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(*Reprinted from* NATURE, *Vol.* 135, *page* 98, *January* 19, 1935.)

Radioactivity Induced by Neutrons

AMALDI, d'Agostino and Segrè[1] report that, using neutrons from a radon - alpha particle - beryllium source, they have induced an activity in indium of a very short half-life period (13 sec.) and also one of half-life period of about one hour (54 min.).

Our own unpublished observations on indium show the one hour period and a longer period of several hours (estimated at $3\frac{1}{2}$ h.). If indium is irradiated in air these two periods show strong initial intensities of the same order of magnitude, but if it is irradiated in water, the one hour period is so strongly reinforced that it overshadows the long period and may thereby prevent its detection. Thus three periods appear to exist for indium, and the two shorter ones of these are reported[2] to be strongly water-sensitive.

Indium has two known isotopes[3] (mass numbers 113 and 115, the ratio of their abundance being less than one to ten). It has an odd atomic number and since, apart from the isolated case of hydrogen, there is no precedent for such an element having more than two isotopes, we tentatively assume that no further stable indium isotope is involved. Accordingly we conclude that one of the two indium isotopes is activated with more than one period.

The question arises whether the observed periods can be interpreted on the basis of the primary processes which have so far been recognised in the Fermi effect. These recognised processes are : (*a*) capture of the neutron by the nucleus (all cases so far investigated were reported to be water-sensitive) ; (*b*) ejection of a heavy positively charged particle—a proton or an alpha particle—from the nucleus (all cases so far investigated were reported not to be water-sensitive). Some isotopes of lighter elements are known to be activated with two or three periods, the ejection of a proton or an alpha particle being quite a common process for elements lighter than zinc (atomic number 30). No such processes have so far been observed for elements heavier than zinc.

In the circumstances the Fermi effect of indium (atomic number 49) seems to deserve further investigation, for which adequate instruments of observation are not at present at our disposal.

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Dec. 18.

[1] Amaldi, d'Agostino, Segrè, *Ricerca Scientifica*, V, 2, No. 9–10 November 1934.
[2] Amaldi, d'Agostino, Fermi, Pontecorvo, Rasetti, Segrè, *Ricerca Scientifica*, V, 2, No. 11–12, December 1934.
[3] Wehrli, *Helvetica Physica Acta*, 7, 6, 611 ; 1934.

Printed in Great Britain by FISHER, KNIGHT & CO., LTD., St. Albans