LETTERS TO THE EDITORS

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IN THE PRESENT CIRCUMSTANCES, PROOFS OF "LETTERS" WILL NOT BE SUBMITTED TO CORRESPONDENTS OUTSIDE GREAT BRITAIN.

NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 784. CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

A New Type of Disintegration Produced by Deuterons

IN a previous communication from this laboratory, Krishnan and Gant¹ reported the formation of ^{108}Ag when silver was bombarded with 9 Mev. deuterons. It appears that this reaction can only be explained by

Since it is well known that ^{62}Cu can be produced by certain methods which also yield ^{108}Ag (namely, $n - 2n$, $\gamma - n$), it was therefore considered that deuteron bombardment of copper might also produce ^{62}Cu . We have bombarded pure copper foil with a few microampere-minutes of 9 Mev. deuterons from the Cavendish cyclotron. The copper fraction was chemically separated from the bombarded sample and its positron activity was examined with a Geiger-Müller counter (the magnetic field used to resolve

the curve clearly indicates that the effect cannot be due to the neutron or γ -ray background, and it would seem to explain why the effect was not observed earlier, in that previous experimenters did not use deuterons of more than 8 Mev. energy.

Further experiments were made in an attempt to decide whether the reaction was $(d - d, n)$ or $(d - p, 2n)$. If the latter alternative be correct, the $(d - p)$ reaction should be observed to decrease as the $(d - p, 2n)$ reaction increases, these two being opposing reactions. The excitation function for the formation of ^{62}Cu (12.8 hr.) by deuteron bombardment of copper [$(d - p)$ reaction] was measured (this was first done by A. G. Ward in this laboratory and later confirmed by us), and it was observed that the yield from this reaction decreased above 8 Mev. This result would seem to show that in the formation of ^{62}Cu the $(d - p, 2n)$ reaction is more probable than the $(d - d, n)$ reaction.

R. S. KRISHNAN.
T. E. BANKS.

Cavendish Laboratory,
Cambridge.
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¹ Krishnan and Gant, NATURE, 144, 547 (1939).

² Livingood and Seaborg, Rev. Mod. Phys., 12, 30 (1940).

the positrons being adjusted so that the positrons from ^{64}Cu were excluded). A single positron activity of energy more than 2 Mev. with a half-life of 10.5 minutes was observed. This would appear to be due to the well-known $^{62}\text{Cu}^2$. Excitation function measurements were made by exposing a pile of copper foils (11.4 mgm./sq. cm.) to the deuteron beam and then measuring the activities after chemical separation as above. The accompanying energy-yield curve was obtained.

The threshold for the production of this radioelement seems to be at about 7 Mev. The nature of

Calculations on the Energies of Hydrocarbons

WE have made a number of calculations on the energies of various hydrocarbons and have also obtained related properties such as the internuclear distances in the ground and simple excited states, the heats of formation and the approximate wavelength of certain absorption bands. Incidentally, an estimate of the heat of sublimation of carbon has been made which is probably as reliable as any other value hitherto given.

The energy of the most stable state of benzene may be written $6H + 6S - 0.4J$, while the energy of the nearest excited singlet state is $6H + 6S - 3.0J$, where H is the energy of the carbon-hydrogen bond, S and J are functions defined by Lloyd and Penney¹. The shape of the excited state is found to be regular, with the C-C link about 1.44 Å. in length. The experimental value of the 'breathing frequency' in this state is 920 cm.⁻¹. The calculated value is a little more than 900 cm.⁻¹, the exact value depending on the type of potential function assumed for the double bond and the normal 'benzene' bond (namely, parabolic law, Morse function, etc.). The energy difference between the two states is roughly $2.6J$, where J has its value at the normal ring distance, and is therefore 1.85 e.v. Hence the absorption band