

Excerpted from *Conspiracy of One: The Definitive Book on the Kennedy Assassination*, by Jim Moore, pages 182-184.

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Since the Zapruder film clearly shows Kennedy thrown back against the car seat by the impact of the fatal shot, the naysayers invoke the aid of a Newtonian law of physics that leads them to believe that the shot came from the right front and, as a result, drove the President backward and to his left. There's no medical evidence to support this contention, just as there's no hard physical evidence to give credence to the second gunman theory. But since so much of the critics' success is based on their examination of the movement of Kennedy's body, this is a hard contention for us to ignore.

Josiah Thompson, for example, devoted nearly fifty pages of *Six Seconds in Dallas* to careful photographic measurements and eyewitness testimony which led him to believe that the President had in fact been hit twice: first from the rear, and then from the front. This double-impact was the result, Thompson said, of two rifle shots fired almost simultaneously.

On its surface, the evidence Thompson presents is somewhat compelling. In 1967, when his book was first published, there was no access to the autopsy photos and x-rays which would have settled the question. Today, with that evidence available, Dr. Thompson's theory faces additional problems.

First, there's nothing in the medical evidence to suggest a shot from the right front. Even Dr. Cyril Wecht admits that the possibility of a shot from the knoll having struck the President in the head is highly unlikely. Wecht, who disagreed with the HSCA medical evidence panel at almost every point, was questioned about the possibility of a head-shot from the front, and admitted that there was no supporting evidence: "Yes, with reasonable medical certainty I would have to say that the evidence is not there. I have already said it is a remote possibility and I certainly cannot equate that with reasonable medical certainty."

The fact "that the evidence is not there" has failed to impede the efforts of critics like Groden, Lifton, and former New Orleans District Attorney Jim Garrison from bringing forth the old suppositions of a gunman on the knoll.

It's also helpful to understand that the movement of the President's head as seen in the Zapruder film isn't immediately backward. Indeed, his head moves forward slightly as a result of the impact of the bullet on the back of the skull. Only after the bullet has obviously torn through his brain and blown out the right side of his head does Kennedy begin the rapid and forceful movement backward.

For all the critics' turgid writings about the backwards head-snap, the House Select Committee's medical evidence panel put the question to rest in a single paragraph:

*"The majority of the panel believes that there is a possibility that this movement may have been caused by neurologic response to the massive brain damage caused by the bullet, or by a propulsive effect resulting from the matter that exited through the large defect under great pressure, or a combination of both."*

This jet effect theory has its adherents, this author being one of them. In 1975, *Time* magazine's Ed Magnuson wrote that Dr. Lattimer and others had conducted experiments that yielded some amazing results that bore directly on the question of the head snap. Magnuson

noted that:

*“Lattimer, again, has done grisly but practical experiments on Kennedy’s head movements. As do other analysts, he notes that the head momentarily moves forward in one frame of the film before jolting more noticeably backward. Lattimer and his sons have fired the Oswald-type gun and ammunition into the rear of human skulls packed with gelatin. He has films to show that in each case the skulls toppled backward off their stands, never forward. Similar tests were conducted with melons by Physicist Luis Alvarez of the University of California, with the same results. Though neither had expected this movement, they theorized that the escape of material through the larger exit wounds in these tests had a jet-like effect that propelled the melons and skulls to the rear.”*

Little I’ve said in this chapter will sway the die-hard scoffers. They’ll continue to believe in shots from the grassy knoll, despite the lack of evidence to support their view. They will continue to assert that autopsy photos and x-rays have been switched or altered, despite their lack of proof and ample evidence to the contrary.

Why, then, do so many people believe that President Kennedy moved backward in response to a shot from the front? Or that his missing brain holds the key to the assassination controversy? The answer is simple—because they want to. Some people rely on their feelings, while others tend to look for something more substantial in which to place their trust. In this case, the evidence is real, substantial, and reasonable, unlike the arguments advanced by the critics.

The problem with the evidence is that it forces us to some pretty obvious conclusions. Eventually, regardless of our convictions, it makes us realize that the crime which robbed us of our President happened as we were told it did, with a few minor exceptions.

**Excerpted from *Assignment: Oswald*, by James P. Hosty, page 252.**

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Still, people counter with the fact that with the third shot Kennedy's head rocketed backward and to his left. I blame the movies for this misconception, for on the screen people shot from the front are almost always flung backward. In real life, it is just as possible for a person to jerk in the opposite direction, due to the "jet effect." Forensic scientists have long ago discovered that when a person is shot in the back of the head, a jet effect could cause the head to jerk backward. This finding has been documented and recreated on film.

**Excerpted from *Case Closed: Lee Harvey Oswald and the Assassination of JFK*,  
by Gerald Posner, pages 313-315.**

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The Clark and Rockefeller commissions, as well as the House Select Committee's medical panel, affirm the original autopsy conclusions about JFK's head wound. The most detailed work was done by the Select Committee. All nine forensic pathologists agreed that the beveling of the skull and the damage to the brain meant the small rear hole in the President's head was an entrance wound. The exit hole was consistent with a wound caused by the two large bullet fragments found in the front of the President's car.<sup>1</sup>

But if the President was struck in the head by a bullet fired from the rear, then why does he jerk so violently backward on the Zapruder film, which recorded the assassination? To most lay people, the rapid backward movement at the moment of the head shot means the President was struck from the front. "That's absolutely wrong," says Dr. Michael Baden. "People have no conception of how real life works with bullet wounds. It's not like Hollywood, where someone gets shot and falls over backwards. Reactions are different on each shot and on each person."

In the case of President Kennedy's head wound and the reaction on the Zapruder film, the Itek Optical Systems did a computer enhancement for a CBS documentary. Itek discovered that when the bullet hit JFK, he first jerked forward 2.3 inches before starting his rapid movement backward. Unless the film is slowed considerably and enhanced, the forward motion is not detectable.

The backward movement is the result of two factors. First, when the bullet destroyed the President's cortex, it caused a neuromuscular spasm, which sent a massive discharge of neurologic impulses from the injured brain shooting down the spine to every muscle in the body. "The body then stiffens," said Dr. John Lattimer, "with the strongest muscles predominating. These are the muscles of the back and neck . . ." They contract, lurching the body upward and to the rear.<sup>2</sup> The President's back brace likely accentuated the movement, preventing him from falling forward. At the same instant the President's body was in a neuromuscular seizure, the bullet exploded out the right side of his head. Dr. Luis Alvarez, a Nobel Prize-winning physicist, focused on that to discover the second factor that drove the President's head back with such force. Dubbed the "jet effect," Dr. Alvarez established it both through physical experiments that re-created the head shot and extensive laboratory calculations. He found that when the brain and blood tissue exploded out JFK's head, they carried forward more momentum than was brought in by the bullet. That caused the head to thrust backward—in an opposite direction—as a rocket does when its jet fuel is ejected. Because the bullet exited on the right side of JFK's head, it forced him to be propelled back and to the left, exactly what is visible on the Zapruder film.<sup>3</sup>

"So much has been made of Kennedy's movement in the Zapruder film," says Dr. Baden, "and yet it is one of the least important parts of the case. By his movement alone, you can't tell which direction he was shot from. You then need to examine the bullets, the bones, tissue, X rays, and photographs to determine from where the bullet came. I have personally done thousands of gunshot autopsies. There is no doubt that the bullets that hit John Kennedy, both in the neck and in the head, came from the rear. Nothing hit him from the front."

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<sup>1</sup> While the Select Committee's forensic panel agreed that a bullet had entered from the rear and exploded out the side of the President's head, there was a lone dissent. Dr. Cyril Wecht said that such a finding did not preclude a shot also entering from the front. Dr. Wecht believed that the large exit wound on the right side "could hide an entrance wound at the same spot." In other words, just as Oswald fired from behind and his bullet exited the President's head, a front shooter fired into the wound created by the rear bullet. That is Wecht's way of explaining why there is not another entry hole on JFK's head. However, the X rays and photographs show no exit for a front bullet. The author raised the issue with Wecht, and he admitted that "the question of where did a front bullet exit is a very good one." He first suggested that the front shot may have been a frangible bullet, which would have exploded upon impact in the brain. However, the X rays do not show any metal fragments in the brain from such a bullet, and when this was pointed out to Wecht, he acknowledged, "Yes, that's true, there should be more fragments." Finally, he suggested that the front bullet may have been plastic, and penetrated the brain but did not exit. He argued that since the brain is not available for examination, his speculation is possible—except that plastic bullets were rarely available until 1968, five years after the assassination.

<sup>2</sup> The author viewed a video taken of the execution of a journalist by army troops in Central America. When the victim, who was lying flat on his stomach on the ground, was shot in the rear of the head, his upper torso and legs arched off the ground, in the opposite direction of the bullet. It was similar to the neuromuscular reaction JFK suffered. Also, when Governor Connally was struck in the rear shoulder by a bullet, he did not fall forward, but is clearly visible on the Zapruder film, his wounded shoulder pushing back into the car seat, toward the direction from which he was shot.

<sup>3</sup> Dr. Lattimer also conducted twelve physical experiments that confirmed Alvarez's work. In each instance, the jet effect, on mock-ups of human heads struck from the rear by a 6.5mm bullet, caused the specimens to rocket back toward the shooter.

Another argument that the shot must have come from the front is based on the fact that two motorcycle policemen riding to the rear of the President's car were splattered with blood and brain tissue. But on an enhanced version of the Zapruder film, the two officers drive right into the head spray, which actually shot up and to the front of the President.

**Excerpted from *Reclaiming History: The Assassination of President John F. Kennedy*, by Vincent Bugliosi, pages 482-489. (In 1986 Mr. Bugliosi participated in a mock trial set up in London, with a prosecutor, a defense attorney, and a jury, to determine Oswald's guilt or innocence. Bugliosi, acting as prosecutor of Oswald, won his case. References below to London or the "London trial" are referring to that mock trial.)**

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Of the three shots fired that day in Dallas, there is no doubt as to when the third (and according to nearly all of the witnesses, the last) shot was fired. The Zapruder film graphically shows the results of the impact of that shot on the president's head at frame 313,<sup>1</sup> when the president was exactly 265.3 feet from the sniper's nest window. Here, the controversy is centered on what happens next—in just four-tenths of a second (Z314-321) the president's head snaps violently to the rear. Perhaps the majority of Americans have seen this portion of the Zapruder film at least once on television. The conspiracy theorists have argued, and millions of Americans have agreed, that this head snap conclusively proves that the president was shot in the head from the front. Indeed, it would be safe to say that the single thing that has convinced people more than anything else that the fatal head shot to the president came from the front, not the rear where Oswald was, is the head snap to the rear. "No layman can watch these frames," author Henry Hurt wrote, "and avoid the clear impression that the shot came from the right front of the President, the grassy knoll area." Mark Lane declared, "So long as the Commission maintained the bullet came almost directly from the rear, it implied that the law of physics vacated in this instance for the President did not fall forward." New Orleans district attorney Jim Garrison said, "You don't have to be a genius. It takes no arguments, no words. When you look at the Zapruder film you see that the president of the United States was shot from the front, and there's no question about it. He's so clearly hit from the front the force almost catapults him out of the back of the car. Any American seeing the film would know at a glance that the entire Warren Commission conclusion was a complete hoax, was absolutely false, and every man on the Warren Commission had to know it was a lie."

This impression was not just limited to those who would end up being hard-core conspiracy theorists, but was widespread. When Robert Healey, the executive editor of the *Boston Globe*, saw the Zapruder film in his office during a presentation to him and his staff on April 23, 1975, by members of the Assassination Information Bureau, a conspiracy-oriented group, he wrote the following editorial just two days later: "Oswald could not have fired all the shots that killed President Kennedy . . . The visual presentation is far more convincing than all the books and all the magazine articles that have ever been advanced . . . No words can make the case better than the Zapruder film. It is as simple as that."

In the London trial, there was little doubt in my mind that if I didn't satisfactorily explain away the problem of the head snap to the rear for the jury, their verdict would most likely be not guilty. And I knew I couldn't use the sudden acceleration of the presidential limousine to explain the backward lurch since the Zapruder film shows that the acceleration was several frames after the president's head had lurched backward.

Perhaps the biggest shock I had in my investigation of the facts and evidence in preparation for the London trial was how this most overshadowing point was completely disregarded by the Warren Commission. In the Commission's report and accompanying

twenty-six volumes, I could not find one single word of reference to the president's head snap to the rear. Warren Commission assistant counsel Wesley J. Liebeler on the *Louis Lomax* television program in Los Angeles in 1966, acknowledged that the Commission did not focus in on the president's head movements. "It is only since the critics have raised this point that anybody has ever looked at it closely," Liebeler said.

Upon reflection I realized that the Warren Commission probably believed it never had to concern itself with the head snap because it had conclusive medical evidence that the president was struck by two and only two bullets, both of which entered the president's body from the rear. Therefore, whatever caused the head snap to the rear was irrelevant to its inquiry since it could not have been a bullet from the front. While the Warren Commission was correct in this regard, its conclusion did not suffice for my purposes at the London trial. It was one thing for my medical expert to testify that an examination of the autopsy photographs and X-rays of the wound to the right rear of the president's head revealed that it was an entrance, not an exit wound, and hence, the bullet that caused the wound had to have been fired from the president's rear. But Kennedy's head dramatically being thrust to the rear would, I feared, be more powerful evidence of a shot from the front in the eyes of twelve lay jurors, probably enough, indeed, to raise a reasonable doubt of Oswald's guilt, which would result in a not-guilty verdict. The old saw that a picture (here, a motion picture, no less) is worth a thousand words was never more applicable.

Fortunately, the HSCA did address itself to the issue, though extremely briefly, concluding that the sharp rearward movement of the president's head was probably caused by a neuromuscular reaction—that is, nerve damage caused by the bullet to the president's brain caused his back muscles to tighten, which in turn caused his head to be thrust backward. Among other things, Larry Sturdivan, a research wound ballistics scientist at the Biophysics Laboratory at the federal Aberdeen Proving Ground in Maryland, showed the HSCA a film of an experiment in 1948 conducted at Aberdeen where live goats were shot in the brain by a bullet, causing the subject neuromuscular reaction, resulting in the goat's back arching backward.

Although no evidence was presented that a goat's back and abdominal muscles are the same as a human's, when Sturdivan was asked whether he was "troubled" by the president's head being thrust backward, he said, "No, sir . . . The neuromuscular reaction in which the heavy back muscles [of a human] predominate over the lighter abdominal muscles would have thrown him backward no matter where the bullet came from, whether it entered the front, the side, or the back of the head."<sup>2</sup>

But this was a *technical* explanation, and although I certainly intended to present it to the jury in London, I felt it might not carry the day for me on this critical issue. The first and most fundamental question I asked myself was why the bullet coming from the rear, irrespective of the neuromuscular reaction, didn't propel the president's head forward at least at the moment of impact, that is, *before* the reaction came into play? Rather ironically, I first learned that my assumption that the president's head had not been pushed forward was an erroneous one while reading the pro-conspiracy, but serious and scholarly book *Six Seconds in Dallas* by Josiah Thompson, in which Thompson treated the whole head snap issue in considerable depth, though ultimately incorrectly. Thompson's book pointed out that

Kennedy's head *was* propelled slightly forward between Z312 and Z313 (the frame in which blood and tissue are seen spraying forward from the president's head).

Thompson's observation was confirmed when in 1975 CBS asked Itek Corporation, a Massachusetts photo optics company, to study the *original* Zapruder film using the most advanced photo analysis techniques and instrumentation then available. (CBS had purchased, from Zapruder's heirs, the right to use the original for analysis purposes.) Over several months, Itek, with a staff of a dozen specialists, studied the film. Among the many findings in its ninety-four-page report to CBS in 1976, Itek proved that *before* the president's head snap to the rear commenced at Z314 and continued until Z321, "at [Zapruder frames] 312-313 [the president's] head goes forward approximately 2.3 inches, his shoulder about 1.1 inches." Although at one point Itek's report says that "frame 313 is the frame in which the President is fatally struck in the head," it is clear from the report that Itek's experts believed the shot struck at frame 312, at another point saying, "Prior to impact at frame 312," and referring "to the impact at frames 312-313." Itek found that "by [frame] 314 Kennedy's head has reversed direction" and continues in a backward direction until "it reverses direction at about frame 321 as his body contacts the back of the seat."

In the CBS television broadcast "Inquiry: The American Assassins," part 1, presented on November 25, 1975, host Dan Rather told the TV audience, "According to John Wolf, president of Itek's optical systems division, when the fatal [head] bullet struck, the president's head went forward with extreme speed, almost twice as rapidly as it subsequently traveled backwards."

Wolf: "In the three frames following 313 he reversed his direction and came back where he was before. It took him three frames to do it, so he's moving considerably slower moving back than he moved forward."

Rather: "That's not the impression one gets just sitting in a room and looking at the film."

Wolf: "That, of course, is the whole point of doing this kind of [analysis]. It's to get away from the subjective impressions that are developed by looking at a blurred motion picture."

Remarkably, the twenty-six volumes of the Warren Commission contain only one reference to the absolutely critical and paramount fact of the president's head being propelled forward, and it's not by any member of the Commission or its staff. Associated Press photographer James W. Altgens, in testifying about the shot to Kennedy's head, said, "What made me almost certain that the shot came from behind was because at the time I was looking at the president, just as he was struck, it caused him to move a bit forward." And there is only one sentence and four additional words on the subject in the entire twelve volumes of the HSCA. The official investigations treated the matter so dismissively that neither of their final reports mentioned the forward movement of the president's head at all.

Watching the Zapruder film in my study, I could not discern the slight forward movement at Z313, one-eighteenth of a second before the head snap to the rear. But looking at the individual frames, I could see that from Z312 to Z313 the forward movement, though slight, was distinct and unmistakable. I now had, for the first time, clear, *photographic* evidence to present to the London jury that Kennedy was struck by a bullet from the rear—powerful evidence I very much needed as a counterpoint to the defense's evidence indicating a shot from the front.



One other point, often overlooked, worked in my favor. The president's head was pushed not only forward at impact but also downward. Only a shot from a high elevation (the sixth-floor sniper's nest) could be expected to push the head downward to the degree it was. A shot from the much lower grassy knoll could be expected to push the president's head to his left, not downward.

On May 24, 1986, I flew to Phoenix, Arizona, to spend the day working with my photographic expert, Cecil Kirk, on a multiplicity of photographic issues. Kirk, who helped me understand the intricacies of the Zapruder film, had been the sergeant who headed the Mobile Crime Lab and Photographic Services Unit for the Metropolitan Police Department of the District of Columbia. This unit was responsible for the preparation of the photographic exhibits for the HSCA hearings and final report. Retired from the force in 1980, Kirk, considered one of the nation's leading experts in forensic photography and forensic crime-scene technology, and a former lecturer on forensic crime photography at the FBI Academy, was now director of the Support Services Bureau for the Scottsdale Police Department. On the dining room table of his suburban home, I witnessed an enormous mound of photographs from the HSCA's investigation of the Kennedy assassination. The photographs were all mixed up, with no discernible pattern. Five or so minutes into my necessarily indiscriminate perusal of the photographs, one photograph suddenly stood out, startlingly so.

"What in the hell is this?" I asked in amazement.

He answered, "A high-contrast photo of frame 313."<sup>3</sup> I asked, "This is an absolutely incredible photo. I've never seen it before. Why wasn't it published in the volumes?"

He said, "I don't know," that he had nothing to do with the determination of what photographs appeared in the volumes.

I asked why wouldn't a similar photo have been in the Warren Commission volumes.

"They didn't have the necessary photographic image enhancement technology to do this back then," Kirk answered.

It had to be pure oversight on the part of someone at the HSCA to not publish this enhanced reproduction of Z313, for this reproduction is almost, if not equally, as dramatic as that of the head snap to the rear, only it shows vivid, graphic evidence that the fatal shot to the head at Z312-313 was fired *from* the rear. As can be clearly seen, the terrible spray of blood, shell fragments, and brain matter a millisecond after the president was shot appears to be to the *front*.<sup>4</sup>

I now had more than enough evidence, of every species I would possibly need, to demonstrate to the jury that at the all-important moment of impact, Kennedy's head was pushed forward, not backward, proving the head shot came from the rear. As I indicated earlier, if I hadn't been prepared to prove this fact to the jury, the verdict most likely would have been different. That my opposition, Gerry Spence, knew it was a pivotal issue at the trial was demonstrated when Spence, being the devil of a great advocate that he is, had the head snap portion of the film shown to the jury (without objection from me) *five* times at the very beginning of his cross-examination of one of my first witnesses, Charles Brehm, even though Brehm was merely a Dealey Plaza witness and not my photographic expert. Spence made the commentary (proper only in summation) during his cross-examination, which I elected not to object to, that the head snap to the rear "looked as if somebody walked right up to the president

with a baseball bat and took a full swing as hard as they could, like Babe Ruth, and hit him right square in the middle of the forehead and knocked his head back.” But the Sultan of Swat actually struck out in this case.

This new evidence I now possessed, that the head shot to the president was fired from the rear, still did not negate, by itself, the far-fetched conspiracy argument that the president was struck by a second head shot perhaps a millisecond after the shot from the rear, and it was *that* head shot that caused the violent head snap to the rear. To furnish scientific support for the head snap to the rear being caused by a projectile (i.e., a bullet), the grassy knoll advocates invariably cite Newton’s second law of motion, to wit, that the rate of change of momentum is proportional to the impressed force, and is in the direction in which the force acts. Thompson asserts,

Basically, the law says that an object hit by a projectile will be given a motion that has the same direction as that of the projectile. At a shooting gallery, for instance, the ducks fall away from the marksman, not toward him . . . Applying Newton’s Second Law to the case in question and supposing that a bullet fired from the rear struck the President’s head, we would expect to see his head and body driven forward . . . We [do] see the beginning of such a movement at Z312-313 . . . If we account for the sudden forward movement as a consequence of the bullet’s impact, *only a similar hypothesis could account for the equally sudden backward movement*. What we see on the Zapruder film are the effects of a double transfer of momentum—one forward, the other backward. At Z313 we witness the effect of a virtually simultaneous double impact on the President’s head. One shot was fired from the rear, and the other from the right front.

The italicized language, referring to the movement of the president’s head to the rear, which we know was considerable, is what immediately caught my eye and attention. It was only at this point that I asked myself, how *does* a human body react to being hit by a bullet? Though I had tried quite a few murder and ADW (assault with a deadly weapon) cases in my career, I was embarrassed to learn I had no idea. I had never witnessed an actual shooting of a human being, and the issue had simply never arisen in any case in my career. The only issue was whether the defendant shot and killed the victim, not how did the victim’s body react at the precise moment it was struck by the bullet. Now, suddenly, it appeared to be perhaps *the* critical issue at the trial in London.

In early May of 1986, I drove down to the University of California at Irvine and spent the entire day with Dr. Vincent Guinn, a professor of chemistry at the university. Guinn was the nation’s leading authority on neutron activation analysis (NAA) and was to be one of my key expert witnesses in London. At dinner that evening, after we left the complex subject of NAA, I casually mentioned to the doctor and his young assistant the problem I was having with the head snap to the rear issue:

“Doctor,” I asked, “this is probably outside your expertise, but if a bullet hits the head of a human being, do you have any idea how much the head would be moved in the direction the bullet was traveling?”

“Rudimentary physics will tell you that the head would move very slightly,” Dr. Guinn said.

I asked, “Why is that?”

Dr. Guinn replied, “The weight of the bullet as compared to the weight of the human head.”

I said, “Let’s take the Kennedy case.”

He said, “Okay. As you know, the Western Cartridge Company bullet that struck the president weighed approximately 161 grains, about a third of an ounce. If Kennedy’s head was a normal head, it weighed between ten and fourteen pounds. Also, heads don’t just lie on top of our torso unattached. There is muscular resistance to the head being propelled in the same direction in which the bullet is traveling. One-third of an ounce striking a resistant ten to fourteen pounds, particularly where there is penetration, as there was here, with a resulting loss of momentum, is going to move those ten to fourteen pounds very slightly.” (In other words, the transference of momentum onto the head from the bullet has got to be small because of the very small weight or mass—only one-third of an ounce—of the bullet.)

When I told Dr. Guinn about the slight forward movement of Kennedy’s head at Z313, which he had been unaware of, he said this was precisely how much he would have expected the president’s head to move.

“So, the head snap to the rear could not possibly have been caused by the force of a bullet from the front?” I asked.

He replied, “That’s correct. Kennedy’s head simply would not be pushed anywhere near that far back by one-third of an ounce, even traveling in excess of two thousand feet per second.”

I told the doctor that although I had avoided taking physics in high school, millions upon millions of Americans who have taken physics have seen the dramatic head snap to the rear in the Zapruder film, and been convinced it was caused by a shot from the front. “Why is this?” I asked.

He said, “I haven’t the faintest idea.”

Dr. Guinn had given me exceedingly valuable information which, if correct, was the precise type of commonsense fact I could give the jury to support my medical evidence that a shot from the front could not have caused the president’s head snap to the rear, and that the sole shot that struck the president’s head entered from the rear.<sup>5</sup>

During a telephone conversation the next day, Dr. Charles Petty in Dallas confirmed what Guinn had told me, saying that the reaction of a head of a human struck by a bullet would be “roughly similar to that of firing a bullet through a half-open door. The door, on hinges, is penetrated, but would move very slightly to the rear.” I asked Dr. Petty if he knew of any shooting of a human recorded on film that I could show the jury in London to support what Guinn and he had told me. Petty said that during Mao’s Cultural Revolution, Mao had a number of major drug dealers lined up and executed by a firing squad. They were all shot in the head, and the film of this was shown on worldwide television. Dr. Petty said he had seen the footage and distinctly recalled that the heads of the victims hardly moved upon the bullet’s impact. I immediately called Mark Redhead in London and told him it was very important that his staff get this film for me. He said the London Weekend Television (LWT) film library was

immense, but that if the library did not contain the footage, they could get it elsewhere. (As it turned out, LWT never did come up with the film footage.) However, during the trial, after establishing for the jury through Dr. Petty the fact that a bullet weighing one-third of an ounce was simply incapable of having propelled the president's head backward the way the jury saw it on the Zapruder film, that it would only move his head very slightly, I asked him, "So the killings that people see on television and in the movies, which is the only type of killings most people ever see, where the person struck by the bullet very frequently is visibly and dramatically propelled backward by the force of a bullet [sometimes to the point of toppling over] is not what happens in life when a bullet hits a human being?"

"No, of course not."

Author Josiah Thompson clearly was unaware of this reality. He wrote in his book, "Supposing that a bullet fired from the rear struck the President's head. We would *expect* to see his head and body driven forward, *the force of the impact perhaps forcing him out of the rear seat onto the floor.*" But this is not what happens in real life. Further demonstrative evidence that a human body is not substantially propelled by the force of a bullet in the direction in which the projectile is traveling is the Zapruder film itself, which does not show either Kennedy or Governor Connally, when struck in their backs by the other bullet from their rear, being pushed noticeably forward in their seats in the presidential limousine. Though one's back admittedly would provide more resistance to such a thrust than one's head, it obviously wouldn't be to the point of completely negating Thompson's proposition.

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<sup>1</sup> Though we can *know* from the evidence the approximate time Oswald's aforementioned three shots were fired, and hence, the spacing of the shots, earwitnesses, for the most part, didn't agree. The space between Z160 and Z207-222 is shorter than that between Z207-222 and Z313, yet most Dealey Plaza witnesses thought there was more time between the first and second shots than between the second and third (WR, p. 115). (Examples of each: "Following the first shot, there was a slight pause, and then two more shots were discharged, the second and third shots sounding closer together" [Lillian Mooneyham: CE 2098, 24 H 531]; "It seemed to me that there was less time between the first and the second [shots] than between the second and third" [4 H 149, WCT Mrs. John B. Connally Jr.].) What explanation can there be for the considerable majority hearing the opposite of what the evidence shows? Apart from the fallibility of eye and ear testimony, though the earwitnesses heard the first shot, it could have been such a shock to their senses that only the sound (which many erroneously thought was that of a firecracker or car backfire) registered, not the sound in relation to the very next sound they heard. By the time of the second shot they may have regained their mental and auditory acuity, now knowing shots were being fired, but they were in no position to compare the space between the second and third shots with that of the first and second. At the London trial, when I asked Dallas deputy sheriff Eugene Boone, who as a member of law enforcement was very accustomed to the sound of shots from a weapon, what was the spacing of the shots he heard that day in Dealey Plaza, he said, "The first two shots and then the third shot was a little longer." Question: "So the first and second shots were closer together, then there was an interval, and then the third shot?" "Yes, sir." I then proceeded to have Boone demonstrate to the jury by the use of the word *bang* the three shots. There was a meaningful interval between the first and second, and second and third shots, but the latter interval was greater. (Testimony of Eugene Boone, Transcript of *On Trial*, July 23, 1986, pp. 125-126)

Quite a few witnesses thought the shots were evenly spaced. “I distinctly remember three shots . . . and the three shots were evenly spaced” (7 H 475, WC affidavit Clifton C. Carter).

<sup>2</sup> While it was clear that the House Select Committee preferred the neuromuscular-reaction explanation for the president’s head snap to the rear, it allowed, in its official conclusion, for another cause. It said that the head snap to the rear could also have been caused “by a propulsive effect resulting from the [brain] matter that exited through the large defect [on the right side of the president’s head] under great pressure, or a combination of both.” (7 HSCA 178) The president’s head can be seen on the Zapruder film as going not only backward but slightly *leftward*. This movement to the left can be explained by the explosive exiting of the brain matter on the right side of the president’s head creating a corresponding propulsive momentum (commonly called a “jet effect”) in the opposite direction, as a rocket recoils in a direction opposite to that in which its jet fuel is ejected.

<sup>3</sup> The enhanced photograph was published as part of Itek Corporation’s report in 1976 on their analysis of the Zapruder film (HSCA Record 180-10001-10396, “John Kennedy Assassination Film Analysis,” Itek Corporation, May 2, 1976, p.57).

<sup>4</sup> And indeed, from Governor Connally’s wife, we know that the shot to the president’s head caused “brain tissue” to land on “both of us” (she and her husband), each of whom was seated in *front* of the president (4 H 147). In fact, Secret Service agent Roy Kellerman, seated in the front passenger seat of the presidential limousine (even farther forward of the president than the Connallys), testified that the blood spray from the president’s head shot landed “all over my coat” (2 H 78).

Not only were the blood, brain tissue, and skull fragments all blown to the *front* of the president’s body, but the five bullet fragments found in the presidential limousine were all to his front. The fragment of the base of a bullet (CE 569) was found on the floor beside the right side of the driver’s seat, and the fragment of the nose of a bullet (CE 567) was found on the driver’s seat right beside the driver (5 H 67, WCT Robert A. Frazier). And then there were the three small fragments found beneath the left jump seat (CE 840, 17 H 840; 5 H 66). Also, the three skull fragments found inside the limousine were all to the president’s front, one in the footwell in front of the backseat, another on the floor in the middle of the car, the other on the floor near the jump seat (HSCA Record 180-10075-10174, January 6, 1964; ARRB MD 259, Interview of Floyd Boring by ARRB investigators Joan Zimmerman and Doug Horne, September 19, 1996; HSCA Call Report of phone call to Douglas Horne by Floyd Boring on September 19, 1996).

The main argument from conspiracy theorists that the “law of physics” requires that an object hit by a projectile has to be pushed in the direction the projectile is traveling, and therefore, the head snap to the rear compels the conclusion of a shot from the front, can easily be used against them. In addition to the fact that the president’s head moved *forward* at the moment of impact, how do the conspiracists explain what would be the ridiculous anomaly of blood, brain tissue, three skull fragments, and five bullet fragments all flying to the front of the president’s body at the same precise time they claim Kennedy’s head was being propelled backward by a shot from the front? They don’t. And can’t.

<sup>5</sup> In 1990, four years after the London trial, I asked Dr. Art Hoffman, a physicist out at UCLA, to give me his views on this matter. In a written report to me, Hoffman hypothesized the situation of a man lying on his back. “How far,” he asked, “will his head rise if struck by a bullet fired directly upward from below? Using the known mass (161 grains) and muzzle velocity (2,165 feet per second) of the Mannlicher-Carcano bullet and 15 pounds for the weight of the head, and assuming that the bullet is

completely stopped within the head for maximum momentum transfer [here, the bullet wasn't completely stopped by bone in the head, most of it exiting the head in fragments, which would even decrease the transference of momentum] and assuming that no other forces than gravity retard the motion of the head, we [Hoffman worked with a colleague, Dr. Robert Ditraglia] find that it *would rise only two inches* . . . The height that a head would be lifted against gravity is a reasonable estimate of how far it might [be propelled] when struck horizontally. The resisting forces of the neck muscles and connecting tissue are comparable to gravity since these muscles normally function to stabilize the head against gravity. Indeed, they are capable of exerting forces several times that of gravity . . . These considerations lead us to conclude that the Mannlicher-Carcano bullet would not impart a particularly large [movement] to the head." From measurements based on his analysis of the Zapruder film, Hoffman found a "2 inch forward movement" of Kennedy's head "owing to the entrance of the Mannlicher-Carcano bullet" from behind. He concluded that Kennedy's head snap to the rear was "8½ inches," obviously far too much for the impact of any bullet to have caused. (Letter from Dr. Art Hoffman to author dated March 20, 1990, pp. 1-3)