

Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 72.

Disintegration by Slow Neutrons

FERMI and his collaborators¹ have reported that neutrons slowed down by collisions in substances containing hydrogen are captured by many nuclei very much more frequently than are fast neutrons. In the cases reported, the process is one of pure capture, resulting in the formation of a higher isotope. It is to be expected that slow neutrons may cause a nuclear transformation with the emission of heavy particles if energy can be released in the process. The probability of such a reaction will depend on the mutual kinetic energy and potential barrier of the resulting particles, and may be large when these quantities are of the same order of magnitude; this can in general only be expected for elements of low atomic number.

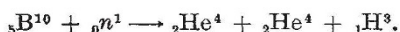
We have examined some of the lighter elements for such transformations. The general procedure was as follows. The element under examination was enclosed, as target or as gas, in an ionisation chamber connected to an amplifier and oscillograph and exposed to the bombardment of neutrons from a radon-beryllium source. A small number of ionisation 'kicks' was always observed, due mainly to recoil particles. The source and chamber were then surrounded by paraffin wax, thus exposing the target or gas to the bombardment of slow neutrons. In some cases, notably those of lithium and boron, a very large increase in the number of 'kicks' was observed, indicating that a nuclear transformation was taking place.

With lithium, the kicks observed were of two kinds, one due to doubly charged particles and one to singly charged particles. By covering the lithium target with aluminium foils we found that the singly charged particles had a maximum range of about 5.5 cm. in air, and that the range of the doubly charged particles was less than 1.5 cm. This suggests that the particles arise from the reaction



From the masses of the nuclei concerned, an energy release of about 5 million electron volts is expected, and a range of the H^3 particle which agrees well with that observed.

In the case of boron, the majority of the particles appear to be doubly charged and to have ranges less than 5 mm. in air. The only reaction which appears to fit the facts is



A small but definite effect has been observed with nitrogen, and a rather doubtful effect with beryllium.

The most interesting feature of these reactions is their very high probability. The cross-section² for capture of a slow neutron by Li^6 or B^{10} appears to be of the order of 10^{-21} sq. cm., a magnitude which suggests that there is an attractive force between a

nucleus and a neutron at relatively large distances. The above reactions afford a convenient and sensitive means for detecting the presence of slow neutrons.

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¹ Fermi, Amaldi, Pontecorvo, Rasetti and Segrè, *Ricerca Scientifica*, V, 2, 282; 1934.
² cf. Fermi, Pontecorvo, Rasetti, *ibid.*, 380; 1934.

Metaplasia of Uterine Epithelium Produced by Chronic Œstrin Administration

THE synthesis of polycyclic compounds possessing both Œstrogenic and carcinogenic properties¹, the finding of considerable amounts of Œstrin in cancerous tissue² and in the blood of tumour-bearing male mice³, and the demonstration in various ways of a correlation between the amount of Œstrin present in the body and the incidence of spontaneous mammary carcinoma (in susceptible strains of mice)⁴ have led many students to suspect an interrelationship between epithelial growths and the female sex hormone. Metaplasia from columnar to stratified epithelium in the seminal vesicles and coagulating glands of male mice and rats treated with Œstrin has been noted^{5,6,7}, but analogous effects in female animals have not been reported. Overholser and Allen⁸ have found that treatment with Œstrin and corpus luteum hormone enhances the atypical epithelium proliferation produced by traumatization of the cervix uteri in monkeys; but since this proliferation occurred in a region in which squamous epithelium is normally present, it cannot be said whether metaplasia occurred or not.

Recently, a series of experiments were planned with the view of determining to what extent the 'anti-hormone' theory⁹ might be found applicable. In one of these a group of eight female castrates were injected daily intraperitoneally with 30-60 γ of Œstrone in oil (crystalline folliculin, kindly supplied by Dr. Girard) over a period of ten weeks. The mammary glands showed marked duct proliferation with some formation of alveoli; the degree of development was the same in biopsy specimens removed two weeks after the beginning of treatment as at the end of the experiment. Biopsy specimens also showed that the uterus and vagina preserved their Œstrous development throughout the whole period. The experiment therefore confirmed the statement of D'Amour¹⁰, that loss of sensitivity to Œstrin does not occur. But when the animals were killed after ten weeks treatment, histological examination of their uteri showed in four cases a more or less complete metaplasia of the cylindrical secretory epithelium into a stratified squamous epithelium with cornification, from which irregular buds penetrated deep into the stroma.