2. It consists of a small ionization chamber filled with pure argon to 40 atmospheres pressure. Close above the chamber is a 7-cm. thick lead screen. Under the chamber is a set of four counters, the lower two being screened by 15 cm. of lead.

Ionization bursts were recorded using an amplifier and cathode ray oscilloscope. The minimum size of burst recorded was that corresponding to the passage of 20 fast rays through the chamber. Four-fold counter coincidences were recorded, and in addition, bursts accompanied by four-fold counter coincidences