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Radiation Laboratory

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SUMMARY OF THE RESEARCH PROGRESS MEETING

July 15, 1948

Margaret Foss Folden

Berkeley, California

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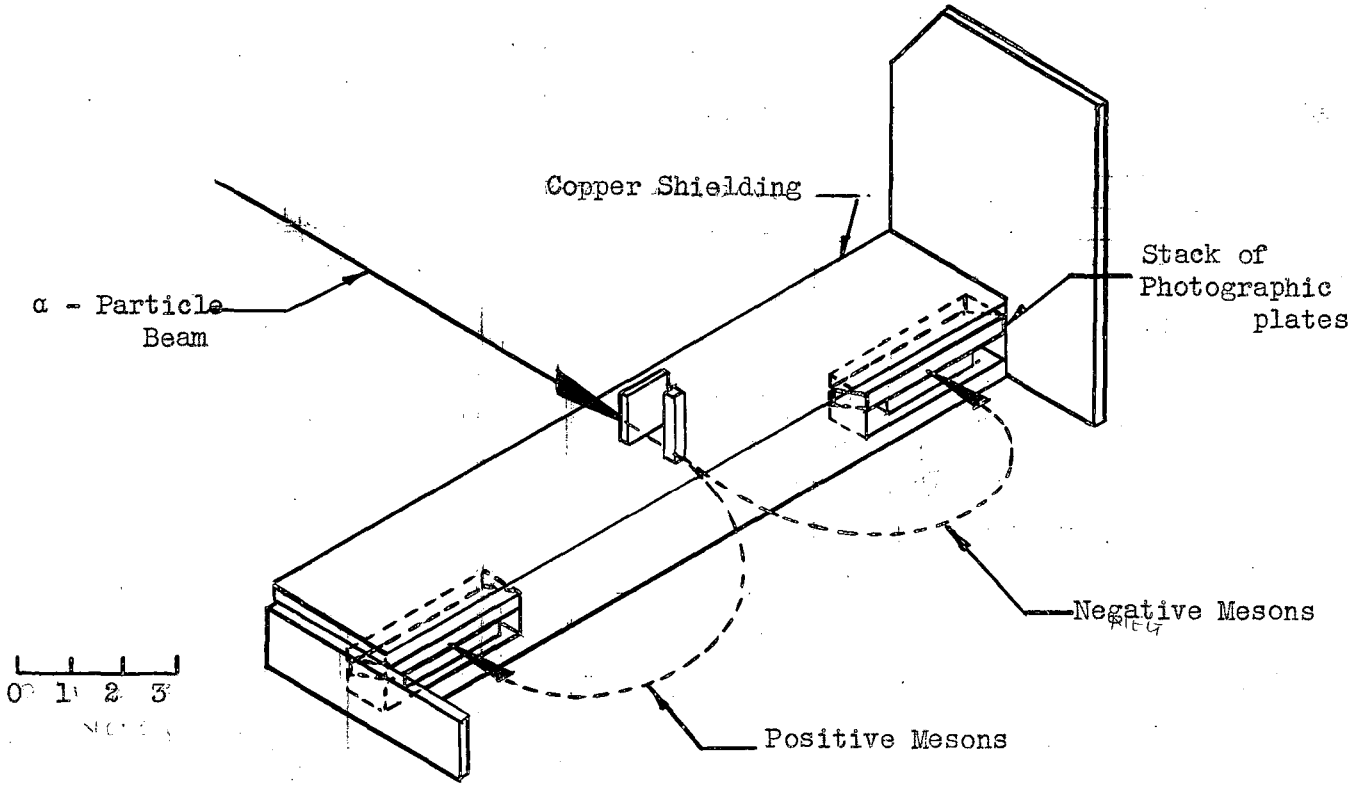
Mesons. C. M. G. Lattes.

Studies have been made of the ratio of positive to negative mesons for one energy range at about 4 Mev. Photographic plates to receive positive mesons are placed below the circulating beam a few inches from the target in a direction toward the center of the cyclotron. The photographic plates to receive negative mesons are placed in a symmetrical position on the opposite side of the target as shown in Figure 1. The arrangement is such that the two sets of plates receive mesons of approximately the same energy and angular range. With a 1/16" carbon target 150 negative mesons and 24 positives were counted giving a ratio of 6.2 ± 2. With a lead target no positive mesons were obtained.

Figure 1



In another experimental arrangement positive mesons were detected which come from the target in a direction opposite to the direction of the beam. One hundred forty-four negative mesons in the forward direction of the beam and 16 positive mesons in the backward direction were counted. This gives a ratio of 9 ± 3.

Other studies indicate that all the heavy mesons may give secondary mesons.

Treatment of Tumors with the Deuteron Beam. C. A. Tobias.

Exploratory tests have been carried out regarding the effect of the deuteron beam on tumors. A strain of mice is used, 100% of whom die of mammary carcinoma. A mammary carcinomic tumor is transplanted from the donor animal and inserted under the skin of a second animal in such a way as to make possible irradiation of the tumor only. The tumor is known to metastasize, and the pathology is similar to that of the human mammary cancer.

Several doses of irradiation are given. If the dosage consists of more than 3000 d units (a d unit is near an r.e.p. measurement), the tumor may possibly regress permanently. It is aimed to investigate the possibilities of this technique by irradiating through the body also. The mouse is unfavorable to this experiment because identifiable tumors are about 1 cm. in diameter which is a large ratio to the diameter of its body (as compared to early detection in human beings).

When the tumor is implanted in the abdominal region as shown in Figure 2, the regression is fairly successful. When normal mice were treated with 1 cm. deep irradiation, all died from 3000 d units with hemorrhagic and other expected symptoms.

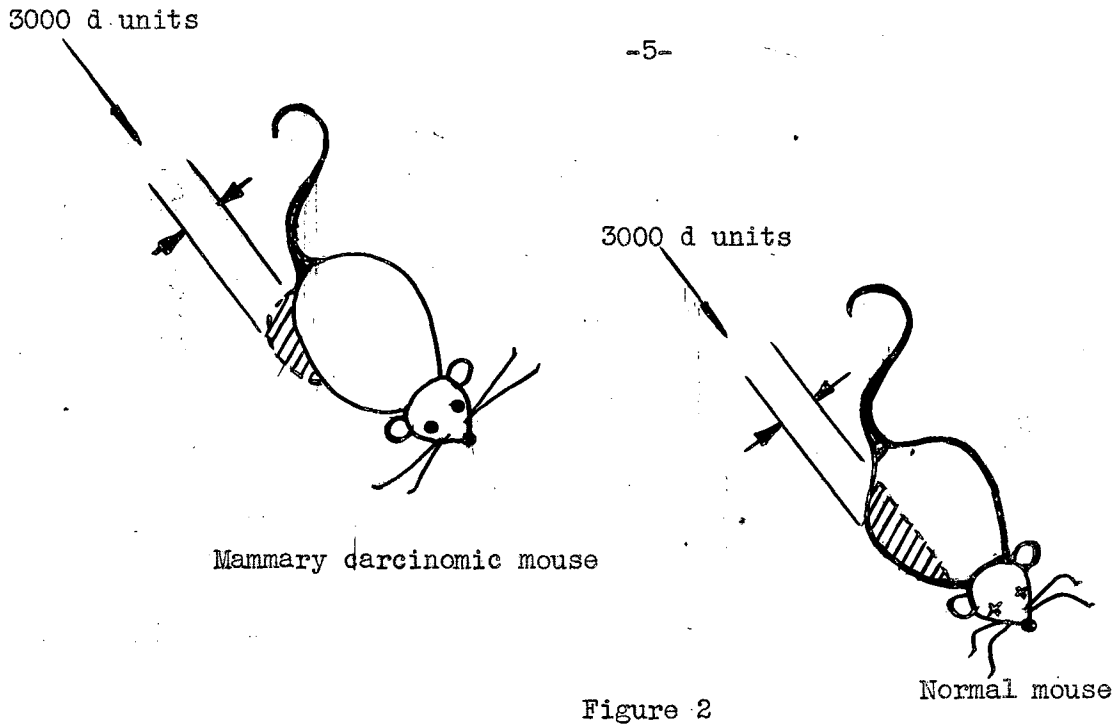


Figure 2

Since this might mean that the abdominal region is especially sensitive, tumors were then placed higher, near the liver and lungs. An increase of the effectiveness of the beam was obtained by rotating the subject under irradiation. The mouse was anesthetized and kept at body temperature. Ten-day old tumors about 1 cm. in diameter were irradiated with slow rotation for about five minutes. Rotation was done at one-minute intervals. Of the 20 mice irradiated, about 8 seemed completely cured, and no important effects were evident from the beam coming through the body. An average 20-gram mouse lost one or two grams of weight but regained it within ten days. Blood counts dropped from 10,000 to 5,000 but returned to normal.

Improvements in techniques of implantation will increase the success of this experiment. It is indicated that early detection is necessary and that the relation of irradiation to body weight is important.

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