MEMORANDUM FOR THE FILE

FROM:  JOHN WALKER

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A discussion with Dr. Teller on January 12, 1953, developed the following historical points of interest:

(1) Berkeley Summer Conference History

The first proposal for an H-bomb developed after a luncheon which had included Dr. Fermi and Dr. Teller. While walking back from the lunch to their office building, Dr. Fermi suggested that now that the A-bomb was in prospect, attention should be paid to a fusion of light elements. Dr. Teller took the proposal from this point and did all of the initial exploration, chatting with Dr. Fermi from time to time.

The personnel definitely placed at the Berkeley Summer Conference included Drs. Bethe, Oppenheimer, Teller, Konopinski, Serber, Frankel, Von Flich, Felix Bloch (of Stanford), plus a few others. Bohem and Winberg were not present regularly, although it is possible that they and other questionable members attended irregularly without contributing to the discussion.

This work was directly related to the earlier H-bomb proposals and it would be most surprising if they could have done this work without knowing where it fitted into our wartime program.

The results of the discussion, at least, were formalized by Dr. Oppenheimer. Dr. Oppenheimer had invited the members to attend...
a conference and was - in a loose sense - the Chairman. Dr. Teller, however, carried the ball at the meetings. After the meeting terminated, Bethe, Urey, Oppenheimer Konopinski, and Teller continued to discuss the H-bomb proposals. These are rediscussed in Chicago later that fall.

According to Dr. Teller, it was Dr. Oppenheimer who developed in this period what has since been known as the Bethe-Feynman formula. In this time Dr. Bethe's contribution was to point out difficulties and subject the proposals to critical examination. It was the general attitude at this point that the H-bomb was not only feasible but "easy".

There was no doubt in anyone's minds but that the A-bomb had to be made first.

(2) Los Alamos Early History

In the early spring of 1943, a conference was held on the H-bomb at Los Alamos under the leadership of Dr. Teller. It was generally believed that the H-bomb was feasible as soon as the gun-type A-weapon was developed. Shortly thereafter Los Alamos discovered the phenomena of the spontaneous fission of Pu-240, and the need for implosion weapon for plutonium was recognized.

Previous to the discovery of this factor, gun-type weapons had looked like sitting ducks, and Dr. Oppenheimer had cast around for something really interesting to challenge the laboratories. The "Super" was chosen for this purpose. However, when the Pu-240 factor was recognized the laboratory had a major and immediate job and efforts were directed in this new direction. Work on implosion occupied the laboratory.
in the winter of 1943-1944. There was also speculation during this winter which, in effect, was the forerunner of the Booster proposals - igniting materials at the center of an A-bomb looked easy at first blush.

In summary, it can be said that the "Super" was shelved in the winter of 1943-1944 and for great good reasons.

Nevertheless it was thought about in off moments as a definite and interesting unsettled question. Dr. Bretscher, a British citizen from Switzerland, ran the first extended machines of the D.T. cross section. This was a windfall for the cross section was very high. (It should be noted that Manley later reran the calculations and came out far too low. The present figure is much higher than Manley but somewhat lower than Bretscher.

After Alamogordo it was clearly understood at Los Alamos by all concerned that the next major project was the H-bomb. Shortly after July 16, the laboratory was reorganized to take over this project under Dr. Fermi. Dr. Fermi started a series of lectures which were attended by almost everyone in the laboratory. Bethe was to work with Teller on this with the other senior personnel - then peace intervened.

On the morning of Nagasaki, or on the following day, Dr. Teller had occasion to talk with Dr. Oppenheimer. The latter's attitude had completely changed in a very short period of time. Dr. Oppenheimer told Dr. Teller that it was all over and that Dr. Teller should go home.
and that the laboratory should close up. The laboratory was profoundly
effected by the word and deed of Dr. Oppenheimer.

(To spell out the story more fully, about January 1, 1945,
it was fairly clear that implosion would work and that Fermi and Oppen-
heimer freed Frankel, Konopinski, Teller, Horowitz to work on "H."
Landshoff joined this group which was A-1 in all respects.)

(3) The Einstein Letter

The Einstein letter was written, conceived, and executed
by Dr. Szilard. Szilard had complete confidence to Dr. Einstein.
Szilard either telephoned Einstein that he had an important letter
for him to sign or had previously indicated the general nature of it
to Einstein. In any event, Einstein's great confidence in Szilard
disposed him favorably, even though Einstein had no interest whatsoever
in "details" of science of this kind. Szilard drafted the letter for
Einstein's signature, telephoned Einstein to arrange a time to see him,
and asked Teller to drive him to where Einstein was staying on Long
Island. Einstein met them in his slippers and signed the letter without
a change of any kind. Teller then drove Szilard back to New York and
delivered the signed letter to Sachs who had arranged to have it delivered
to President Roosevelt. Dr. Teller notes that Einstein reaches decisions
quickly and says "yes" or "no" in a simple matter but is not interested
in details.

Another small antidote re Dr. Einstein occurred when a
newspaper reporter telephoned Dr. Gamow with the publication several
years ago of Einstein's unified electro-magnetic and flow theory:
The reporter asked Gamow if the work was right. Gamow referred the reporter to Einstein. The reporter said that he had already telephoned Dr. Einstein and had asked him the same question. Gamow asked what Einstein's reply was and the reporter said that Einstein requested that he 'phone him back in twenty years.

4. Discovery of the Alarm Clock

The precise date of the first proposal of the alarm clock, according to Dr. Teller, is August 31, 1946. This is the day Teller's daughter was born which pegs his recollection. The proposal was made only to Dr. Richtmeyer, who then proceeded to work up the preliminary theory. This was published in the fall of 1946.

Re the question of whether Fuchs could have learned in advance of ideas leading to the alarm clock, Dr. Teller notes that he was in Chicago in mid-June - when Fuchs left Los Alamos. He then went to Palo Alto, California, and did not get to Los Alamos until the first days of August. These recollections would seem to indicate no overlapping between Teller and Fuchs.

5. Thermonuclear History at Los Alamos in the Fall of 1949

Prior to the laboratory's recommendation to the Commission technical on the H-bomb issue, a major meeting occurred at Los Alamos. Dr. Bradbury cautiously outlined the issues and Manley discussed a number of points in the program which might be bad for the laboratory. Every speaker from then on for a solid hour was wholeheartedly in favor of the H-bomb program, and Bradbury and Manley went on to Washington (the October 19, 1949 recommendation?) with the support of the laboratory for the H-program.
The GAC recommendation was keenly anticipated. Dr. Teller states that his first impression upon hearing of it and seeing it was that the GAC, in a move that was stunning, found that the H-bomb program was morally objectionable. However, the report was not made known to key personnel until ten days to two weeks after the actual GAC finding. Manley telephoned Teller and others to state that "the boat should not be rocked" for political reasons for the moratorium period of ten days to two weeks. It was further stated that the GAC considered it very important that a division of opinion would become apparent in Washington. As a consequence of this moratorium period, and the request not to let a division of opinion be apparent, nothing happened for that period of time following the October 30, 1949 GAC recommendations. For example, a meeting of various leading scientists, proposed by Dr. Teller, for Los Alamos was cancelled. This meeting was intended as a recruiting measure to obtain top flight people for the new and revitalized H-bomb program. Manley's wording was very close to a request for no action and no activities to insure proper functioning at the political level and was made to Bradbury and others, as well as Teller. After the delay, Manley returned from Washington to Los Alamos with a copy of the T.S. GAC report and showed it to a dozen key people. This was the first knowledge at Los Alamos that the GAC had recommended counter to the Los Alamos recommendation.

The GAC report had just the opposite effect, on personnel at Los Alamos, according to Teller's interpretation. He stated that had it been less strong it might have removed Los Alamos from an H-bomb program. But the report was so outspoken and contained such heavy judgment of the
moral issue that Los Alamos's opinion turned off some strongly in favor of it. The reasoning was that if H were immoral A was immoral and they refused to so characterize their work there.

It will be recalled that when the first recommendation of the Commission went to the President on November 9, 1949, there was no figure of the number of H-bombs which might pollute the atmosphere. Teller heard a story that the President was verbally told that one H-bomb might render the planet unfit for life. It is at this point, according to Dr. Teller, that the President said "Who in Hell is feeding me all this crap", because of the story it was suggested to Dr. Teller (by Lewis Strauss?) that a study of this point was politically advantageous.

Dr. Teller secured Dr. Anderson (?) to write the report as the rebuttal and Teller found it inadvisable to include his name. The staff has confirmed that this report did get to the President.

6. Two New Elements

In connection with the arguments used in 1949 that the H-bomb would contribute nothing to peacetime welfare, Dr. Teller notes that the MIKE Shot produced two new elements heretofore unknown. These are Nos. 99 and 100 in the periodic table. Both have been recovered in detectable amounts. Both appear highly fissionable. Dr. Teller has suggested the name elugulabium - the name of a departed island in the MIKE Shot for the new element 100. The staff suggested the name tellenum for the new element 99. Both of these have reasonably long half lives and both could be made in reactors by neutron capture. Element 100 in particular seems to have a high degree of spontaneous fission.

7. Early Family Committee History

When the Family Committee was organized on March 15, 1950,
two immediate ways of proceeding to test were recognized. These were both intended to carry the 1946 model to the point where deuterium might be ignited.

The point here is that very quickly initiated radiation implosion was discussed, and discussed at length—at the very first meeting of the reconstituted program. Second, the proposals at this time were for both tests rather than one or the other.

By this time also Von Neumann began to show that the amount of tritium needed would be perhaps more than $\text{[redacted]}$. Therefore, by June 1950, it seemed reasonable that the immediate tests proposed would be feasible, but that the further step to the burning of deuterium would be much less rewarding because of the very high cost of tritium.

In July 1950, Teller asked Dr. Kennedy at Los Alamos to look at tritium to increase the usefulness of the alarm clock. These calculations looked good and brought this device to a head.

It should be made very clear in any staff paper that the expensive cost of tritium is what makes the construction of Savannah River and Hanford piles pertinent to the thermonuclear program.

By August 5, 1950, two additional statements can be made:

1. [Redacted]

2. There were doubts as to feasibility of an H-bomb and these had been intensified by the repetition of
calculation on the propagation of deuterium by Drs. Fermi and Ulam. It was understood that repetition of some measurements of constants were needed and that some high speed machine calculations were required for the traditional "Super" before these discouraging prospects could be removed.

It should be noted that these calculations are still only in the stage of preparation.

In September 1949, Teller was given a verbal directive by Smyth and Bradbury that theoretical work would be directed toward detailed recalculation for the preparation for machine calculations on other general considerations of propagation. All alternate models of H-bombs and other matters were to be put aside. This was friendly verbal advice by Smyth and by Bradbury. Dr. Teller pleaded for one exception for Nordheim's work on the with which he was so familiar.

By mid-January, 1951, these calculations were rerun with substantial agreement with previous calculations looked good. Two crucial meetings and a series of decisions then occurred. For the first time, Los Alamos decided to recommend At the same time, it was decided not to recommend the Booster Shot and this matter was left in abeyance. Furthermore, the next test shot was
thought of as eighteen months from the meeting, whereas Teller wanted a test in approximately a year. This last point coincided with the receipt at Los Alamos of the December 30, 1950, long range study prepared for the Research and Development Board and Atomic Energy Committee by a Panel of which Dr. Oppenheimer was Chairman. (General McCormick, Dr. Oppenheimer, and Dr. Alvarez participated in this study.)

After the report was received—and the report characterized thermonuclear work as a long range nature—it was not decided to drop thermonuclear work entirely but as soon as all urgency at the laboratory vanished.

In February and March, Drs. Ulam and Teller worked on and wrote their memorandum:

In the spring of 1950, the Family Committee recommended shooting the Booster. This recommendation, however, was not unanimous whereas all previous recommendations had been unanimous, and Bradbury refused to forward a report to Washington. This appears to be March 1950.

3. A Booster

Bradbury said "no" to number three—that it was too late and of the first two items, stated that the directive from the President was to proceed until it could be said with assurance that it was not feasible before other avenues could be explored. This controversy was discussed by Bradbury, Froman, Von Neumann, and Teller, and possibly Wheeler. Dr. Teller went to Dean, accompanied by polite letter from
Bradbury, which gives the impression that Teller was going to Dean at Bradbury's suggestion. Shortly thereafter, the Booster Shot was approved.

Dr. Teller says that Dean smoothed over Bradbury, appears under heavy pressure from the GAC and makes the comment that the H program might have stopped at this point despite a good proposal - in fact, the proposal which has become the basis of our present program.

2. That the reactions proceeded essentially as predicted.

3. That the details observational techniques set up to understand the functioning of performed more satisfactorily than expected; and that the Booster Shot established the probable usefulness of tritium in moderate size A-bombs.
8. The Princeton Meeting
The Princeton meeting of June 16-17, 1951, was preceded by a meeting a day or so earlier at Matterhorn. Dr. Oppenheimer attended and, after surprisingly few questions, said, in effect, "This is wonderful."

The main meeting gave the go ahead. At that time, however, it was clearly implied in the meeting that there was a difference of opinion of the time scale. Los Alamos was not prepared to consider anything earlier than the spring of 1953, while Dr. Teller hoped for the spring of 1952. There was also controversy.

Dr. Teller recommended an immediate go ahead and Chairman Dean was inclined to accept this approach over that of Dr. Bradbury, who was not ready from the standpoint of Los Alamos. Chairman Dean's decision was thus in effect a departure from the usual channels, and Dr. Teller implies that got started because Dean did not stick to channels.

9. Second Laboratory
As early as October 1949, the idea of a Second Laboratory was discussed at Los Alamos. People such as Graves took the position that a thermonuclear work was not to be carried out there, but should be done some place else.

Dr. Wheeler wanted a second laboratory, but the Matterhorn became just a theoretical study center. A theoretical study center has limited appeal. In the meeting of January, 1951, when an eighteen months delay appeared probable before the test after Greenhouse would be undertaken, Dr. Teller openly mentioned a second laboratory. By the spring of 1951, there was discussion of either a second laboratory or an independent division.
in Los Alamos for thermonuclear work. Since Dr. Bradbury was against an independent division at Los Alamos, the only alternative appeared to be a second laboratory.

Dr. Teller was first approached in January, 1952, to go to Berkeley for thermonuclear work, but Dr. Teller had the same objections to theoretical work there that he had with Dr. Wheeler at Matterhorn—an effort solely theoretical in its work was too limited to be of general appeal or usefulness. It was at this point that Dr. Griggs dragged Dr. Teller into the Air Force controversy.

10. The MIKE Shot

Dr. Teller suggests the following comparisons:

On this analysis, Mike costs some 20% upward more than the Trinity Shot. When the relative yields are compared, this is a startling way to recognize the advancement.

11. Personal Observations

Dr. Teller hopes that current negotiations with Chicago will permit him to stay at Livermore until next October. At this time, the Castle operation will be planned and he hopes to return to Chicago and spend the equivalent of two days a week at Livermore during the rest of the school year. He then would plan to spend all of the following summer at Livermore.
Dr. Teller states that Dr. Oppenheimer telephoned him at Princeton and was nice enough to invite Teller to cocktails at his house. At this time, Dr. Oppenheimer discussed the possible use of H-bombs in Korea. Sometime later, Dr. Oppenheimer called Dr. Teller on the long-distance phone and stated that he had presented this idea at the Pentagon and that the suggestion went through channels other than Dr. Oppenheimer to General Eisenhower.