

Memo: On "An Experimental Study of the Motion Produced by the Fatal Shot in the Assassination of President Kennedy"

Note: Please pardon the format of this memo, which, rather than being an overview, was done serially as I went through the paper.

Pg. 2, line 13: At least as presented by CBS, Dr. Alvarez had not "found evidence" that Z had jerked his camera, but rather had hypothesized this

Pg. 4, last few lines: You had better spell out what you mean by tests "inconclusive" and "best for simulating what we thought we saw in the Zapruder film." If tests discussed here did not produce results consistent with your experimental hypothesis, than rather than termed inconclusive, they should be discussed as negative or disconfirmative results with regard to your experimental (or operational) hypothesis. For instance, would a double shot from front and rear fired from these targets have produced results which adequately simulated "what you thought you saw in the Zapruder film."

Pg. 5: What is the muzzle velocity of the bullets used and what was their composition? As you know, different types of bullets have radically different effects on their targets depending on how they fragment.

Pg. 7--conclusions: Even accepting your subjective judgments as to the results of your experiment, and forgetting about the discrepancy with Thompson's data concerning the forward motion (which you do not deal with adequately, since you ignore the double head hit possibility with the straw man: "the forward motion cannot be used as evidence for a shot from the front"), how can you logically travel from the results of your experiment to the conclusion that the head movement is "completely consistent with a single shot from the rear." Certainly not on the basis of your characterization of a "taped melon" as a not "unreasonable simulation of a person's head." Forgetting the problems mentioned above with the experiment, how does the demonstration that a certain type of object can move backwards demonstrate anything about the president's head which would justify the use of the words "completely consistent." I would suggest "not inconsistent." Alvarez's conclusion as you report it (I don't know whether he proofread the article) is, ##### not justifiable according to valid theory testing procedures. His conclusion implies that the data are a good fit to a single bullet from the rear hypothesis. The question is not, of course, whether the data (which are certainly far too imprecise to even talk in terms of goodness of fit) are best predicted by the single bullet from the rear theory or a double hit theory. For centuries physicists have proved and disproven theories (or, more properly, accepted and rejected) based on exact point predictions, or incredibly small differences between predictions based on theory and observed data. Here you seem to abandon this standard methodology. (for a fuller discussion of this see P.E. Meehl "Theory Testing in Psychology and Physics: A Methodological Paradox" in Philo. Review, 1967) Change 5th floor to 6th floor.

Pg. 8: It seems here that you are unfair to Thompson who did all he could by consulting experts. This is especially true given the fact that Dr. Alvarez himself, when put on the spot, did not think of it, not to mention the fact that he went over into an area\* in which he does not have expertise to speculate, suggesting bias rather than impartiality. This whole thing reflects poorly, in my opinion, on Dr.

*\*Neurophysiology [which may have contributed to the final observed movement]*

Alvarez's motives, <sup>since it makes his conclusion seem predetermined.</sup> I strongly suggest deleting the last paragraph on this page.

pp.11-12: I think that the Garrison stuff detracts from the article. He added nothing new to the head shot stuff and the Shaw trial would appear to be of little relevance. You have gone from a report of an experiment to a political treatise. And Bremer's comment, as I understand it, refers more to the core than to the head snap aspect.

pp.13-17: If you are going to have this much data on previous thinking on the subject, why not put it at the beginning as a literature review. If you do this, I again would strongly advise keeping stuff on Garrison only insofar as you are publishing testimony, or something of that sort.

pg.17: Thompson came to "the wrong conclusion?" How so. Back on page 7 you spoke only of finding support for the rear shot hypothesis. You cannot make such a statement unless you have also tested the double shot theory. And, then with regard to CBS, you speak of the "correct solution." ~~\_\_\_\_\_~~ You more <sup>directly</sup> state on page 22 that what is observed could have been caused only by a shot from the rear, making it clear that you have found the "correct" & right conclusion.

pg.23: The statement that your work has demonstrated that "the fatal shot probably was fired from the direction of the" TSBD is not acceptable until you demonstrate at least the following: 1. The pattern of metal in the head is consistent with one bullet from the rear (John Nichols work indicates it is not if the Carcano was the weapon with the 6.5mm bullets); 2. The head movement is better predicted by the rear hit theory than by a double head hit theory; 3. the pattern of ~~#####~~ injury to the skull and brain is consistent with the rear head shot theory as opposed to the double head hit theory; 4. the movement of debris is more consistent with predictions based on one theory as opposed to another. (i.e. If Harris was hit by a skull fragment, it was going in a line drive--can that vector be accounted for? And, what about the distance traveled by the fragment found by Harper.)

How can you forget the Tague hit in your 3 bullet theory? That would seem to make four shots. The fragment from the head hit theory doesn't work, (and I notice you didn't add that fragment into your momentum calculations, <sup>so I assume you don't believe that theory of the Tague hit.</sup>)

How can your findings be said to "tend to support" the conclusion of the lone assassin, Lee Harvey Oswald. Where do you provide one shred of evidence that LHO was involved?

Summary: It is not clear that the substantive hypothesis that the head shot came from the rear can find any significant amount of support from confirmation of the experimental hypothesis that certain objects will move in the manner you have found. Your data are crude, you do not resolve the question of immediate forward reaction, and you do not discuss the disconfirmative results. Then you fail to apply the goodness of fit test to the data. Throughout the history of physics many theories have been abandoned which fit very exacting data (which we do not have here) very closely (also counter to indications here) because another theory fit more closely. \* Without a test of the double head hit theory it would appear that you would not have a leg to stand on.

I am confused a bit by much of what is included in the article beyond the basic experiment mentioned in the title. Much of it seems to be a loose attempt to explore the history of head hit thinking. If your purpose is truly to explore thinking in this area, why not discuss the issue more thoroughly. For example, myself (and I assume others) hypothesized a double head hit quite early in the game based on the medical evidence alone. Thompson and I were originally put in touch with each other by Vince Salandria because we had independently reached the same conclusion using different data. That I was involved, or that anyone per se was involved in this work is not the point, but rather the basis for the think-  
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would seem to be. Correlation of the medical evidence with physical observations of head movement would appear to be important, especially since the medical evidence is theoretically easier to study.

Furthermore, you ask why the question has not been studied before? Before asking this in your paper, you should have asked in letters. I (and I'm sure many others) have considered the possibility and have never ruled out the possibility that a shot from the rear could cause other than movement forward. I discussed this with many people and eventually decided that an elaborate experiment would not be worthwhile, because even a very good one could not come close to duplicating what happened that day. Let's face it, we couldn't use a live person. Furthermore, one would have to use many types of shells including exploding ones in order to fully test the hypothesis, since the L&O-carcano theory scarcely exhausts all possibilities. I decided that the trouble and expense would not be worth it given that the lone assassin theory is not tenable on many counts and that the medical evidence, ballistics, and pattern of movement of the fragments seems to support a shot from the front. Further work, I felt, should be in these areas, even with regard to making more of that evidence available. No conclusion of any certainty would ever be possible from experiments with mellons or gellatin whereas some certainty is possible in the medical end if the proper documents and evidence are made available. Already the 1968 Panel Review has provided physical evidence as to the pattern of dispersion of metal in the president's head which is not the type expected from those alleged assassination bullets. And, as for the possibility of a definitive experiment, it obviously depends on how realistic the test of the hypothesis is. Ironically, on page 7 of your article you write: "A more complicated experiment, using high-speed photography and an animal head from a slaughterhouse, has been suggested, but I do not feel that such an experiment would allow us to make a conclusive statement about the assassination." And yet, after having done an experiment which is not as exacting in terms of testing the hypothesis you propose, you make conclusive statements both explicitly (at the end) and implicitly (using words like "correct").

Well, I'm sorry for the sloppiness of this critique and for its poor organization, but this is my second time through the article and I am limited timewise (with secretaries so overworked that dictation would have slowed this down several days). I think the point that the head movement to the rear does not rule out a shot from there is a good one, but would not carry it any further (and feel that it is scientifically indefensible to do so). No doubt if it is published in this form it will be taken to task by persons with better credentials than myself. Other points made, such as Thompson's error term, which I raised in letters after the book came out and which I have discussed with Harold, are of interest, but you carried them no further than we did. Here some real contributions could be made. I am most concerned about what constructive purpose you feel this article will serve if it appears in a journal or anywhere else. I will send copies of these comments to Harold with instructions to send copies to anyone else he knows to have read your article.

If all of the background is to remain in the article, I would reread it carefully. Alvarez's theory about the blurs on the film sounds pretty good to someone uninformed who does not realize how many blurs there are on that film. Some LIFE Magazine people, who said they gave much of that stuff to CBS, were quite upset when only the 3 blurs were mentioned. If a blur equals a shot, then Alvarez has proven more than one assassin, because then there were 8-9 shots. And the blurs he selectively discussed are not the most prominent.