sorption and microspectrographical studies at low temperatures, both on individual compounds and on biological specimens.

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¹ Holiday, E. R., *Biochem. J.*, **30**, 1795 (1936).

² Caspersen, T., see, for example, Symposium No. 1 of the Society of Experimental Biology, "Nucleic Acid", 126 (Cambridge, 1947).

³ Loofbourow, J. R., Scott, J. F., and Sinsheimer, R. L., *Science*, **107**, 302 (1948).

⁴ Holiday, E. R., *J. Sci. Instr.*, **14**, 166 (1937).

Disintegration of Separated Isotopes of Magnesium by Deuterons

IN a recent study of the transmutation of a number of elements by deuterons¹, the emission of three groups of protons from magnesium under deuteron bombardment was reported. These groups were assigned to particular isotopes by arguments based chiefly on the value of the energy released in similar reactions with other elements and on differences between the excitation functions of the groups. We have now been able to bombard separated isotopes, and the accompanying graph shows the proton groups observed from targets of magnesium-24, -25 and -26 deposited on stainless steel. The deuteron energy was 930 keV. as in the earlier experiments, and the protons were observed at right-angles to the incident beam. The three targets for which the results are shown in the figure were cut from larger areas on which the magnesium was deposited; but since the deposits were not uniform, the target thicknesses could not be accurately estimated. In the case of the magnesium-24 target, observation of the width of a ($p\gamma$) resonance-level suggested an equivalent thickness of about 10 keV.; the thickness of the magnesium-25 and -26 targets was unknown, and the relative intensities of the groups shown in the graph are therefore unlikely to be those which would be obtained from targets in the normal isotopic ratio of thickness.

The earlier interpretation of the proton groups now has to be revised and extended as follows:

Magnesium-24: The groups observed (Fig. *a*) are similar in range and relative intensity to those found from ordinary magnesium targets. The *Q*-value of 5.03 MeV. previously given¹ for the reaction $Mg^{24}(dp)Mg^{25}$ is therefore confirmed, and the other two groups shown in Fig. *a* indicate excited states in magnesium-25 at 0.58 and 0.98 MeV.

Magnesium-25: We believe that the groups observed (Fig. *b*) from this target are due to contamination by magnesium-24, since they are the same both in range and relative intensity, within the limits of error of the experiment, as those observed from the magnesium-24 target. This has been established by careful counting, under conditions of good geometry and low bias, for several different magnesium-25 targets. There is no evidence for the previous assignment of the 35-cm. proton group to the transmutation $Mg^{25}(dp)Mg^{26*}$, although a small group of this range from magnesium-25 would be obscured by the contamination groups from magnesium-24. The main reason for originally ascribing the 35-cm. group to the transmutation of magnesium-25 was the fact that its excitation function differed

Number-range curves for protons emitted in the bombardment of targets of separated isotopes of magnesium by deuterons: (a) Mg^{24} ; (b) Mg^{25} ; (c) Mg^{26} . The target thicknesses do not necessarily correspond to the normal isotopic ratio

strikingly from that of the 32- and 42-cm. groups¹. Two of us (C. A. W. and C. D. C., unpublished) have since shown that this difference may be explained by variations in the angular distribution of the emitted particles with bombarding energy.

Magnesium-26: The group of protons of range 32 cm. (Fig. *c*) found from the separated target would not have been resolved in the experiments with ordinary magnesium from the strong group of similar range from magnesium-24. The new group gives a *Q*-value of 4.21 ± 0.1 MeV. for the reaction $Mg^{26}(dp)Mg^{27}$ instead of the value previously quoted of 4.05 MeV. The group of protons at 48 cm. appears on blank targets and could be due to carbon contamination.

The separated targets have also been used to confirm the reaction $Mg^{26}(d\alpha)Na^{24}$ ¹. The 15-hr. activity of sodium-24 was easily observed and followed from the magnesium-26 target after deuteron bombardment, while the activity of this period from similarly bombarded targets of magnesium-24 and -25 was at least ten times smaller.

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¹ Allan, H. R., and Wilkinson, C. A., *Proc. Roy. Soc., A*, **194**, 131 (1948).