Letters to the Editor.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Mercury Band System in the Neighbourhood of the Resonance Line.

A BAND in the mercury spectrum referred to as 2540 has been the subject of much discussion, owing to its proximity and apparent relationship to the resonance line 2536·52, and to the fact that it is seen in absorption by unexcited mercury vapour of suitable density. I have long suspected that this is only one feature of a complicated band system in this neighbourhood. The investigation is much embarrassed by the glare of the resonance line, which makes it difficult to photograph delicate details in the immediate vicinity.

Recently examining some old spectrograms of a water-cooled mercury arc, I have been able to measure two similar and additional bands between this one and the resonance line. The wave-lengths are 2540·37, 2538·44, 2537·32. These are shaded *from* the red.

In addition, two bands have been measured on the other side of the resonance line at 2535·82 and 2535·35. These are shaded *to* the red.

There are faint suggestions of much more, which could probably be made definite if the source were carefully adapted to the purpose. Unfortunately, the large spectrograph used was destroyed by fire, which hinders any immediate progress.

RAYLEIGH.

Terling Place, Chelmsford,
Jan. 12.

Methods of Investigating the Intensities of γ-Rays.

THERE are two important methods of investigating the intensities of γ-rays, that of Skobeltzyn (*Zeit. f. Phys.*, **43**, 354; 1927: **58**, 595; 1929) and that of Ellis and Aston (*Proc. Roy. Soc.*, A, **129**, 189; 1930). We wish to point out that the results of the measurement of the intensities of the γ-rays of radium B and radium C by these two methods are in as good agreement as can be expected.

Skobeltzyn's method, which depends on the Compton effect, determines the intensity distribution throughout the spectrum, in the sense that it gives the quantity I_ν when $I_\nu \Delta\nu$ is the aggregate intensity of the γ-rays the frequencies of which lie in the interval ν to $\nu + \Delta\nu$. The quantity $\Delta\nu$, in this connexion, is not a differential, but is to be understood as an interval determined by the conditions of the experiment. In certain parts of the spectrum where there are two or more strong γ-rays close together, it is not possible to separate their effects, and, as can be seen from col. 3 of the following table, the Compton effect method gives the summated intensity (cf. Skobeltzyn, loc. cit., **58**, 609, Table 2, col. 4).

The method used by Ellis and Aston depends on the photoelectric effect, and while there are certain definite disadvantages in the method, it does possess the important advantage of giving the intensities of the individual γ-rays. These are shown in col. 2 of the table corrected for filtering through 3·5 mm. of lead to correspond with the conditions of Skobeltzyn's experiment. The ratios of the intensities obtained by the two methods are given in col. 4, from which it will be seen that there is on the whole good agreement.

To see what can be deduced from this agreement it is necessary to refer briefly to the main features of the measurements. Skobeltzyn's method depends on observing by the Wilson cloud method the relative number of electrons ejected within a certain angular range by the Compton effect of the different γ-rays. It is generally accepted that the data about absorption

INTENSITIES OF THE γ-RAYS OF RADIUM B AND C.

$h\nu$ of the τ-rays (volts × 10^{-5}).	Intensities by photoelectric method after 3·5 mm. lead (I_p).	Intensities by Compton effect method (I_c).	$\frac{I_c}{I_p}$.
2·43	0·011		
2·97	0·056 } 0·22	1	4·5
3·54	0·152		
6·12	0·415 } 0·46	1·8	3·9
7·73	0·046		
9·41	0·050		
11·30	0·160 } 0·26	1·19	4·5
12·48	0·050		
17·78	0·22	0·81	3·7
22·19	0·064	0·27	4·2

coefficients needed to deduce the relation intensities of the γ-rays is sufficiently well known for purposes such as the present, and that there is no fundamental uncertainty in the method.

Ellis and Aston's method, which depends on the photoelectric effect, determines essentially the relative values of the quantities $I_1\tau_1$, $I_2\tau_2$, etc., when I_1, I_2, etc., are the intensities of the γ-rays and τ_1 and τ_2, etc., corresponding photoelectric absorption coefficients. There is at present no direct experimental evidence about the variation of τ at these high frequencies, and to evaluate the results it was necessary to extrapolate from the X-ray region by an empirical formula.

The general agreement between the results of the two methods suggests that this extrapolation is approximately correct, and that we have therefore reasonable grounds for accepting the values of the individual intensities of such γ-rays as were measured by the photoelectric method.

In view of the important part played by the intensities of the γ-rays in certain speculations about the structure of radioactive nuclei, we feel it is of interest to point out how these two methods, when combined, yield information which is far more definite than that supplied by either alone. The certainty of the Compton effect method supplies just that deficiency in the photoelectric effect method, whilst the latter has the power of dealing with individual γ-rays, the lack of which is the chief disadvantage of the Compton effect method. A further point which brings out the complementary nature of the two methods is that the photoelectric method is best suited to lower frequency γ-rays, whilst the Compton effect method deals, if anything, rather more easily with the higher frequency γ-rays.

C. D. ELLIS.
D. SKOBELTZYN.

Uniform Propagation of Flame.

MASON and Wheeler,[1] following the initial observation of Mallard and Le Chatelier, considered that when a gaseous explosive mixture is suitably ignited at the open end of a horizontal glass tube, the other end of which is closed, flame travels at a uniform speed for some distance. The results of their experiments have been extended further by Wheeler and