

UNIVERSITY OF CALIFORNIA

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Dr. Walter Menaker
69-09 108th Street
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Dear Dr. Menaker:

Thank you very much for your latest letter. I'm afraid that we are now getting into the little details with which I vowed I would not concern myself. You will remember that I stated that the main reason I asked CBS to hire an independent consulting firm to analyze the films themselves, using the general principles I enunciated in my letters, was to avoid being questioned about a difference of two or three frames here or there.

I find that you have devoted more than a page of single-spaced typed comments concerning what I would class as minor details of timing. I can't for the life of me understand why these should be of any interest to anyone, but that is for you to decide for yourself. For example when you say "you overlooked the time that sound takes to traverse about 270 feet from the sixth floor depository window to Zapruder's ears" I can just as well point out that you forgot to include the time the bullet took to get from the depository window to the automobile. If the bullet were traveling close to the velocity of sound, these two things would very nearly cancel out, since the sound does not come "from the window" but is a shock wave that comes from the bullet in flight.

You say "if you will use the facilities of your department (and, if need be, of related departments) at Berkeley, you may become the foremost authority on the correct answer to this question." That may very well be true, but I haven't the slightest interest in becoming such an authority.

My reference to the one-third of a second reaction time was really not to the time from the stimulus to the reaction, but really to the oscillation period of the neuromuscular system. Since I am not an expert in this field, I mixed up the definitions, but as a physicist I would simply say "the characteristic time of the neuromuscular system is one-third of a second." This is typical "physicist talk", and means that the reaction time is not measured in nanoseconds or microseconds or milliseconds or seconds or hours or centuries or eons. Since physicists deal with times that go from approximately 10^{-25} seconds to 10^{10} years, it is important for them to state what the "characteristic time" is of any system they study. So when I implied that the characteristic

Dr. Walter Menaker
October 23, 1968
Page 2

time of the neuromuscular system was one-third of a second, I was not trying to specify it in any more detail than that.

As you can see from my comments, I feel that our letters are degenerating into details about whether something happened in this frame or two frames earlier or two frames later, and I really have absolutely no interest in such a discussion. Perhaps if you could indicate to me why you consider it important, I could get interested. But in the absence of such an explanation, I just will have to say I can't take the time to answer all the detailed questions you ask.

I will comment on only one of the questions you asked. You wondered why if I believed that the reaction in frame 313 could be due to a direct interaction of the shock wave, the earlier frames could not have such an explanation. If you will look at the chart I sent you, you will see that the angular acceleration in frame 313 is clockwise looking down, and the other "first reactions" of the camera are counterclockwise looking down. Had the earlier two been in the same direction, I might not have come to my stated conclusion, and would certainly have entertained the possibility that they were due to direct interaction of the shock wave with the camera. My calibration point is of course the shot at 313, where the camera moved in the direction I would have expected it to move from the interaction of a close-by shock wave with the camera body. (In the two earlier shots, the bullets -- not the gun! -- were farther from the camera, so the shock waves were less intense.)

Very sincerely yours,

Luis W. Alvarez

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