Letters to the Editor.

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An Attempt to Accelerate the Rate of Radioactive Transformation.

DANYSZ and Wertenstein showed in 1915 (*Comptes rendus*, **161**, 784; 1915) that when uranium oxide is bombarded by the α-rays of radium, not one in five million α-particles is effective in changing an atom of U into an atom of UX_1. If we consider that with a layer of uranium containing 1 mgm. per cm.^{2} one α-particle in 20,000 penetrates to a distance less than 5×10^{-12} cm. from the nucleus, and that the emission of an α-particle from uranium seems to start at a distance greater than 5×10^{-12} cm., it is surprising that the unstable radioactive atom shows itself so stable.

According to a theory put forward by Sir Ernest Rutherford (*Phil. Mag.*, Sept. 1927) the α-particles circulate round the nucleus as neutralised satellites. If external action brings about an α-transformation, this action must lead to the artificial break up of an α-satellite. Such a break up must take place in a spontaneous α-disintegration, but while in this case the two electrons go to the nucleus, the violent commotion in the artificial disintegration may lead to the escape of the electrons. If this really happens, a favourable collision of an α-particle with a radioactive nucleus may result in a triple (one + two β) transformation. This assumption would explain the negative results of the former work, for in the case of uranium bombarded with α-rays, a favourable encounter would result in the formation of an atom of U II and not of UX_1, as was previously assumed.

On account of the long period of U II the effect could not be detected unless there were an abundant formation of atoms.

In the case of thorium, however, the product formed after one α- and two β-transformations would be radiothorium with a period of only 2·02 years, and calculation shows that the limit of sensitivity in detecting the change Th–RaTh is about the same as for U–UX_1.

We therefore repeated Danysz and Wertenstein's experiment, substituting thorium for uranium, and we tried to detect changes in α-ray, and not β-ray, activity. We prepared three sources, each containing about 1 mgm. ThO_2 in a uniform layer 3 mm. × 7 mm. Such a layer is equivalent in absorption of α-rays to about 1 cm. air. The sources were covered with thin aluminium leaf to avoid loss of activity by escape of emanation, an effect which was, however, found to be negligible. Their α-ray activity was tested in a differential α-ray ionisation chamber connected with a Wilson electroscope. A difference of activity corresponding to 1/10 mgm. ThO_2 could easily be measured. One of the sources was used as a standard, the others were exposed for six days to the α-rays of radon. They were placed one on either side of a thin-walled glass tube (equivalent stopping power 1·5 cm.), containing initially 28 millicurie of radon. Each source received nearly half the total α-emission. After six days the sources were each compared with the standard. Within 2 per cent no change in activity could be detected.

The number of α-particles from radon and products which fell on each source during the time was $2{\cdot}2 \times 10^{14}$. 1 mgm. thorium with its products gives 27 α-particles per second, and 1/20 of this could be detected, so that if any radiothorium were produced by the bombardment, it gave less than 1·35 α-particles per second. For radiothorium, the disintegration constant $\lambda = \frac{1}{9{\cdot}2 \times 10^7}$ sec.$^{-1}$, and then follow five α-ray products of short life, so that the number of atoms of radiothorium corresponding to 1·35 α-particles per second is $\frac{1{\cdot}35}{5} \times 9{\cdot}2 \times 10^7 = 2{\cdot}5 \times 10^7$.

It appears that the upper limit of the probability of an α-ray collision producing an explosion of this type in the α-satellite is $\frac{2{\cdot}5 \times 10^7}{2{\cdot}2 \times 10^{14}}$; less than one in eight million.

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The Recognition of a New Category of Structures in Spermatogenesis.

IN connexion with some work which Dr. Sylvia Wigoder and I are carrying out, it became necessary to re-examine the spermatogenesis of *Cavia*. By chilling the Da Fano fluid (5° C.) it was possible to get extremely good and unshrunken preparations. These revealed a remarkable argentophile band on the ripe sperms (Fig. 1, PNB), which was easily traced back into the spermatid (Fig. 2, No. 13, PNG) in the form of a group of granules, which constituted in the later spermatid (Fig. 2, No. 14) a sort of coalescing network embracing the hinder part of the nucleus. This reminded me of similar structures already described in *Saccocirrus* (*Q.J.M.S.*, 1922, and Fig. 2, Nos. 1 and 2, PNB) and in a number of pulmonate mollusca (*ibid.*, 1919, and Fig. 2, Nos. 3 and 4, PNG, post-nuclear granules).

FIG. 1.

The finding of such undoubtedly homologous structures in an annelid, molluscs, and a mammal, made it likely that the post-nuclear system was universal in flagellate spermatogenesis, and the papers of Bowen have been consulted. It is impossible here to enter into all the work of Bowen, but in the pentatomid, *Murgantia* (Fig. 2, Nos. 5 and 6, PNB), Bowen has given a practically correct account of the post-nuclear system (his 'pseudo-blepharoplast'). In probably a number of cases Bowen has mistaken the post-nuclear body for a centrosome or middle-piece. In the urodele (Fig. 2, Nos. 7, 8, and 9), for example, it seems likely that the 'middle-piece' of Meves and Bowen (PNG) is the post-nuclear apparatus. In *Cincindela*, the post-nuclear band, Bowen's chromatinic 'chromatic