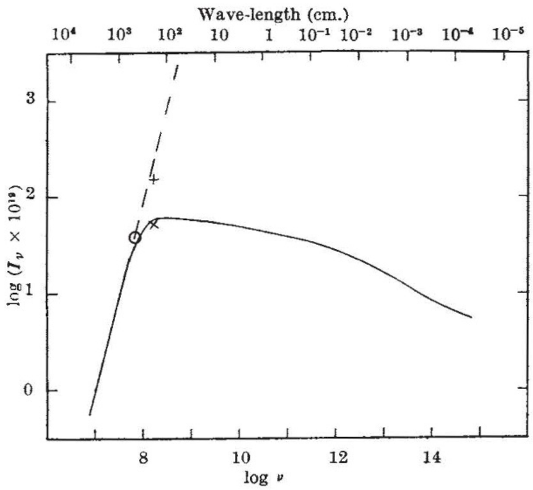

THE FULL CURVE REPRESENTS THE COMPUTED RADIATION FROM FREE ELECTRONS IN INTERSTELLAR SPACE, IN THE DIRECTION OF SAGITTARIUS. THE BROKEN LINE SHOWS BLACK-BODY RADIATION FROM A TEMPERATURE OF 10,000°. OBSERVATIONS: BY HEY, PHILLIPS AND PARSONS ARE SHOWN BY THE OPEN CIRCLE; BY REBER AS CROSSES:—1940 (×) AND 1944 (+)

the first place, it is necessary to consider the fraction of the area of the sky covered by stellar disks (the 'dilution' of stellar radiation). This fraction depends on the space density of the stars, on stellar radii, and on the extent of the galactic system. Numerical data are given by Dunham[5] for stars of various types. Stars similar to the sun, dwarf *F*0 to *M*, and giant *F*0 to *G*9 all have similar dilutions, $\delta = 10^{-14}$. It may be thought that hotter stars would be more efficient because of their higher luminosities. However, because of the relatively small number of such stars in space, δ drops to 10^{-17} for *B*0 stars.

The energy received at the earth from the cooler stars, assuming a constant emission at the maximum level observed by Hey[2], would be 5×10^{-27} ergs/sq. cm./sec./kc./sq. degree, which is of the order of 10^{-9} of the observed cosmic radiation. The solar observations indicate that the time-average radiation is considerably lower than the peak value, on which the above figure is based. A low time-average would lead, of course, to an even greater discrepancy. If the hotter stars are considered, the larger dilution results in a discrepancy of 10^{-12}, without considering the time-average effect. In other words, a hot star would have to suffer disturbances 10^{12} times as intense as those observed in the sun, per unit area of its disk, if such bursts are to account for the cosmic radiation at radio frequencies. It would seem probable that the solar observations represent a new and different type of phenomenon from that observed by Reber[6] and by Hey, Phillips and Parsons[1]

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Separation of Nuclear Isomers in the Electric Field

Segré, Halford and Seaborg[1] demonstrated the isomeric filiation of bromine 80 by a chemical method on the basis of the Szilard–Chalmers process. We have carried out experiments in which the isomeric filiation is proved by a physical method, collecting the isomers when partly separated by means of an electric field using electrodes in a non-electrolytic solution.

To study the isomeric filiation of bromine 80 of two periods, 17·4 min. and 4·4 hr., 250 c.c. of $C_2H_4Br_2$, surrounded by water, were irradiated for 15 hours by means of neutrons of a radium-beryllium source of 400 mC. After irradiation, the solution was submitted to an electric field (115 volts/cm.) for three hours. The electrodes used are silver plates of 5 cm. × 4 cm., 3 cm. apart.

Three hours after irradiation, all the bromine of 17·4 min. period directly formed has gone, and the 17·4 min. period activity collected on the plates is produced by isomeric filiation (Fig. 1). The same experiment has been made without field (Fig. 2). In both cases the activities of the anode were measured by a Geiger–Müller counter, using a scale of sixteen. With the electric field (Fig. 1), the 17·4 min. period appears very strongly.

In such experiments, the question of the expulsion of bromine from the molecule does not seem to be concerned as is the case in chemical separation, where the recoil effect is the important factor[1–4]. Here the effect seems to be based mainly on the ionization.

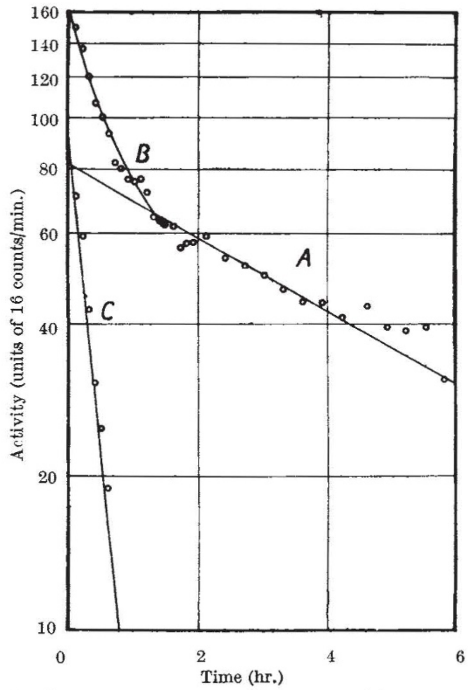

Fig. 1. WITH ELECTRIC FIELD. *A*, BROMINE, 4·4 HR. ACTIVITY; *B*, BROMINE, 17·4 MIN., AND 4·4 HR. ACTIVITIES; *C*, BROMINE, 17·4 MIN. ACTIVITY

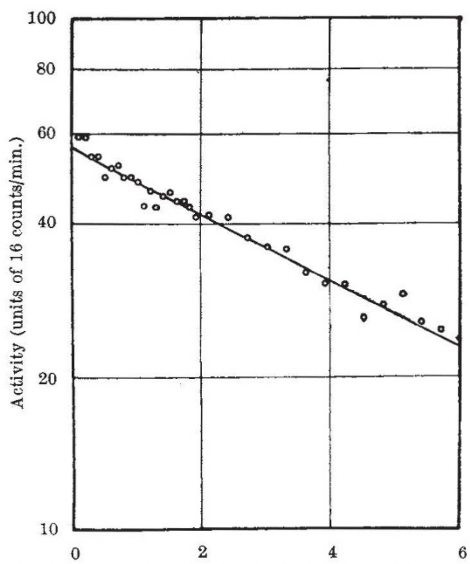

Fig. 2. WITHOUT ELECTRIC FIELD. BROMINE, 4·4 HR. ACTIVITY

By this method we hope to be able to determine the conversion factor[5]. We also hope to apply the method where the chemical separation has failed and as far as conversion permits.

In the case of $C_2H_4Br_2$, more activity was collected on the cathode than on the anode. A first experiment with C_6B_5Br shows more activity on the anode, as in the results of Fay and Paneth[6].

A full report will be published later.

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