periods, too, will have to be ascribed to elements considerably lighter than uranium.

In conclusion, we wish to thank Dr. T. Bjerge, Dr. J. Koch and K. J. Brostrøm for putting the high-tension plant at our disposal and for kind help with the irradiations. We are also grateful to Prof. N. Bohr for the hospitality extended to us at the Institute of Theoretical Physics, Copenhagen.

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Radioactive Organic Bromo-Compounds

CONSIDERABLE attention has recently been focused on the use of artificially radioactive substances in biological work. The radioactive isotope ^{82}Br has been chosen by us because it has a conveniently long half-life (34 hours), it is chemically reactive, it gives off gamma-rays which aid in its detection, and finally, it can be prepared from ^{81}Br either by the action of slow neutrons or deuterons. Slow neutrons are easily available from the radon-beryllium reaction. Fast deuterons from the cyclotron or any other suitable high-energy source may be used either as projectiles themselves or for the production of slow neutrons as in the lithium reaction below. The relative abundance of ^{81}Br in natural bromine is 49·3 per cent. Contamination of radioactive ^{82}Br by other isotopes is of no consequence since bromine forms no non-bromine radioactive elements on bombardment by slow neutrons or deuterons[1].

Two reactions have been studied. The first is the Sandmeyer reaction for the introduction of bromine into the benzene ring. 345 c.c. of water containing 50 gm. Cu_2Br_2, 175 gm. $NaBr.2H_2O$ and 30 c.c. HBr (density 1·49) was bombarded by slow neutrons produced from lithium with 900 kev. deuterons. 250 gm. of $CHBr_3$ was also bombarded. The glass vessels were surrounded by thick blocks of paraffin. Two experiments were then performed. 115 c.c. of the solution called the Sandmeyer solution was shaken with the whole of the bombarded $CHBr_3$ to concentrate the radioactivity[2], then separated off and extracted with $CHCl_3$. 14·5 gm. of $C_6H_5NH_2$ was diazotized in the usual manner and 11·8 gm. of C_6H_5Br prepared, called C_6H_5Br (1). Another sample, called C_6H_5Br (2), was made from a second 115 c.c. of the Sandmeyer solution, not shaken with the $CHBr_3$. As expected, attempts to exchange the radioactive bromine in C_6H_5Br by shaking with NaBr were wholly unsuccessful.

Table 1 shows the radioactivity per gram atom of bromine compared to that of the Sandmeyer solution before concentration of the radioactivity. Measurements were made with a thin-walled Geiger-Müller counter. The samples were in glass vessels and the measurements were made nearly simultaneously to obviate corrections due to radioactive decay. It is to be emphasized that, although care was taken to keep the geometry constant, the results can only be taken as qualitative.

TABLE 1

	Relative radioactivity per gram atom Br.
Sandmeyer solution	1·0
$CHBr_3$ before enrichment of Sandmeyer solution	2·6
$CHBr_3$ after enrichment	1·4
C_6H_5Br (1)	4·2
C_6H_5Br (2)	0·6
C_6H_5Br (1) after shaking with NaBr	4·2

The second technique is the addition of bromine to a double bond. 100 gm. CH_2Br_2 was irradiated with slow neutrons and after irradiation 0·2 c.c. of bromine was added. Three hours later 1·2 gm. of cholesterol in 12 c.c. of ether was added, and the CH_2Br_2 distilled off in vacuum. The crystalline residue was dissolved in ether and recrystallized. Table 2 shows the relative radioactivity per gram atom of bromine compared with the irradiated CH_2Br_2. Experiments with $CHBr_3$ in place of the CH_2Br_2 yielded an oil from which the cholesterol dibromide could not be separated.

TABLE 2

	Relative radioactivity per gram atom Br.
CH_2Br_2 before enrichment	1·0
CH_2Br_2 after enrichment	0·5
Cholesterol dibromide	300

The first method does not yield such a high concentration of radioactive material. It may be of use in the labelling of halogenated molecules and the determination of their fate in the body. The second technique gives a very high concentration of radioactivity. It is hoped to obtain concentrations high enough to enable us to study the effect of artificial radioactivity on normal and pathological tissues. Further work will be done along these lines.

We wish to express our thanks to the members of the Cavendish High Tension Laboratories for help in the slow neutron bombardments.

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Catalytic Exchange of Deuterium and Hydrogen in Hydrocarbons

IN a recent communication[1], L. and A. Farkas have followed the exchange of deuterium for hydrogen in cyclohexane and hexane on platinized foil at relatively low temperatures. They suggest that the catalytic mechanism for both saturated and unsaturated hydrocarbons involves the primary detachment of a hydrogen atom from the hydrocarbon. We have had occasion to examine the mechanism of catalytic exchange with olefines by a number of different methods, and have come to the definite conclusion that the primary act in the case of olefines is the addition and not the loss of a hydrogen atom.