Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 511.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Production of Radioactivity by Neutrons

IN a previous letter[1] we described the measurement of the half-lives of a few elements made weakly radioactive by neutron bombardment. The same neutron source and method have been used to investigate the radioactivity produced by slow neutrons in metallic zinc, cæsium nitrate, thallium acetate and bismuth carbonate, with the following results:

	Half-life
Zinc	100 minutes
Cæsium nitrate	75 minutes
Thallium acetate	97 minutes
Bismuth carbonate	No detectable activity

In addition we obtained the 6-minute half-life for zinc, reported by Fermi and co-workers.

The method we have used to calculate these half-lives, and also those published earlier, affords considerable accuracy in the case of relatively long-lived elements, even when the activity, measured by counts per minute, is very weak. Instead of plotting the rate of counting, dN/dT, as a function of time as is usually done ('differential method'), we have constructed an 'integral' curve (Fig. 1) in the following manner:

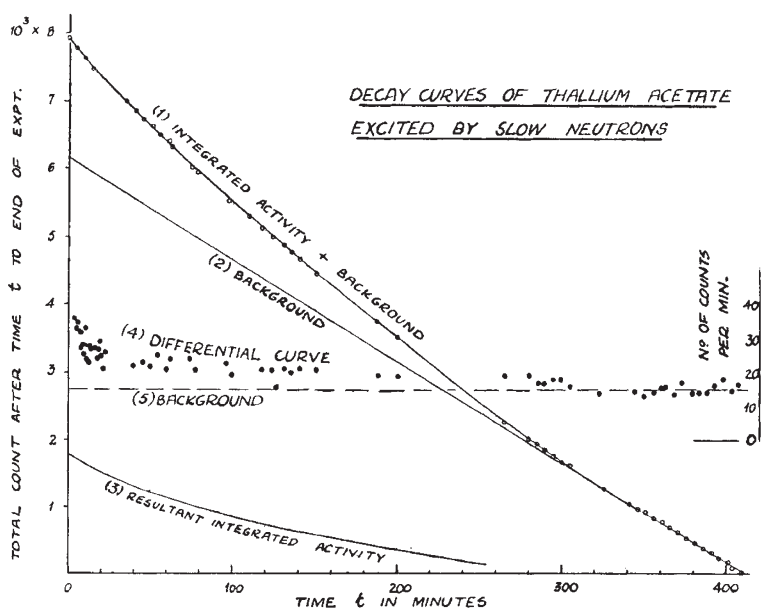

FIG. 1.

The activity was measured continuously until it had decayed to the normal background of the counter. A curve was then plotted to show the total number of impulses recorded, going backwards in time from the end of the experiment (curve 1). Part of this curve was due to the background, which contributed a total count increasing uniformly in time (curve 2). The difference between these two curves gave the true decay of the active substance (curve 3); it actually represented the number of excited atoms present at any time. The points of a logarithmic plot lay very close to a straight line.

The superiority of the integral curve method over the differential curve method is apparent from curves 3 and 4. The fluctuations in the counting rate make it exceedingly difficult to draw a smooth differential curve when the activity is weak.

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[1] NATURE, 135, 147, Jan. 26, 1935.

X-Ray Diffraction Patterns of Ice

DURING the last visit of the late Dr. E. W. Washburn to Toronto in the latter part of 1933, in an address on the properties of heavy water, he announced that water vapour, when condensed at very low temperatures, formed an amorphous rather than a crystalline solid. He reported that he did not know of any X-ray evidence to this effect. Mr. Fraser Oliver undertook to test this theory by taking X-ray photographs of the ice formed by condensation of water vapour on the outside of a copper rod. The copper rod could be maintained at any given temperature. The X-ray photographs were taken by the Hull-Debye-Scherrer method.

In the accompanying figure [see over] are reproductions of two photographs showing the X-ray diffraction patterns of ice formed at − 85° C. (*a*) and − 155° C. (*c*) respectively, together with microphotometer tracings (*b* and *d*) of the films. In the former case the diffraction pattern consists of lines characteristic of the close-packed hexagonal structure of ice, while in the latter there is one diffuse line corresponding to a spacing of 3·7 A., indicating the amorphous character of the condensate. The lines due to diffraction by copper are indicated in both photographs, the other lines being those due to ice.

The results of our experiments, to be published later more fully, indicate that there is a critical temperature about − 110° C. below which the