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FINAL DETERMINATION
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L. M. Redman
OCT 24, 1980
P. Lang 6-20-86

S. K. Allison

H. L. Anderson

Cooperation of the Metallurgical Laboratory

In connection with our assignment to measure the nuclear efficiency of the Trinity bomb we had occasion to ask the Metallurgical Laboratory to carry out certain auxiliary experiments. Our original request was directed to Drs. Sugarman and Zinn at the Metallurgical Laboratory, who were asked to

1. Investigate the fission yields from 49, and in particular, study the energy dependence of these yields with the object of finding those fission products which had a small energy dependence.

2. Study the gaseous ancestry of the fission chains with a view to finding those fission products which have either no gaseous parent at all, or a gaseous parent of extremely short life. Alternatively, if only a small fraction of the fission product is formed from a gaseous parent this would be of interest.

3. Study the chemistry of the soil at Trinity with the hope of finding what chemical procedure would be needed to quantitatively extract certain selected fission products.

Problem 3 was started at the Metallurgical Laboratory, but the bulk of the work was done at "Y" when the transfer of Dr. Sugarman to this site was effected. The experimental work on problems 1 and 2 was carried out by a group under Dr. Rubinson with the cooperation of Dr. Zinn. Both problems have been completed.

The results of the first bore out the expectation that the fission yields near the peaks of the yield distribution would not be altered appreciably in going from slow to fast neutrons. An 18 per cent increase was observed for the 47h $Sm^{(153)}$ which is on the edge of the distribution curve. Because of these measurements we were able to say that our fission calibration, made with thermal neutrons, when applied to the efficiency determination, could hardly cause an error of more that 2 per cent.

The results of problem 2 showed that we could expect much smaller fractionation effects due to the gaseous ancestors of 17h Zr and 275d Ce than of 12.8d Ba and 55d Sr. These observations were borne out in our results.

In addition, with the cooperation of Dr. Zinn and the use of the P9 pile we were able to carry out a fission analysis of the 49 content of our samples. This was extremely important to us because at the time

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Per Memo dated 6/29/77
By Leo Redman / Jerry Rice

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we made an assay of the 49 content by alpha counting we could not tell how large a contribution there might be from other plutonium isotopes. Once the fission analysis had been carried through, we knew that our alpha assays were only slightly perturbed by other alpha emitters, and in particular, that the 48 content contributed only 4% to the alpha count.

Dr. Zinn also carried out neutron irradiations on Trinity dirt, whereby we were able to clear up the puzzle presented by the neutron activation of the dirt by the Trinity bomb.

All this work helped considerably in the interpretation of our experiment and increased the reliability we could place in the final results. We are very grateful for the cooperation which we received and would like to take this opportunity to praise these men for the spirit as well as the competence with which they carried out their part.

H. L. Anderson

HLA:ch

cc/ J. Oppenheimer ✓
E. Fermi.

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