Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 524.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Atomic Numbers of the So-called Transuranic Elements

WE have recently had the opportunity of obtaining a very strong preparation of the so-called transuranic elements, which are precipitated with platinum as sulphide in acid solution, from roughly 100 grams of uranium, after an irradiation with the neutrons of (^{7}Li + ^{2}H) carried out for us in the Cavendish High-Voltage Laboratory. A deuteron current of 100 μa. at 900 kv. was employed over a period of several hours, and the source of neutrons and the uranium were surrounded with a large amount of paraffin so that 'thermal' as well as fast neutrons were effective in the transformation.

The platinum precipitate, weighing less than 20 mgm., separated four days after the irradiation, was examined in a tube counter filled with xenon and alcohol vapour. The counter was fitted with a thin mica window at one end, and roughly 20,000 impulses per minute were recorded with the bare source 2 cm. from this window. When the β-particles were absorbed in graphite, roughly 425 impulses per minute remained. Absorption measurements using aluminium, copper and lead showed that, of these, more than a hundred impulses per minute were to be attributed to a quantum radiation in the ordinary X-ray region.

Further measurements were then made with thin foils of molybdenum (42), palladium (46), silver (47), cadmium (48), indium (49) and tin (50). In this range of elements, a large increase in transparency was observed between indium and tin; 30 mgm./cm.^{2} of tin reduced the counting rate by 36 per minute, whereas the same mass per square centimetre of any of the other elements produced a diminution which was almost twice as great. The simplest interpretation of this result is that a quantum radiation of wave-length between 0·443 A. and 0·424 A., the wave-lengths corresponding to the K absorption energies of indium and tin, is emitted by the source. According to the tables of natural X-radiations, the $K\alpha$-radiations of iodine alone lie in this interval of wave-length. Again, then, the simplest supposition to make is that the element iodine is, in fact, one of the bodies present in the platinum precipitate, being formed from tellurium by β-transformation.

According to previous results[1], our precipitate contained only the radioactive bodies of half-value periods 66 hr. and 2½ hr. respectively. We therefore investigated chemically the suggestion that these bodies are in reality isotopes of tellurium and iodine. Strong confirmation was obtained from the fact that we were able to concentrate the activity of shorter period in a precipitate of silver iodide. On the basis of these results, it is very unlikely that any of the active products hitherto separated with platinum from irradiated uranium is a true transuranic element; rather must they all be regarded as originating in a similar process of nuclear fission to that in which the barium and lanthanum bodies have recently been shown to arise.

These results had been obtained when the *Physical Review* of February 15 was received in the laboratory. It is of interest to remark that Abelson[2] there records similar observations, made some time earlier than ours, and draws similar conclusions from his observations.

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March 9.

[1] Meitner, Hahn and Strassmann, *Z. Phys.*, **106**, 249 (1937).
[2] Abelson, *Phys. Rev.*, **55**, 418 (1939).

Transmutation of Uranium and Thorium by Neutrons

IT has been shown by Hahn and Strassmann[1] that uranium bombarded by slow neutrons forms a radioactive noble gas. We repeated their experiments, using the very strong neutron source of the Philips X-Ray Laboratory. About 500 cm.^{3} of a saturated solution of uranyl nitrate was irradiated. Air was bubbled through the liquid at a rate of 600 cm.^{3} per minute, then it passed through a tube filled with cotton-wool (length 15 cm.) and through a wash-bottle containing 40 cm.^{3} of water with a small amount of nitric acid and one drop of ammonia. After adding cæsium, rubidium, barium, strontium and lanthanum salts we obtained from the contents of this wash-bottle radioactive substances which could be precipitated together with cæsium, rubidium and barium.

Cæsium, precipitated after 15 minutes with antimony chloride dissolved in hydrochloric acid, showed periods of 10 minutes, 30 minutes and a longer period. Precipitating the cæsium from the solution 45 minutes after the irradiation had been finished, we obtained the 30-minute period only.

Rubidium was obtained by precipitation with a saturated solution of sodium bitartrate, dissolving the precipitate in dilute hydrochloric acid and adding perchloric acid. Occasionally the precipitation of the bitartrate was repeated in order to remove traces of cæsium. A period of 16 ± 2 minutes was found. As the decay curve has a shape quite different from that of the cæsium precipitate (neither a shorter nor a longer period was observed), this activity cannot be ascribed to small amounts of cæsium.

We looked for a short period in precipitates of the mixed alkali perchlorates prepared in a very short time. A period of 1–2 minutes was observed. We could not determine whether this activity is due to cæsium or rubidium.