Letters to the Editor

The Editor does not hold himself responsible for opinions expressed by his correspondents. He cannot undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.*

NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 837.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Intensity Variations in the Channel of the Return Lightning Stroke

PHOTOGRAPHY of lightning strokes with the Boys camera has shown that each separate stroke is of a dual nature, consisting of a leader and a return portion. It has been shown that the return stroke travels from ground to cloud, passing outwards along the branches when it reaches branching points of the leader. The charge on the leader branches passes in this manner to ground. It has also been shown that there is a marked diminution in the intensity of the light emitted from the main channel after the return stroke has passed a prominent branch.

The photographs also permit of the study of the manner in which the intensity at any point in the channel varies with time. It is found that this intensity at the ground end of the channel fluctuates in such a manner as to indicate a series of component discharges, all apparently passing upwards. A maximum number of six such components in the return stroke has been observed, but the components of high order are weak and not always clearly seen.

The time intervals between successive component discharges are indicated in the following table:

Component	1	2	3	4	5	6
Separation from first appearance of luminosity in return channel (microseconds)	0	7 to 75	37 to 370	110 to 580	510 to 2,100	815
Cases observed		25	21	7	3	1

The ratio of the intensities of the different components has been obtained by photometric analysis of photographs specially taken with this purpose in view. Component 2 is of the same order of intensity as component 1. In a few cases it is found that at a point above a prominent branch it is actually more intense than component 1. Between component 1 and 2 the luminosity of the channel falls to less than half its previous value. If the intensity of component 1 is taken as unity, that of component 3 is of the order of 1/10 and that of component 4 of the order of 1/200. The subsequent components are too feeble for a satisfactory determination of their intensities.

There is some evidence that the second, and sometimes also the third, component is related to the existence of the charge distributed along the branches. In a number of cases the time intervals between 1 and 2 is of the same order as that required for 1 to reach the start of a prominent branch. Component 2 thus starts at the moment that this branch charge is beginning to disappear, suggesting that it is associated with the induced charge bound on the surface of the earth beneath the branch.

Where prominent branches do not exist, as in the case of strokes after the first, the second component in the return portion does not start until the first has reached the cloud.

The influence of these components upon the wave-form of the atmospheric radiated from a lightning flash is being investigated.

Our thanks are due to the Lightning Research Committee of the South African Institute of Electrical Engineers for permission to publish this report.

D. J. MALAN.
B. F. J. SCHONLAND.
University of Cape Town.
H. COLLENS.
Victoria Falls and Transvaal Power Co.,
Johannesburg.

Radioactivity of some Rare Earths induced by Neutron Bombardment*

WE have studied the radioactivity produced by bombardment with slow neutrons in those elements of the rare earth group where the results of other workers are not in agreement.

The results are summarised below.

Compound	Half-period	Quantity used	Initial activity
Neodymium oxide	35 min. ± 5 min.	2 gm.	8 impulses per min.
Gadolinium oxalate	6·4 hr. ±0·3 hr.	14 gm.	16 " "
Dysprosium oxalate	2·5 hr. ±0·1 hr.	1 gm.	strong
Erbium oxide	5·8 min. ±0·2 min.	25 gm.	6 impulses per min.
	2·7 hr. ±0·2 hr.	25 gm.	very strong
Holmium oxide	2·6 hr.	0·01 gm.	very weak
Lutecium oxalate	3·6 hr. ±0·4 hr.	1 gm.	35 impulses per min.

The source of neutrons consisted of 500 mgm. of radium intimately mixed with 2 gm. of beryllium. The irradiation was carried out inside a block of paraffin wax 30 cm. high and 30 cm. in diameter.

The half-period of dysprosium and the long period of erbium were determined by means of an ionisation chamber and quadrant electrometer; this is a convenient method where strong activities of fairly slow decay are concerned. The remaining half-periods were found by means of a Geiger-Muller β-ray counter, with aluminium walls 0·2 mm. thick.

It was not possible to compare accurately the relative intensities of excitation, on account of the differences in the quantities and geometrical arrangements of the specimens of the rare earths. Nevertheless, an idea of the relative intensities can be gained from the additional information given in the table.

The half-period of 6·4 hr. obtained for gadolinium is in fair agreement with the value 8 hr. reported by Hevesy and Hilde Levi[1]. The half-period, 3·6 hr., of lutecium is close to the value 4 hr. given by Marsh and Sugden[2]. The short period of erbium reported by the latter authors has been carefully investigated

* Sir John McLennan died on October 9, but the observations here recorded were made with the joint author, Mr. W. H. Rann.—Editor, NATURE.