

THE MANTIK VIEW

THE ZAPRUDER FILM CONTROVERSY



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By David W. Mantik, M.D., Ph.D.

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[Editor's note: In this essay, David W. Mantik, M.D., Ph.D., who has undertaken the most extensive and detailed studies of its internal content and other properties, including comparisons of the film to other copies, of the film to other photographs and films, and of the film to eyewitness reports, in the history of the study of the assassination of JFK, provides a framework for understanding and exploring the questions raised by the lack of authenticity of the film, which has been extensively edited using highly sophisticated techniques. Those who wish to pursue this issue in greater detail should see the studies on this topic in Assassination Science (1998), including Mantik's transformational work.]

It is misleading to claim that scientific advances and scholarly experiments can cause all photo fakes to be unmasked. Questions about authenticity remain. Many photos that once were considered genuine have 'recently been determined to be faked. The authenticity of some is still being debated... -Dino Brugioni.

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A VISIT TO THE SOUTH: DOES HISTORY REPEAT?

A regal couple traveled to the south of their own realm where they were intensely disliked by many. They were feted at a state dinner. An open motorcade was held for them in the morning. Surprisingly, the crowds were large and friendly. Suddenly, a bomb was thrown at them. It exploded behind the car and several were injured. The motorcade stopped momentarily, and then continued on to the Town Hall. After a brief reception there, the husband decided to visit the hospital to see those who had been injured. Unfortunately, the motorcade took the wrong route so the governor shouted at the driver to stop and turn around. As soon as the car stopped, the assassin, who stood within ten feet, fired several shots, one striking the husband and one the wife. The royal couple remained frozen and upright. Then the car leaped forward and the wife plunged backward against her husband. Both were soon dead. The date was Sunday, 28 June 1914. It was the feast of St. Vitus, a Serbian national holiday that celebrated two major Serbian battles symbols of Serbian independence. The city was Sarajevo, Bosnia. The husband was Archduke Franz Ferdinand, heir to the Austrian throne. The assassin was a high school student, Gavrilo Princip, a Bosnian conspirator who lost his arm in the resulting melee and who died a few years later of TB. His name meant "Bringer of Tidings." This event precipitated World War I.

Based on the sources cited below, the conspiracy was organized in Belgrade by the Black Hand with the connivance of Serbs in position of power, army officers and government officials, including frontier authorities. The Austro-Hungarian government suspected this and the Austrian authorities found evidence to prove most of this although they knew nothing of the Black Hand and mistakenly suspected the Narodna Obrana. In 1925 a Serbian politician, Jovanovich, who had been Minister of Education in the Serbian Cabinet, casually mentioned that the Cabinet knew of the plot and discussed it in May or early June. He recalled details of its organization. Although a colleague denied this, his denials were unsupported and Jovanovich's story was probably true. [Authors note: Sources included:

1. Francis Whiting Halsey, *The Literary Digest: History of the World War* (1919)
2. Emil Ludwig, *July 1914* (1929)
3. S.L.A. Marshall, *The American Heritage History of World War I* (1964)
4. Laurence Lafore, *The Long Fuse: An Interpretation of the Origins of World War I* (1965)
5. Lee Davis, *Assassination: 20 Assassinations That Changed History* (1993).]

DOES HISTORY REPEAT? SOME ANALOGIES

The JFK and Ferdinand assassinations contain remarkable similarities; in both cases, the following statements can be made:

- The southern region was disaffected with the central government.
- The wife accompanied her husband.
- Murder occurred during a motorcade.
- Security was limited during the motorcade, despite rumors of possible assassination attempts. Ferdinand ridiculed an offer from Count Harrach to stand on the left footboard beside him. In Sarajevo, as in Dealey Plaza, the streets were unguarded.
- The motorcade stopped momentarily after the first loud sound and after the governor's shout.
- The governor turned around to look at the victim after the initial shooting.
- The fatal shot occurred either at or very close to the time that the vehicle stopped.
- Two or three shots were usually reported.
- The victim sat erect when the fatal shot hit.
- Death followed quickly.
- Evidence of a government conspiracy later emerged.
- Eyewitnesses were the source of the early reports.

My purpose in presenting this historical summary is not simply to note the existence of a conspiracy, moreover a probable government conspiracy in both cases, nor merely to draw engaging historical analogies, but, more importantly, to emphasize how the Zapruder film has affected our view of the JFK murder, in a manner that photography could not do for the Sarajevo assassination. [Authors note: To avoid confusion between the out-of-camera original film and the current film in the Archives, which are not identical, in my view I shall use the term "extant" to describe the film currently held by the Archives.]

Without the Zapruder film, we would be forced to rely on the testimony of eyewitnesses. Their descriptions have been included in the above summary even when they disagreed with the Zapruder film. For example, witnesses who described the movement of the limousine almost uniformly recalled a limousine stop (albeit a very brief one) in Dealey Plaza, in direct contradiction to the extant Zapruder film. And those who described the position of JFK's head at the instant of the final headshot almost always reported that he was erect, also in distinct disagreement with the extant film. This particular issue has previously been discussed in some detail (Assassination Science 1998, pp. 273-274 and pp. 286-292).

The witnesses also disagree sharply with the extant film regarding the movement of JFK's head. They describe a slumping forward (probably on two successive occasions), including a forward slump immediately after the fatal headshot, the same moment when the film shows a violent backward snap of the head. It is also noteworthy that an early observer of the film

(Zapruder's partner, Erwin Schwartz) failed to describe a head snap, and that both Dan Rather and Deke DeLoach (Cartha DeLoach, *Hoovers FBI: The Inside Story* by Hoovers Trusted Lieutenant 1995, p. 139) describe JFK going forward after the fatal head shot. DeLoach describes seeing the film on the evening of the assassination and Rather saw it within several days. None of these three described what is seen on the extant film, the head snap, which is at once both obvious and stunning.

If the Zapruder film is authentic, and yet displays such profound disagreement with the eyewitnesses (who speak with almost one voice), then deeply troubling questions arise about any historical event not recorded by a motion picture camera, even in those cases in which the eyewitnesses agree. If such radical cynicism about historical events is justified, then all historians should be put on notice that almost nothing in history can be certain, since eyewitnesses, no matter how high their level of agreement, would be essentially useless.

By way of illustration, without a confirmatory movie film of the Sarajevo assassination, we could not be certain how many shots were fired, what the governor did or said during the motorcade, where the victims were struck by bullets, or even what route was taken. Nevertheless, most of this information is recorded, and recorded consistently, in the early news bulletins (see the sources cited above) even though there are no photographs. The early newspaper articles are also in surprising agreement about the day's events. This agreement is sustained in subsequent books over a long time interval; those cited above range from 1919 to 1993.

If the extant Zapruder film is authentic, and the witnesses therefore so uniformly wrong, we ought to seriously doubt these Sarajevo witnesses, and all of the accounts based on them. If we adopted this extreme distrust of eyewitnesses, then all historical events before 1888 (Edison's Kinetograph) must be inherently not just unreliable but, in fact, flagrantly unreliable. Historians have rarely espoused such radical cynicism about what can be known (Edward Hallett Carr, *What is History?* The George Macaulay Trevelyan Lectures 1965, pp. 3-35). Although history is filled with cases in which the facts are uncertain, this very uncertainty, especially when the facts are critical, is usually acknowledged explicitly by historians rather than silently concealed.

Although historians do sometimes disagree vigorously about the facts, such as the murder of Adolph Hitler by his own staff (Hugh Thomas, *The Murder of Adolph Hitler: The Truth about the Bodies in the Bunker* 1995), often the facts are not in dispute and yet there is disagreement about the interpretation of events. Henry Steele Commager (*The Nature and the Study of History* 1965, pp. 59-60) has described how views of Southern reconstruction changed dramatically between the early twentieth century and the post-World War II era, becoming less harsh in the latter period. Likewise, C. Vann Woodward, former Sterling Professor of History at Yale, has concluded (*Thinking Back: The Perils of Writing History* 1986, p.112): "I doubt that revisionist scholarship has been more active in any field of American or Southern history than it has in Reconstruction historiography during the last generation."

Another example in which the facts are quite clear but the interpretation is in some doubt is the death of Meriwether Lewis: was he robbed and murdered as he slept alone in a cabin in central Tennessee while en route to Monticello? Or did he shoot himself during a severe depression (perhaps while deranged after weeks of serious drinking), once in the head

and once in the chest, slash himself with his razor, and then [tongue-in-cheek] steal his own gold watch and money? (Willard Sterne Randall, Thomas Jefferson, A Life 1993, p. 571.)

Advocates of Zapruder film authenticity seem oblivious to the logic of their own views. By ignoring the surprising agreement (actually, near unanimity) of the JFK witnesses, they must logically maintain an extremely pessimistic view of what can be known in history, a view not commonly embraced by professional historians (Robin Winks, editor, The Historian as Detective: Essays on Evidence 1968; David Hackett Fischer, Historians' Fallacies: Toward a Logic of Historical Thought 1970).

In fact, this radical distrust of eyewitnesses, even when they strongly agree is so extreme that it frankly borders on historical nihilism. Such a view is close to that of the logical positivist, Ayer, who wondered (A.J. Ayer, Philosophical Essays 1965, p. 168): "...whether we have sufficient ground for accepting any statement at all about the past, whether we are even justified in our belief that there has been a past." During his lifetime, Ayer won rather few followers; even fewer remain today (Ernst Breisach, Historiography 1983, p. 331).

[Editor's note: Frames of the Zapruder film may be viewed in books such as:

1. Robert Groden, The Killing of a President (1993)
2. Richard Trask, Pictures of the Pain (1994)
3. Noel Twyman, Bloody Treason (1997)
4. Stewart Galanor, Cover-Up (1998)

ASSASSINATION RECORDS REVIEW BOARD (ARRB)

As a result of Oliver Stone's movie, JFK, the Assassination Records Review Board (ARRB) was established by Congress in 1992 and was signed into law by George Bush on 26 October 1992. Board members were nominated by Bill Clinton by September 1993 and sworn in on 11 April 1994. Congress finally appropriated funds by 1 October 1994. The ARRB submitted its final report on 30 September 1998 (Final Report of the Assassination Records Review Board, 1998). Due to the efforts of the ARRB, several controversial issues related to the Zapruder film have been resolved, or at least partially resolved. The work of Roland Zavada, a retired Kodak engineer with special expertise in film production (who was re-hired by Kodak to perform work for the ARRB), has contributed to several new insights.

THE DARK INTERSPROCKET AREA

When the movie is projected the image between the sprocket holes is not seen on the screen. The image in this intersprocket area can, however, be examined manually, frame-by-frame. Much of this area is then seen to be darker than the central (projected) image, particularly after about Z-235. Zavada shot film through several cameras of the same model as Zapruder's and discovered that a dark region was commonly seen over most of this intersprocket area. This dark intersprocket area occurred repeatedly with several cameras and was similar to Zapruder frames after about Z-235. Independently, Brian Edwards and Phil Giuliano performed similar simulations with identical model Bell & Howell cameras in Dealey Plaza. They have shared their films with me and frame-by-frame analysis has shown similar results in these films. (Zapruder used a Bell & Howell Model 414 P.D Director Series movie camera; P =power zoom; D =dual electric eye.)

Zavada concluded that the claw was responsible for this dark intersprocket area. The claw advances the film, frame by frame. It moves downward when the shutter is closed, then moves upward when the shutter is open; during this exposure the claw casts a partial shadow on the intersprocket area, enough to cause the darkening seen in the intersprocket images. Although this explanation has been touted by some as proof, in and of itself, of authenticity, in fact, such an image could persist even after film alteration. This could occur, for example, if the original frames had first been magnified and then re-shot through the same camera. If the new frames had been magnified enough, the intersprocket area could be entirely eliminated by excluding it from the captured image of the new film. Of course, all of the new frames would be magnified, but if this were done in a continuous manner it would be difficult to detect such uniform magnification.

Furthermore, if all of the new frames had been shot through the same camera, then the resulting intersprocket images would again exhibit a dark area just like the initial generation. (Oddly enough, Zapruder's camera was not returned to him from the FBI until several months after the assassination. Is it possible that it was used in the process of alteration?)

Or, if a different camera had copied the identical field of view but did not itself produce a claw shadow, then the new film would still exhibit a dark area in the intersprocket area (from the first generation film). This could be achieved, for example, by manual copying in a single frame mode (each frame would be advanced manually), in which case a claw would not be necessary.

In any case, the dark area in the intersprocket image need not be a direct by product of reframing; the claw movement most likely causes it. What is less clear though is why this dark area is difficult to see in frames before about Z-235. Its absence is especially obvious in the Life issue of 25 November 1966. Zavada did not address this paradox.

THE GHOST IMAGE INFERIOR TO THE UPPER SPROCKET HOLE

In frames beginning at about Z-310, in the upper one third of the intersprocket area, there is a superimposed image of the front portion of a motorcycle. Why such a superposition occurs only at the time of the fatal head shot and nowhere else is peculiar. Zavada examined this image, found that it could be simulated in his laboratory experiments, and concluded that it was a double exposure from an adjacent frame. For example, during exposure of the (arbitrary) first frame, the lower portion of the field of view for that frame extends into the upper portion of the second (still unexposed) frame. This occurs because a hole in the aperture plate (for the claw mechanism) permits light to shine onto a small portion of the second frame. Only when the shutter is again opened is the full image for the second frame exposed.

However, this ghost image (from the first frame) can only be seen when the primary image in the second frame is dark. If the primary image in the second frame is too light the ghost image is difficult to detect against such a light background. Such double exposures were also seen in the Edwards and Giuliano films, often these ghost images did not display discrete objects but were simply lighter patches with well-defined borders. This area of overlap was reproduced at about the same site and with approximately the same size as the ghost images seen in the Zapruder film, thus confirming Zavada's hypothesis.

Although Zavada seemed satisfied with his explanation, it still appears to fall short of full clarification. Zavada repeatedly advised us that his primary task was to address technical issues. It was not his mandate to analyze the actual content of the images, e.g., he did not ask whether animation specialists had been at work on certain frames, or whether the content of one frame was consistent with that of other frames.

An astonishing example of such inconsistency is seen in the intersprocket image for Z-318; a good quality reproduction of this frame shows the limousine immediately behind the motorcycle, in the ghost image! According to Zavada, the ghost image in Z-318 was exposed at the same instant as the primary image of frame Z-317 (which also shows the limousine). But if Zavada is correct, then the limousine is in two different locations at the same instant! If Zavada was aware of this flagrant paradox, he failed to comment on it.

Another line of evidence is the quality of the central image in the (arbitrary) first frame compared to the ghost image in the second frame. According to Zavada, they were formed at the same instant, and should therefore display similar features.

But this is not always the case: e.g., the central image in Z-319 is obviously blurred, whereas the ghost image in Z-320 is distinctly sharper. Since both images were formed at the same instant, according to Zavada, why do they show such different tracking characteristics? Again, Zavada offered no explanation.

OCCASIONAL DOUBLED IMAGES

Poor tracking of a moving vehicle within a single frame can result in image doubling of background objects such a pedestrian. Such poor tracking also causes blurring of the moving vehicle. Frames immediately before and after such an event usually do not display such image doubling, so the tracking error must be very brief. Although none of Zavada's shots on Elm Street produced a double image, ¹ 'such events were occasionally seen in the simulated films of Edwards and Giuliano.

LIMOUSINE MAGNIFICATION AND THE GRASSY BACKGROUND OPPOSITE ZAPRUDER

The Edwards and Giuliano simulations show limousine magnifications similar to the Zapruder film at about Z-313, i.e., the length of the limousine occupies about the same fraction of the entire frame width in both cases. These simulations also suggest that Main St. (beyond the top of these frames) probably lies outside the field of view, as is also the case in the Zapruder film. Whether the magnification in the Zapruder film changes (it should not) between the Stemmons freeway sign and the fatal head shot, however, may need further study.

It is also possible that some frames in the interval between the sign and Z- 313 are composites i.e., normal foreground magnification and increased background magnification. In some of these frames there is little in the background to help decide this question. This question recurs below; Moorman's location in the Zapruder film, in particular, is most likely due to a composite image.

THE LEGAL STATUS OF PHOTOGRAPHIC EVIDENCE

Millicent Cranor reminds us that, because of the possibilities of photographic tampering, eyewitnesses have legal priority over photographic evidence (Assassination Science 1998, p. 265). Such evidence cannot be accepted in court until eyewitnesses have vouched for it (McConnick on Evidence, 3rd edition., 1984, Section 214). Nonetheless, scores of lawyers in past government investigations of the JFK murder chose to ignore this rule. Eyewitnesses were regularly accused of seeing or hearing events that (supposedly) could not be true because they were inconsistent with the official conclusions. A search throughout the many volumes of the Warren Commission and the House Select Committee on Assassinations (HSCA) reveals no reference to this fundamental principle.

THE CHIEF ARGUMENTS FOR AUTHENTICITY

The chain of possession... Josiah Thompson summarized this argument during a debate at the JFK Lancer Conference in November 1998. [Editor's note: His talk was later reprinted as "Why the Zapruder Film Is Authentic," JFK Deep Politics Quarterly (April 1999).] Thompson's argument is that the film was always accounted for and could not have journeyed anywhere for alteration.

Recent releases by the ARRB, however, suggest otherwise. The Homer McMahon interviews, in particular, suggest a broken chain of possession.

[Editor's note: See the NPIC reports by Douglas Home elsewhere in this volume.] McMahon was head of the color lab at the National Photographic Interpretation Center (NPIC) in 1963. He describes receiving the film (without a doubt, the Zapruder film) from a Secret Service agent who had flown it to Rochester for development before bringing it to the NPIC. McMahon's recollections were corroborated by one of his assistants, Bennett Hunter, who was also interviewed by the ARRB.

As best these two could recall, they received the film on the weekend immediately after the assassination (almost certainly before the funeral). McMahon recalls seeing the film projected at least 10 times that night. It was his opinion, based on this viewing, that JFK was shot 6 to 8 times from at least three directions, but the Secret Service agent told McMahon that there were just three shots, and that these all came from the Book Depository. McMahon and his assistant were told to keep their work secret and were prohibited even from telling their supervisors (who were not present).

The chain of possession argument relies critically on the memories of those who handled the film that day. Those skeptics who disparage the recollections of the Dealey Plaza witnesses nonetheless insist that the memories of the film handlers that day were flawless. Why those who handled the film that day can be trusted, while those who witnessed the assassination are not credible, is known only to disciples of film authenticity. Besides this reliance on the memory of the film handlers, however, the chain of evidence argument relies on sworn affidavits, to the effect that only three copies of the film were made at the Jamieson laboratory on 22 November 1963.

For the credibility of these affidavits, ² ultimate reliance must be placed on human honesty; there is no movie film that documents the preparation of only three copies of the film. How do we know that the affidavits were honest, or even that the signatories were actually in a position to witness everything they claimed to see? Is it even possible that the

affidavits were deliberately prepared possibly at the suggestion of the Secret Service, merely to cover up the existence of additional copies? Paul Rothermel, head of security for H.L. Hunt (Twyman 1997, p. 552; Harrison Livingstone, *Killing the Truth* 1993, p. 522 and p. 533) has long claimed that he received a copy of the film on the day of the assassination.

More recently, William Reymond, a French journalist, claims to have seen a different film in France, which may be either Hunt's copy or a descendant of it. Was the original switched at the Jamieson laboratory for a copy and then given to the Secret Service for transportation to Rochester that same evening? Was Zapruder merely given a copy when he thought he had the original? If so, how would he have known the difference? The fact is that no documentary evidence, nor anyone's memory, can settle a question of this nature.

My purpose here is merely to emphasize that the chain of possession argument, like all historical issues, ultimately relies on human memory and human honesty. Wherever either of these is in doubt, the chain of possession argument fails. And these recent claims-by McMahon, by Hunter, and by Reymond, do raise questions about the chain of possession, questions that could not be raised just a few years ago. I would conclude, at the very least, that arguments for film authenticity require much more than a simple chain of possession argument to make their case.

If the film was altered, why leave in evidence that suggests a frontal shot? I have previously addressed this entirely sensible objection in some detail (*Assassination Science* 1998, p. 272), but it still provokes discussion and emotion, so several more comments may be useful. Based on a careful review of the eyewitnesses, JFK most likely slumped forward twice, once after the throat shot, and then immediately after the fatal headshot (a motion not seen in the extant film).

Between these two events, it is most likely that Jackie (slowly) lifted JFK to an erect position so that she could examine his face closely. In Erwin Schwartz's interview with Noel Twyman, this is exactly what he described in the film that initial weekend. It seems likely that this upward movement, in a later version of the film (unnaturally accelerated by excised frames), has come to be seen as the head snap.

If the limousine really did stop, what other options did the editors have? They could simply have left JFK leaning forward for the entire sequence, thus retaining only one episode of slumping forward. This would mean that his position would have changed little even after the fatal headshot. Such a choice would, however, have the distinct disadvantage of being rather too simple a sequence to coincide with the memory of any observer and would therefore have raised suspicions merely because of its odd simplicity. Once this option was excluded any other choice required that JFK come erect again at one speed or another.

If the original speed of JFK's slow upward movement (i.e., no frame excision) were kept, then the limousine stops (or near stop) would still be visible. To eliminate the limousine, stop, editing within frames would have been required. JFK's slow upward movement would have to be retained in most (or all) frames but the limousine movement would have to be altered. This would require composite frames, frames in which JFK's actions would be continuous but in which the limousine movement was accelerated by the editing process. This would have been no small task and would, in addition, have carried an associated risk of detection. Much easier than the composition of new frames would have been the simple

excision of unaltered frames (at regular intervals) in order to hide the limousine stop. (Such frame excision might also have erased evidence for backward flying debris from the headshot.) Such frame excision would, of course, have accelerated JFK's backward movement, which is now seen as the head snap.

Wesley Liebeler, assistant counsel for the Warren Commission, recalled that the Warren Commission never paid much attention to the head snap. Furthermore, the film was hidden from public view until 1975 (twelve years later) and even then no official permission was granted to Geraldo Rivera for his public showing. Such reticence suggests that the editors were not eager to share their product with the public. Perhaps there was a genuine fear that the head snap would suggest a frontal shot, but because the editors were assured that the public would not see it, they may have decided that nothing further was necessary.

In conclusion, without knowing what the original film actually showed, we can only speculate on the difficulties faced by the forgers. Those who emphasize the self-defeating result of the head snap (as suggesting a shot from the front) must ask themselves what technical problems the forgers faced and also whether they were told that the public would not see the film. So long as these answers remain unknown, not too much emphasis can be placed on the head snap as a proof of authenticity. This is particularly so since the head snap was not spontaneously reported either by Dealey Plaza witnesses, or by early viewers of the film—such as Schwartz, Rather, and DeLoach. Finally, the reversal of the critical frames Z-314 and Z-315, when published by the Warren Commission, does suggest that the head snap was a concern even in 1964.

The final headshot most likely struck when JFK was sitting erect. This is based both on eyewitness testimony and on the lateral skull X-rays. The trail of metallic debris actually rises from front to back within the skull, a most unlikely trajectory for a frontal shot that occurred with JFK's head tilted forward as seen in Z-312. Supporters of two immediately successive headshots (at Z-312 and at Z-313, approximately) have never seriously faced this objection. On the contrary, the X-rays argue strongly for a headshot while JFK was sitting erect (or nearly erect) such as near the end of the head snap (at Z-321 in the extant film). Furthermore, those eyewitnesses who comment at all on this issue, especially the Secret Service agents who rode in the follow-up car, also recall that JFK was erect at the moment of the final headshot.

My own interpretation of all of the evidence is that JFK was hit first in the head from the rear while slumped forward such as in Z-312, then struck in the head for a second time (but from the front) while sitting erect. Such a posterior headshot has been strongly supported by the pathologists for over 35 years but they persistently ignored evidence for the second headshot. Only the second headshot produced a spray of blood; not enough blood could have accumulated before the first shot to give rise to such a visible spray. The bloody spray now seen at Z-313 was probably imported from the image of the second headshot (which is no longer seen in the film).

TECHNICAL CHALLENGES.

It has been argued that:

- There was insufficient time for a tedious and lengthy editing task.
- No optical printers existed for enlarging 8 mm film and no precedent existed for such manipulation with 8 mm film,
- The available light sources were too weak to enlarge an 8 mm film.
- The multiple generations required for such a process first enlargement from 8 mm, then film alteration, and then reduction again to 8 mm-would have yielded too much contrast build-up through multiple generations of copying, especially for a final copy on Kodachrome II
- Available film was not fast enough for such enlargement.

These are all serious objections, some of which admittedly cannot be answered easily or with finality.

1. Regarding the length of time required for the final product, my own view is that the editing went on for a long while. After the initial weekend, there is no record of a screening again until 25 February 1964. This provides a rather long time interval (two months) for completion of the alterations. It is not likely that the work was completed overnight, or even within a few days. It is even possible that no alteration was done within the first few days. Only several frames were published in Life magazine within the early weeks. These must have been retained unchanged, but most frames were not published at all in these early issues of Life.
2. We know from the testimony of Moses Weitzman, who for some time employed Robert Groden, that optical printers existed (at least by the late 1960's) that could enlarge 8 mm film. We also know now, contrary to Robert Groden's earlier protestations, that such a process could have captured the intersprocket image. To clinch this argument, the "home movie" portion of the Zapruder film, a known copy (not the original) does contain intersprocket images (although seriously degraded), thus proving that the intersprocket image could be copied. Although there may have been no precedent for enlargement of 8 mm film, the commercial firms in existence (Bob Colburn, Moses Weizman) were able to perform such enlargements, some of which were done for Life magazine within a few days; these latter may have been done by Colburn (Twyman 1997, p. 56).
3. Regarding the strength of available light sources, Homer McMahon told the ARRB that he produced 8"x10 still enlargements of single frames. It was apparently 'routine for NPIC to perform such blowups from very small negatives. If sufficiently powerful light sources were not available on standard optical or contact printers, is it possible that NPIC equipment (or similar equipment) was used for such blowups? Is it even possible that some of these 8"x10 frames created by McMahon were employed in the process of alteration? If so, construction of a custom optical (or contact) printer, used in a manual frame-by-frame mode, may have been required. It should also be recalled that the work required on the Zapruder film (about 25 seconds) is worlds away from a full Hollywood feature such as Mary Poppins (1964); for the extant Zapruder film, fewer

than 500 frames exist, and many of these may have needed no alteration at all. Finally, Zavada's report (Study 3, p. 5) states that a 150-300-watt lamp was used on the Bell & Howell Model J printer (presumably used to make the first day copies). But this could be customized for higher output in order to increase printing speeds. If so, then perhaps its light output could also have been adjusted when working with 8 mm film.

4. From his own experiments, Zavada reported that copying showed "tremendously effective retention of resolution" through three generations of contact printing (using modern film and chemicals), although tones were off by the third generation. He also noted that the first 60 batches of Kodachrome II (from 1961 the batch used by Zapruder) had lower contrast and longer exposure latitude than later batches. This would have increased the possibility of copying in 1963 without building up excess contrast. Furthermore, the chemicals used at that time (not available at present) would have contributed to increased fidelity during copying. In other words, both the film and chemicals used in 1963 would have increased the probability of copying through multiple generations without detection. Zavada concluded (R.J. Zavada, "JFK Photographic Evidence," September 1998, p. 25): "The 1963 film process combination had a greater opportunity to yield good quality than our practical test. The Secret Service copies attest to this fact. One of our limitations was that the Kodak Qualex Laboratory ceased processing Kodachrome Movie film in 1997, requiring us to use a test process yielding slightly different toe characteristics." [Authors note: The word "toe" here refers to the left side of the characteristic curve of the film.]
5. Although there is merit to the argument that available film was not fast enough (for enlarging 8 mm film), what is not known is whether commercial printers were actually used. For example, if custom printers (perhaps in a manual mode) had been used with potent light sources (such as those employed by McMahon to produce the NPIC prints), then the argument becomes moot in this manual mode, longer exposure times could compensate for film speeds that were too slow.

Only after a good deal of effort did I discover that copying X-rays in 1963 was entirely different from today (Assassination Science 1998, pp. 120- 137). In particular, the available film in 1963 made it quite easy to alter X-rays-and to do so without detection. Is it conceivable that the technical factors for Kodachrome II (both film and available chemicals) in 1963 made alteration easier than it would be now? Zavada's statement implies that the answer is certainly yes. What is less certain is whether these factors were sufficiently different to make it fully feasible (as it was for the X-rays). In face of the current absence of 1963 film and chemicals, this question may never be answered.

Several observers have suggested that Kodachrome II film is distinctive and can be recognized at a glance by an expert. But others, Jamieson among them (and Jack White, too) say that it is not that simple, that a side- by-side comparison of the two would be required. In this case, of course, that is not possible: the out-of-camera film appears to be missing. The next best comparison would be the original home movie (taken on the same roll of film by Zapruder) vs. the extant film now stored in the National Archives. Unfortunately, and despite the efforts of the ARRB, the original home movie segment has never been located. If this were ever located, this comparison, using a full battery of chemical and physical tests-could put the question of authenticity finally to bed.

Psychological issues: altering the film for a cover-up is too great a risk for any reasonable person to take. Since this is a psychological argument no final answer is possible, but many lines of evidence suggest otherwise. What if this rational person were ordered to alter frames? To 'raise the ante, what if he were not told the significance of the particular step he was asked to perform, or perhaps was given a cover story that seemed credible? Then what would he do? Would our rational man decline to do such work, merely because he vaguely suspected foul play? And what would he do if his career were at risk?

Similar issues arise in the case of the photographs taken by the Dallas police of the Oswald evidence. John Armstrong has made a powerful case that these photographs were extensively altered. Why would anyone do this when they faced a serious risk if caught? This JFK case also contains convincing evidence of altered documents (items that emerged from the FBI). The paper bag that supposedly surrounded Oswald's rifle is a case in point: one FBI document reports that it matched the paper at the Book Depository while another reports the exact opposite. Logically, at least one of these is a probable forgery. So the same question arises: why would someone take this risk? Although the question cannot be answered specifically in these cases, it is nonetheless apparent that someone did take just such a risk.

The autopsy photographs and X-rays raise identical issues. Based on the recent ARRB interviews, both with the pathologists and with newly discovered witnesses, the evidence for photographic alteration is now very difficult to ignore. My own work on the X-rays (Assassination Science 1998, pp. 120-137), which was reviewed without suggested changes by Kodak's Director of Medical Physics, is still a powerful indictment of the X-rays. The ARRB directed precise questions about the X-rays at pathologists Humes and Boswell while they viewed them; their answers provide astonishing corroboration (often at great personal embarrassment for them) for X-ray alteration, just as I had predicted based on my own studies of the X-rays.

So the question is similar: if government employees were willing to alter autopsy X-rays and photographs, willing to alter Oswald evidence photographs and related documents, why would they be unwilling to alter a movie film? Particularly if provided with a cover story, would they truly choose this moment to dig their feet into some vaguely defined ethical ground? What is particularly ironic about this argument is that some individuals who advance it actually believe that the photographs and/or X-rays were altered, or that the Oswald evidence has been forged. Such a view is not logically consistent.

Secrecy of this sort is impossible; someone would have told by now. This statement assumes that no one has told, but that is probably not true. I have previously described a personal encounter (Assassination Science 1998, p. 341) in which a purported former CIA employee claimed contemporaneous knowledge of film alteration. His name is Oswald LeWinter and his association with the CIA was reported in 1998, both in American tabloids and in respectable European newspapers, regarding documents that may be germane to Princess Diana's death. I have also received a handwritten note from someone who claims to know the perpetrators' identities; the names of several suspects were even listed. [Editor's note: I received similar correspondence, which I forwarded to the Department of Justice. For my efforts, I received a form letter in reply.]

This information was also forwarded to Douglas P. Home at the ARRB. Based on a telephone call, he suspected that this trail led nowhere. Whether this is sufficient follow-up I

do not know. More recently, the French journalist, William Reymond, has seen a clearly different version of the film in France. What is striking is his description of specific motorcade events that are not seen in the extant film (such as the tum at Houston and Elm), and the fact that eyewitnesses had previously reported these same events. Since Reymond apparently had not known about the eyewitness reports, his screening of this film becomes even more meaningful. All of these events at least raise doubts about whether the secrets have been kept.

The larger question, though, is whether major secrets can be kept for long intervals of time. Many lines of evidence suggest that this is not only possible, but for bureaucracies, is surprisingly common (John Ralston Paul, *Voltaire's Bastards* 1992). Gary L. Aguilar, M.D., has recently reminded us that Daniel Ellsberg, who released the Pentagon Papers, recalls that in 1964 at least 100 people knew the same information that he disclosed in 1971, yet no one said anything about it before he did ("Ellsberg Remembers," *The Nation* (27 May 1997), p. 7). On the morning that the first nuclear bomb was exploded in the New Mexico desert in 1945, Mrs. Leslie Groves received a telephone call. The caller suggested that she listen to the radio during the day since one of her family members would be in the news. Not knowing what to expect, and not even knowing which family member was meant, she was shocked to learn that her husband, General Leslie Groves, had been the military director of the Manhattan Project. Many others at Los Alamos, to say nothing of family and friends, honored this same state of secrecy. Neither the public nor the media knew any significant details of this project during the several years that it continued, or if they did know, they also kept the secret.

Secretary of Energy Hazel O'Leary tried (irresponsibly) to take credit for exposing the (unethical, by today's standards) radiation experiments that began in the 1940s. However, it was only through the persistent and courageous work of Eileen Welsome of the Albuquerque Tribune that this matter came to light ("The Plutonium Experiment," *The Albuquerque Tribune* 1993, Eileen Welsome). My files contain numerous examples of medical misbehavior over several decades about which no one ever said anything for many years. Without Welsome we may never have learned about the radiation experiments either. Furthermore, these experiments were performed at blue ribbon universities and institutions. In each of these cases the secret was kept for many years, and often kept by many.

Walter Goodman ("Mass Media: The Generation of the Lie," *All Honorable Men* 1963, Chapter 4) recalls the TV quiz shows of that era. Congressional hearings were conducted and participants (at all levels) were questioned under oath. New York County District Attorney Frank Hogan (interim HSCA Chief Counsel Robert Tanenbaum later worked in the same office) reported that of 150 contestants on Tic-Tac-Dough and Twenty-One, no fewer than 100 had lied about getting answers. Would we have known any of this without Herbert Stempel? Could we even, especially during that era-have believed it? Nor can it be said that disclosure was inevitable, since the shows were losing popularity and their long-term survival was becoming less certain.

Eyewitnesses are unreliable. This claim has been repeated so often that scarcely anyone dares question it. Although the statement is often true there are, in fact, important exceptions. I have always granted the obvious: eyewitnesses are not very good at identifying a human face only briefly glimpsed (e.g., purported witnesses to Oswald

sightings such as Howard Brennan and Helen Markham), nor are they reliable at recalling a complex sequence of events. The human brain is simply not programmed for such tasks. On the other hand, when a simple and important event occurs, humans can be quite remarkable for recalling it with consistency and with accuracy. In the heat of debate, it is precisely this fact that is forgotten.

As a physician who specializes in the treatment of cancer, I routinely take medical histories from patients and family members. If there is one thing I have learned in medicine over the decades it is simply to listen and let the patient tell his own story. Almost always, by the time he has finished, the diagnosis is obvious.

If humans are so unreliable as eyewitnesses, then how is it that they can be so reliable, and so consistent, when telling their own stories? The answer is simple: they really do recall these medical events, events that are usually uncomplicated and that are also very important to them. If eyewitnesses were so unreliable, then a patient's diagnosis should not typically be evident after a brief medical history but, in fact, it is.

As a sports fan, I occasionally reminisce about major sports events with friends or family. During these conversations I have never encountered an occasion where the precise details of what happened became a major issue-the kind that would send us scurrying to the sports history books or to a video replay. On the contrary, for an event that was significant for both of us, the facts were never in doubt; the conversation instead centered on what happened before and after the main event, but especially on the significance of the event. How is it possible that we could so easily agree on the central facts if eyewitnesses have such poor recall for events? The fact is that they don't, at least not for events that are reasonably simple and that are also significant in some way to the viewer.

The Lincoln assassination has long held interesting parallels to the Kennedy assassination (Richard Belzer, UFOs, JFK, and Elvis 1999, p. 92). In this case, the events at Ford's Theater, the pursuit of Booth, his capture, the subsequent hanging of conspirators, various authors mostly agree upon these primary details. And such agreement has persisted for many years, despite the absence of photographs of these events (aside from the hangings). How is this possible if eyewitnesses are so unreliable? Or are we merely simpletons to believe these tales?

Another striking example of eyewitness credibility has recently reached the media. During this very weekend (14-16 May 1999) the descendants of Sally Heming's have been invited to join Thomas Jefferson's descendants at a Monticello reunion. ³ This event, which would have been miraculous, only several years ago, has arisen due to DNA comparisons between a living descendent of Sally Heming's youngest son, Eston, and five acknowledged Jefferson family descendants ("Jefferson fathered slave's last child," Nature 396: 27; November 5, 1998). The same Y chromosome markers were found in each. This has led most scholars, even former skeptics, to concede that Jefferson had a sexual relationship with Sally Heming's.

This is an astounding turnabout for professional historians, almost none of who had taken this relationship seriously. Dumas Malone, who spent 40 years writing a multi-volume biography (Jefferson, the Virginian 1948), had previously denounced this story as "filth" and "virtually unthinkable in a man of Jefferson's moral standards." Willard Sterne Randall (1993) called the story "one of America's most durable myths, unproven and unprovable."

How Randall knew this story to be a myth if it could not be proved-or correspondingly disproved, he was too arrogant to explain. Jefferson's most recent biographer, Joseph J. Ellis, also originally rejected this liaison.

That these respected biographers could all reach the same wrong conclusion was possible at least partly because they all ignored a long standing oral tradition within the Heming's clan that Jefferson was indeed the father of some, if not all, of Sally's children. How many of these authors interviewed any of Sally's descendants, examined their photographs, or tried to trace the story in any way? Randall's biography does not even mention such possible avenues of research. This episode of gross ignorance also reminds us of the danger of believing authorities when evidence is lacking, no matter how often they speak, no matter their credentials, and no matter how many of them line up in a row. In this case their personal biases overcame their professional training as historians.

EYEWITNESSES IN THE PROFESSIONAL LITERATURE

Is there any evidence in the professional literature regarding witness reliability for items that are relatively simple and salient? For this answer we turn to a remarkable publication. Elizabeth Loftus has summarized this paper (Eyewitness Testimony 1996, p. 25); ironically, the dust jacket of her book questions the reliability of eyewitnesses. Contrary to the dust jacket, however, the original University of Michigan paper by Marshall, Marquis, and Oskamp (Harvard Law Review 84: 1620 (1971)) makes a startlingly powerful case for eyewitness reliability, providing that certain conditions are met.

Marshall et al. showed a two-minute, homemade, color movie film with sound to 151 "witnesses." Within minutes of their viewing they gave a "free report," during which the interrogator said almost nothing. In individual interviews held in private rooms they were asked to be as accurate and complete as possible, with the understanding that the interviewer had not seen the movie. After this, they were examined using one of four types of questions:

1. Open-ended with moderate guidance.
2. Open-ended with high guidance.
3. Structured, multiple-choice questions.
4. Structured leading questions.

In addition, half of the witnesses encountered a supportive atmosphere whereas the other half met a hostile atmosphere. To assess salience of specific items, a second group (high school students and members of the survey staff) was asked to recall as many as possible of the 900 items in the movie; if more than (50%) of these viewers reported a particular item it was labeled highly salient. The conclusions of this study are as follows.

The first surprise was that the experimental atmosphere, whether hostile or supportive, had no important effect on either the accuracy or completeness of the testimony. In the free report format, the accuracy of the witnesses was never less than (95%) for any degree of salience, and it was (99%) for highly salient items. And for these items, it made little difference how the questions were asked: the accuracy ranged from (96 to 99%).

The free report format yielded the lowest completeness, (70%) for highly salient items. For these items, higher levels of completeness were found for moderate guidance (84%), high guidance (88%), multiple choice (98%), and leading (98%) questions. The greater the salience, the less was the effect of different types of interrogation on accuracy. Also, as salience increased there was only a small increase in completeness. The authors note that the trade-off between accuracy and completeness was much less than expected; in fact, coverage could increase a great deal while accuracy declined only slightly.

Accuracy and completeness were also assessed by type of item: person, action, sound, and object. In the free report, accuracy for sounds was (92%), while the other formats ranged from (78% to 90%). For actions, the most pertinent item for the JFK motorcade-accuracy remained high with moderate guidance (97%) or even with high guidance (94%). For actions, completeness was as follows: free report (28%), moderate guidance (38%), high guidance (42%), multiple choice (86%), and leading (87%). These researchers concluded: "Our witnesses were able to testify with impressive ability. For instance, those confronted with leading interrogation in a challenging atmosphere testified with approximately (83%) accuracy and (84%) coverage."

The astonishing reliability of these witnesses is quite remarkable: it is totally contrary to the traditional view of eyewitness unreliability. What made these witnesses so reliable? The authors note that an immediate interview is different from the usual courtroom situation, which often occurs months or even years after the event. This promptness, no doubt, improved the performances of the witnesses. The authors also add, however, that salience is a major factor and they emphasize that prior studies had often investigated non-salient items. ⁴

What relevance does this have for the JFK assassination? It is highly relevant. Many of these witnesses recalled the motorcade events, not months or years later, but within a brief period, sometimes even within minutes, just as in the experiment. Even more importantly though they described salient actions, such as whether or not the motorcade stopped, or which direction JFK moved in the limousine at certain critical moments. And, finally, they described items that were rather simple, easily within the ability of the human brain to recall without great difficulty.

In fact, the events seen in the two-minute movie in the experiment were distinctly more complex than a simple question of whether the motorcade stopped, or whether JFK moved forward or backward with the final headshot. Therefore, contrary to what adherents of film authenticity have claimed, the Marshall experiment has shown convincingly that eyewitnesses (and ear witnesses, too) can accurately recall simple and important events. This Marshall study has taught us that a blanket statement of eyewitness unreliability is simple minded, we must instead ask what is being demanded of our witnesses. When the items are simple and salient and recall is prompt, they can do remarkably well.

THE CHIEF ARGUMENTS AGAINST AUTHENTICITY

Time constraints prohibit a review of much germane evidence against authenticity that has accumulated during the past several years. I have selected the arguments presented here based on my perception of their strength as well on as my familiarity with them. Other critics of the film would doubtless have a somewhat different list.

THE DEALEY PLAZA WITNESSES (ASSASSINATION SCIENCE 1998, PP. 273-275)

In my prior essay I listed ten witnesses (of many eligible candidates) who reported a limousine stop. For this effort I was primarily criticized for using an indirect quote for Chaney (instead of a direct one). In reply, I would ask a more direct question: what did the ten closest witnesses report? First, did they describe the movement at all? Then secondly, what did they see? It is quite striking that each of these ten witnesses did describe what the limousine was doing; this would not have been expected if the limousine had traveled at a nearly uniform speed, as the Zapruder film suggests. This uniformity of the closest witnesses is also remarkable though because many Dealey Plaza witnesses are not known to have commented on the limousine. These latter, however, were uniformly farther from the limousine, some much farther away, and might therefore not have paid as close attention to the limousine as the closest witnesses.

But all ten of the closest witnesses did comment quite explicitly-and they all saw it either stop, or nearly stop. Their comments show no equivocation. These witnesses (in no particular order) and their statements follow. The Newman's are counted only once.

- Bobby Hargis: "At that time [just before a shot to the head] the Presidential car slowed down. I heard somebody say, 'Get going.' I felt blood hit me in the face and the Presidential car stopped immediately after that" (6H294). " ...I felt blood hit me in the face, and the Presidential car stopped immediately after that and stayed stopped about half a second, then took off at a high rate of speed." (Trask 1994, p. 209, who quotes from an interview with The Dallas Times Herald.)
- B.J. Martin: He saw the limousine stop for "...just for a moment." (Newcomb and Adams, *Murder from Within* 1974, unpublished, p. 71.)
- Douglas Jackson: "...the car just all but stopped ...just a moment." (Newcomb and Adams 1974, p. 71.)
- James Chaney: "...from the time the first shot rang out, the car stopped completely, pulled to the left and stopped" (2H44-45, 3H266). Marrion Baker, his fellow officer, attributed this quotation to Chaney. Mark Lane confirmed that Chaney had indeed said this (2H45) and Lane then added " ...[it] seemed to be so generally conceded by almost everyone that the automobile came to, almost came to a complete halt after the first shot did not quite stop, but almost did."
- Bill Newman: "I believe Kennedy's car came to a full stop after the final shot." (Bill Sloan, *Breaking the Silence* 1993, p. 169.) "...I've maintained that they stopped. I still say they did. It was only a momentary stop, but..."

- (Newcomb and Adams 1974, p. 96, who cite an interview by Mary Woodward in the Dallas Morning News, 11/23/63; also see Jim Marrs, Crossfire 1989, p. 70.)
- Mary Moorman: "She recalls that the President's automobile was moving at the time she took the second picture, and when she heard the shots, and has the impression that the car either stopped momentarily or hesitated and then drove off in a hurry." (22H838-839; Harold Weisberg, Photographic Whitewash 1967, p. 160.)
- Jean Hill: "...the motorcade came almost to a halt at the time the shots rang out... It [the limousine] was just almost stopped" (6H208- 209).
- Charles Brehm: "...between the first and second shots the President's car only seemed to move some 10 or 12 feet. It seemed ...that the automobile almost came to a halt after the first shot..." (22H837-838).
- Alan Smith: "The car was ten feet from me when a bullet hit the President in the forehead... the car went about five feet and stopped." (Newcomb and Adams 1974, p. 71, who cite The Chicago Tribune, 11/23/63, p. 9.)
- Mary Woodward: "Apparently the driver and occupants of the President's car had the same impression because instead of speeding up, the car came to a halt after the first shot." (2H43; Dallas Morning News, 11/23/63; also see Marrs 1989, p. 28.)
- That all of these closest witnesses comment at all on the limousine movement, independent of the type of movement, is by 'itself, extraordinary. In view of Marshall, these witnesses clearly considered the limousine movement to be a salient feature of the entire event. This is totally contrary to what devotees of film authenticity would have us believe about the motion of the limousine. Furthermore, the witnesses' actual words leave no room for a slight deceleration. Instead, they uniformly described a dramatic deceleration, and for many of them it was a literal stop. Furthermore, all four of the closest motorcyclists agreed that the limousine stopped; since they were riding immediately beside the limousine and trying to mimic its speed, they, of all people, should be reliable witnesses.

If witnesses can indeed recall simple and important events, this surely must be one of them. Why would all ten closest witnesses recall the same event in the same way, unless that was really what had happened? And why would all four of the closest motorcyclists invent such a stop if none existed? Readers who have watched the extant Zapruder film might ask themselves: would they have commented at all on the limousine speed? If so, what would they have said? Would they have reported either a stop (most unlikely) or even a near stop (unlikely)?

There are many more witnesses to the stop than those listed above ("59 Witnesses: Delay on Elm Street," The Dealey Plaza Echo 312, July 1999, Vince Palamara, pp. 1-7). [Editor's note: This study appears elsewhere in this volume.] In fact, virtually every witness who commented on the limousine movement recalled a stop or a near stop. Moreover, this stop was widely taken for granted at the time; it was reported contemporaneously in the media (Newsweek, 2 December 1963, p. 2 and Time, 29 November 1963, p. 23), by later biographers (UP's Four Days 1964; William Manchester, The Death of a President 1967; Jim Bishop, The Day Kennedy Was Shot 1968) and, much later, even by the media's current hero of lone assassin aficionados, Gerald Posner, who describes the limousine stop as

follows: "Incredibly, Greer sensing that something was wrong in the back of the car slowed the vehicle to almost a standstill" (Case Closed 1993, p. 234). How Posner squares this astonishing statement with his presumed acceptance of the film he does not bother to explain.

The head snap was spontaneously described neither by the Dealey Plaza witnesses nor by early viewers of the film. In the recent past, moreover, the jet effect as an explanation for the head snap has been fully discredited in independent experiments performed by Arthur Snyder, Ph.D. and Doug DeSalles, M.D. It can no longer be offered as a viable explanation for the head snap. In addition, a long list of arguments against that particular explanation has been previously recounted (Assassination Science 1998, pp. 279-284). The other explanation offered by Warren Commission supporters, the neuromuscular reaction, has never received any credible support from appropriate experts in the neurosciences. The many arguments against it are also recounted in Assassination Science (1998, pp. 279-284). Nothing new has emerged to resuscitate this idea. Jackie's simultaneous head snap (originally noted by Itek; see Assassination Science 1998, p. 283) remains a mystery as well-unless film alteration is accepted. In summary, none of the traditional explanations can account for the head snap. By itself, this argument alone requires that film alteration be taken seriously.

The traditional Warren Commission critic, for years, has taken the head snap as an obvious proof of a frontal shot. Itek originally pointed out, however, that this simply could not work, mainly because it is not a simple matter of transferring energy from the bullet to the motion of the head. The problem is that JFK's head (and upper torso, too) must be lifted substantially against gravity. This requires a great deal of energy, energy that is no longer available for the kinetic energy of the head. These calculations demonstrate that the energy left over cannot reproduce the head snap of the Zapruder film.

I found this to be true even after I revised some of Itek's anatomic values. [Editor's note: This is one of many manifestations of the importance of the author's expertise in both medicine and physics.] Unfortunately, no one else, to my knowledge, has corroborated these calculations, even after all of these years. In summary, then, these arguments about the head snap leave believers of film authenticity in a very difficult position. They are left with no explanation for the most remarkable feature of the film, the head snap.

Many witnesses describe an erect posture at the instant of the final headshot, after which JFK is commonly described as slumping forward. Such witnesses, mostly Secret Service agents in the follow-up car, are Schwartz, Ault, Hargis, Hickey, Kinney, and Landis, (Assassination Science 1998, pp. 289-290) these descriptions of erect posture are totally inconsistent with the Zapruder film, in which the (single) headshot occurs when JFK is slumped forward and to the left. But when the question is raised (as it rarely is) about what posture the witnesses saw at the moment of the headshot, none of them describe JFK as slumped over. This issue, so striking when it is considered has received almost no discussion whatsoever.

Those witnesses who do describe JFK's position at the moment of the headshot describe him as sitting erect. And most of these then go on to describe how JFK next slumped forward (probably for a second time). How is it possible for such a simple and memorable event to be remembered so incorrectly (if authenticity devotees are correct) by

so many relevant witnesses, especially in view of Marshall's research? This simple recollection should not tax the abilities of human memory, nor is it so inconsequential that it would be forgotten. In fact, it is just the kind of incident, one with simple actions and salient events according to Marshall, that witnesses would recall. In fact, witnesses do recall these events with remarkable consistency. If there were no Zapruder film, how would the assassination be described in history books? It is likely that the Zapruder version would be unknown.

THE EARLY RE-ENACTMENTS

I will say rather little here about the first two reenactments, for which I previously cited (Assassination Science 1998, pp. 305-308) the meticulous articles by Daryll Weatherly (The Investigator, Winter 1994-95, p. 6) and Chuck Marler (Assassination Science 1998, pp. 249-261). Their work has, unfortunately, received little attention, but also little criticism. The point is simple, these re-enactments as well as associated documents and eyewitness statements, place the final head shot (the second, in my view) about 30 to 40 feet further down Elm Street than Z-313. Warren Commission data tables actually place the final shot at 294 ft. from the "sniper's" window, not the 265 ft. that corresponds to Z-313. This greater distance of about 294 ft. was actually identified in a photograph (Figure 1) printed in Newsweek (pp. 74-75) as recently as 22 November 1993. In summary, the data tables, documents, and figures from these early re-enactments remain powerful corroboration for the alteration of the film. The evidence is so powerful, in fact, that proponents of authenticity usually ignore it. There is little else for them to do.

INCONSISTENCIES WITH OTHER PHOTOGRAPHIC EVIDENCE

This substantial area can be addressed only briefly here. Jack White has discovered new, and astonishingly robust, evidence, based on a simple reenactment he performed in Dealey Plaza. In the famous Moorman Polaroid, taken immediately after a headshot, Jack noticed the geometric pattern in the background arcade over JFK's head. He also noticed Zapruder's pedestal in the foreground and he recognized that, by lining up both of these features, it was possible to locate Moorman (actually Moorman's eye) very precisely at the moment she took her picture. Although her distance from the arcade remained uncertain, her lateral and vertical position could be determined quite exactly.

[Editor's note: White's newer discoveries, some quite astonishing, appear elsewhere in this volume.]

When I attempted to reproduce this I was astonished. As I lined up one corner of the pedestal with a chosen point on the background arcade, I could immediately see that this technique was exquisitely sensitive to even slight head movements. The smallest movement of my head put it out of alignment. So I lined it up precisely and then placed a knife in the ground to mark the exact lateral position. Then I moved a short distance away, and without looking at the ground, attempted to reproduce what I had just done. To my amazement, I could do this repeatedly to within an inch, just as Jack had implied. Next I looked at the vertical location. It was immediately obvious that I had to crouch far down in the grass in order to reproduce the image seen in the Moorman photo. I stepped onto the street immediately adjacent to the curb and discovered that I still had to crouch quite a lot.

On a subsequent visit, I was able to use as a model a young woman who was only slightly taller than Moorman. When standing on the grass south of Elm St. (Figure 2), she had to

crouch a good deal in order for her eye to reproduce the background alignment of the Moorman photo. Next she stepped onto the street:

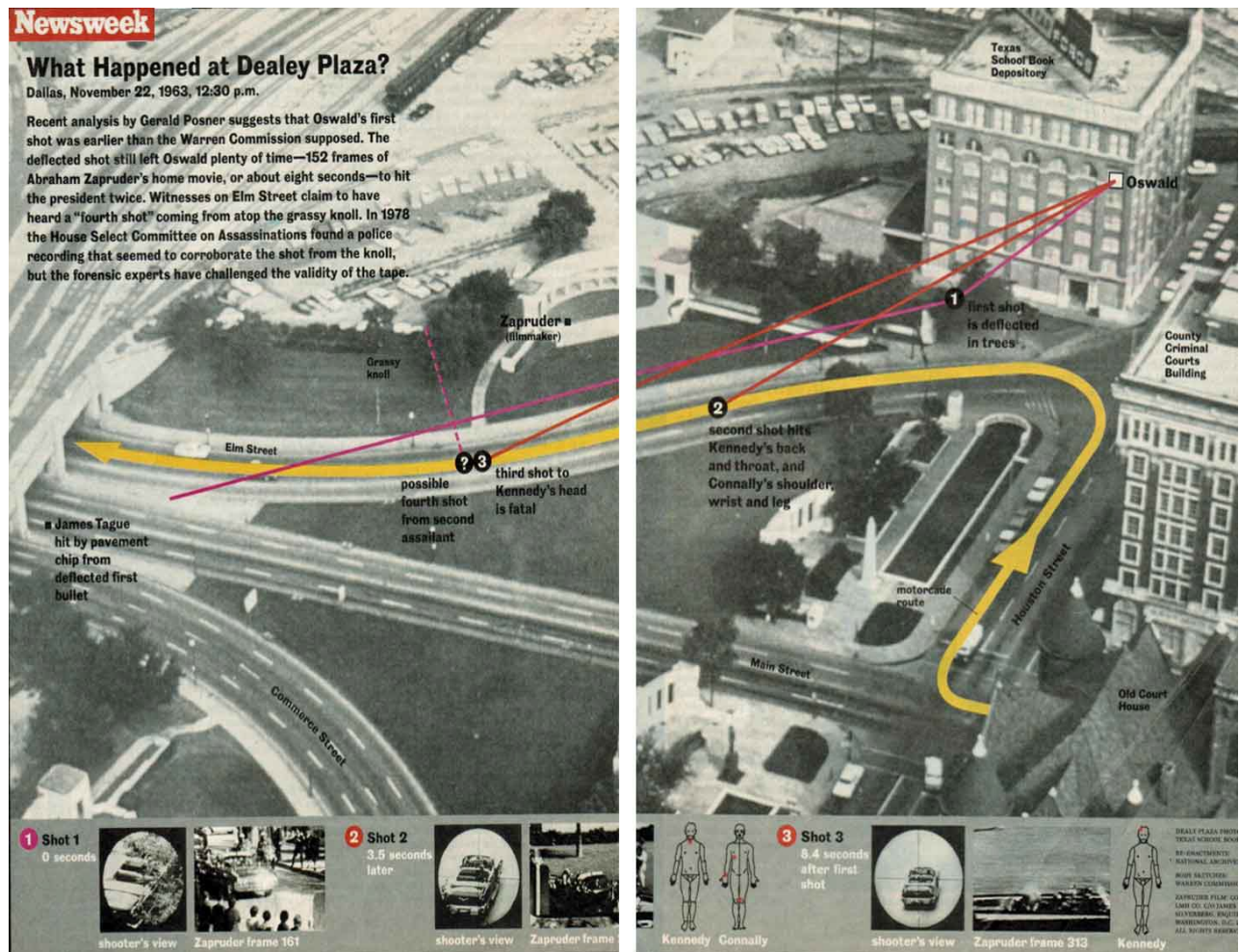


Figure 1. This astonishing photograph, from Newsweek (22 November 1993), shows the final heads hot at 30-40 feet further down Elm Street than frame Z-313 (the supposed final headshot). This downhill location is strongly suggested by early re-enactments as well as data tables and documents, all of which the Warren Commission ignored.

Even here she had to crouch a bit (Figure 3). Jack White has determined that several, if not many, layers of blacktop have been added to Elm Street since 1963, thus raising it by several inches. These successive layers were obvious to me, too, when I looked for them. Now here is the paradox: The Zapruder film shows Moorman standing upright on the grass during her photo, with the camera held to her eye. Based on our reenactments this was impossible, she should have been crouching, in a rather obvious fashion, or the camera should have been held well below eye level. Jack was able to explain this however. By Moorman's own account, she was not standing on the grass when she took this photo she was on the street. In 1997, Mary Ann Moorman Krahmer was interviewed by KRLD; Debra Conway supplied the interview.

Moorman: Uh, just immediately before the presidential car came into view, we were, you know, there was just tremendous excitement. And my friend who was with me, we were right ready to take the picture. And she's not timid. She, as the car approached us, she did

holler for the president, "Mr. President, look this way!" And I'd stepped out of the curb into the street to take the picture. And snapped it immediately. And that evidently was the first shot. You know, I could hear the 'sound and'...

Jones: Now when you heard the sound, did you immediately think 'rifle shot?'

Moorman: Oh no. 'A firecracker maybe. There was another one just immediately following, which I still thought was a firecracker. And then I stepped back up on to the grassy area. I guess just, people were falling around us, you know. Knowing something was wrong. I certainly didn't know what was wrong.

These are Moorman's own words; she stepped into the street to take her Polaroid picture. As if for emphasis, she also recalls not just stepping back onto the grass, but precisely when she did so. In fact, based on our re-enactments and without the additional layers of blacktop, it is likely that Moorman could have stood erect in the street, with the camera to her eye, while taking the photo, just as she recalled. It is unusual in this JFK case to make a prediction, and then later to have it verified so precisely by a statement directly from the mouth of the pertinent witness.

So what happened to Moorman in the Zapruder film? When these composite Zapruder frames were formed, the composition experts placed her on the grass, instead of in the street. Whether they moved her laterally (and, if so, why) is still confirmation that at least several composite frames were made. Anyone can go into Dealey Plaza and check this out independently, as I was able to do in a few seconds. To my knowledge, this argument remains un-refuted. (See Figures 2 and 3.)



Figure 2. *This shows how Mary Moorman would have had to stoop during her famous photograph if the Zapruder film were authentic and she was standing on the grass.*



Figure 3. *Where Moorman actually stood, by her own words, although the road has been repaved multiple times in the interval. Without these additional layers, she could probably have stood erect, with the camera to her eye, just as she is shown in the Zapruder film.*

Internal evidence: film maps of the extant film and the two SS copies. The following new information derives from an ARRB memorandum (dated 9 April 1997) by Douglas Home-and also from observations made at the National Archives by Harry Livingstone 4 and Doug Mizzer. In the chain-of- custody affidavits that were signed in Dallas after the assassination, a Kodak laboratory official identified the out-of-camera film as perforated by the number 0183 (which was placed at the time of development). Unfortunately, the exact site of this perforation on the film was not identified in the affidavit. The extant film (i.e., the purported original film currently in the National Archives) does not contain any perforated number. But since this number 0183 was photographically copied (or printed) onto Secret Service (SS) copies # 1 and 2 after the home movie segment, this seemed to imply that 0183 originally was punched only after the home movie segment. If true, then the absence of 0183 from the extant film (which shows only the motorcade) would be expected. According to Zavada, standard Kodak practice was to punch this processing number after the last image on the second side. If this practice had been followed with the Zapruder film, then a 0183 should have appeared after the motorcade side. None of the remaining numbers (the image of 0183, the punched 0186) coincide with this practice. A review of the intact original home movie side might prove enlightening; unfortunately, it remains un-located.

The chain-of-custody affidavits (for reasons unknown) do not mention serial number 0184, which remains a mystery, because it has never been located and because the Kodak lab has no record of any roll of film that would correspond to it (critics have suggested that this was the Hunt copy). They do state that the numbers 0185, 0186, and 0187 were punched (one per copy) through the three copies made at the Jamieson laboratory on 22 November 1963. While SS copy #1 has no perforated number in it, SS copy #2

does have the number 0186 perforated through its black leader. This is the only perforated number currently present in any of the two SS copies, or the extant film.

In SS copy #2, this perforated number (0186) precedes the first portion of the motorcade segment. Curiously though, the number 0186, while physically continuous with the beginning of the motorcade segment, is separated from the actual motorcade images by a photographically copied (i.e., printed) splice. This image of a splice occurs only 12-1/4 inches after a physical splice (according to Livingstone's film map, Zavada's report does not contain this information). This photographic splice suggests that a physical splice was present (for reasons unknown) in the source material- supposedly the original film. This enigma is only exacerbated by the knowledge that the original was processed intact without removing the four- foot leader; as the Zavada report reminds us. This expected four-foot leader is seen neither in the extant film nor in SS #2. Instead the extant film contains three (sic) separate leaders each followed by a splice, after which the motorcade begins. This motorcade sequence includes 6' 3" of images and 2'7" of black film, with no splice between them. These distances obviously cannot explain the 12-114" interval seen on SS #2. Since SS #2 has earmarks of authenticity (e.g., 0186 punched through it, loading fog, and the pre-motorcade images), we would expect to see an image of the four-foot leader. None is seen, however, which suggests either that:

1. The Zavada report is wrong about the leader.
2. SS #2 is not a first day copy-despite its apparently authenticating features.

Thus, while the presence of the perforated number 0186 on SS #2 is consistent with the chain-of-custody affidavits, the presence of the photographically printed splice raises questions about the source film: was the source film really the out-of-camera original? If so, why did this source film contain a physical splice? If so, how and why did it get there? Or was the source film not the outdo camera original?

Because film is unavoidably exposed to light when it is loaded into a camera, all developed film should contain loading fog, but none is seen before the motorcade sequence in the extant film. However, examination of SS copies #1 and #2 reveals an explanation for this: most (all but a few frames) of the pre-motorcade segment (a green chair and three bystanders in Dealey Plaza) that is seen in both SS copies is absent from the extant film. Thus, no loading fog is present in the extant film because the pre-motorcade segment is missing-it appears to have been cut off.

On SS #2, the second portion of the motorcade has been separated from the first portion and actually precedes it in the present configuration. Between these two segments lie four physical splices and three sections of leader. The reason for this odd arrangement is unknown. ⁵ Because of the dense concentration of information in these paragraphs, I have assembled the following table. The LMH copy (the Life copy), supposed by Zavada to be a first day copy, is included in this table, based on a recent report by Zavada (see the Addendum):

Table I. The Film Maps

<i>Evidence Item</i>	<i>SS#1</i>	<i>SS#2</i>	<i>LMH Copy</i>	<i>Extant Film</i>
<i>Perforated Number</i>	<i>No</i>	<i>0186 (a)</i>	<i>No</i>	<i>No (e)</i>
<i>Initial Fog</i>	<i>Yes (b)</i>	<i>Yes (c)</i>	<i>No (d)</i>	<i>No (e)</i>
<i>Terminal Fog</i>	<i>Yes (f)</i>	<i>Yes (f)</i>	<i>Yes (f)</i>	<i>No (e)</i>
<i>Image of 0183</i>	<i>Yes (g)</i>	<i>Yes (g)</i>	<i>Yes (g)</i>	<i>N/A (h)</i>

In the following, the letters "a" through "h" correlate with the above table.

- A. The perforated number 0186 is separated from the motorcade by a photographic splice, thus suggesting that a physical splice existed (for reasons unknown) in the source film (supposedly the original). The perforated number 0186 lies at the beginning of the motorcade side, an obvious inconsistency with the image of 0183, which lies at the end of the home movie side.
- B. Initial fog is separated from the motorcade by a physical splice. Therefore, earmarks of authenticity are not available. On the home movie side (for SS #1, SS #2, and LMH), no initial fog is seen; this portion has probably been cut off in each of the three copies.
- C. Initial fog is followed by the pre-motorcade images (the green chair and three bystanders) and then the motorcade. Except for the photographic splice this sequence seems normal. An additional inconsistency, however, is the absence of an image of a four-foot leader; Zavada clearly states that this leader was not removed from the out-of-camera film before it was copied on the first day. If a four-foot leader was attached to the original film while it was copied, where is its image on the copy? Zavada does not address this additional conundrum.
- D. Nothing before Z-214 exists in this copy.
- E. Both the initial and terminal portion has been removed from the extant film.
- F. Terminal fog follows the home movie segment.
- G. The photographic image of 0183 follows the terminal fog on the home movie side.
- H. This entry does not apply to the extant film, which should contain a punched number 0183 but no image of a number; an image of 0183 would only be expected in subsequent generations.

If the extant film and the two SS copies were authentic there should be no oddities in the above table. In fact, there are many, as listed here.

1. Uninterrupted (i.e., no physical or photographic splices) loading fog does not precede the motorcade segment in SS #1, SS #2, or in the extant film.
2. In SS #2, fogged film and a perforated number 0186 are both present, which would ordinarily be earmarks of authenticity. However, a photographic splice is present where none should exist. Furthermore, an image of the four-foot leader (which was attached to the original film, according to Zavada) is missing. In addition, because this is the sole, normal, fogged sequence on any of the films, another question may be raised: rather than representing an image of fog from the original film, was

this fog on SS # 1 caused by light striking SS # 1 directly? If so, this fog would provide no support for authenticity at all.

3. No perforated processing number (0183, 0185, 0186, and 0187) is continuous (i.e., no intervening physical or photographic splices) with the motorcade in any of the three copies or in the extant film...
4. Although the perforated number 0186 appears at the beginning of the motorcade side, the photographic image of 0183 appears at the end of the home movie side-in SS #1, SS #2, and LMH.
5. The Zavada report states that the perforated number (e.g., 0183) omits photographic image, would ordinarily appear after the last image of the second side (the motorcade side). In fact, it appears at the end of the last image on the first side (the home movie side).

Internal evidence: in the Zapruder film, the intersprocket images extend to the left edge. ⁶ Zavada shot film through identical model cameras, using his wife as a model (see Zavada, page 33 of part 4, particularly Figure 4-26), and found that the intersprocket image did not extend nearly to the left edge. What is particularly relevant here is that Zavada's test camera was set on full telephoto-the same setting that Zapruder used throughout the motorcade. Most importantly, this particular photograph of Mrs. Zavada, standing in front of a garage door, was taken in full sunlight. The sequence that immediately follows shows a light colored garage door in the immediate background, fully illuminated by sunlight. Such full illumination is critical because it increases the penetration of the image into the intersprocket area (as Zavada determined).

Why is it so critical that Zavada's intersprocket image does not extend all the way to the edge? Because the intersprocket images in the extant Zapruder film extend much farther, nearly to the very edge. An excellent example is frame Z-312, in which Jean Hill can be seen at the very edge-in clear disagreement with Zavada's simulation. This discrepancy between the Zapruder film and Zavada's simulation is consistent with the suggestion that some frames (at least) in the extant film have resulted from re-shooting, by using a magnified original as the image source. In particular, it would be possible to magnify the original image just enough so that the intersprocket image (from the original film) remained just outside of the captured image for the new film. As a result, of course, all objects in the new frame would be larger than they were in the original. If a composite image were formed, however, then some objects could have been returned to their original size (or any size desired by these specialists).

Such a re-shooting has the distinct merit of overcoming one major, and possibly otherwise insurmountable hurdle, the elimination of the telltale edge prints on the left side of the original film. Two such overlapping sets of edge prints, as a copy would otherwise unavoidably contain, would be prima facie proof that the altered film was a copy. These edge prints are placed at the time of manufacture and inevitably show up after development on all film.

But even more evidence exists on this score. When Zavada shot additional film of a gray wall through an identical model camera (again at full telephoto), this time using graduated f-stop settings, he found once again that the intersprocket images extended only partially to the left, not as far as in the extant Zapruder film (see Zavada's report, page 34 of

part 4, including Figure 4-27). Zavada also determined that the penetration of the image into the intersprocket area depended on the aperture of the camera i.e. on how wide open the iris was. The smaller the aperture (or the brighter the ambient light), the greater was the penetration.

Yet even Zavada (part 4, page 35) acknowledged: "Overexposure will show an increase in image penetration and extreme overexposure [emphasis added] can produce full penetration is possible (sic)." It hardly needs to be said-and no one has claimed-that Zapruder's film shows such extreme overexposure (it does not). Despite this, however, the Zapruder film does show intersprocket images going to the edge of the film, in clear disagreement with Zavada's simulation. This evidence, therefore, constitutes compelling, and independent evidence of film alteration. It would seem either that Zavada missed the significance of this evidence or that he was reluctant to address it.

Internal evidence: first frame overexposure (this issue was first raised by Doug Mizzer). Zavada addressed this issue by using several Bell & Howell cameras of the same model as Zapruder's camera. When the camera is stopped and then restarted it takes a finite amount of time for the motor to get up to normal speed. This, in turn, means that for a brief interval the frames will advance slower than normally. Because the frames are advancing slower, the exposure time will be longer for these frames and the images will appear lighter than usual (overexposure). At three separate occasions during the home movie sequence (supposedly on the same film as the motorcade sequence) this actually occurs, and at each occasion such overexposure is visible.

However, on the one occasion when the camera apparently stops during the motorcade just before the limousine appears) an overexposure is not visible. This inconsistency is remarkable and should normally have raised the question of whether the camera actually did stop, or whether the effect is absent because frames had been excised at this juncture. However, Zavada gives no hint of recognizing this central question of authenticity. He recognizes that there is no overexposure when the limousine appears, but he makes no attempt to explain it. (In his research, to give him some credit, however, he finds that not all tested Bell & Howell cameras showed this overexposure effect.)

Internal evidence: the differences among the three supposed copies of the film made by Jamieson on 22 November 1963. Two of these supposed copies are now held by the National Archives and listed as Secret Service copies #1 and 2. I had previously described (Assassination Science 1998, p. 325) the differences in density between these two copies: Secret Service copy #1 is much darker than copy #2. Zavada confirmed this observation and tried to explain it. He proposed that exposure bracketing different exposures for each of the three copies was used by Jamieson as a technique to assure that at least one of the three copies would show good fidelity.

There are two problems with this explanation:

1. The density difference between the two Secret Service copies is too large for such bracketing (this is actually stated in the Zavada report)
2. There is no documentation that such bracketing was done. In fact, the exact opposite is the case: Jamieson seemed quite sure that such exposure bracketing was not done, he recalled that the same printer light and filter pack were used for all three

copies. Greer's rapid head turn. This has been summarized well by Noel Twyman (Bloody Treason 1997). The driver's turn is far too rapid. Furthermore, as Twyman notes, the absence of blurring during such a rapid turn is often overlooked. Such absent blurring is, by itself, a powerful indictment of the film. All of this remains unexplained.

Toni Foster's peculiar stop: Z-321 to Z-322. Foster is the pedestrian in the background grass. Her lateral separation from the adjacent (ghost) motorcycle image is constant between these two frames. Because the camera is tracking the limousine, her image should undergo a regular and steadily growing displacement from the motorcycle image. It is obvious from preceding and following frames that this is exactly what happens, but it does not happen for these two frames. It's also apparent from nearby frames that Foster is not jumping to and fro within single frame intervals, so as to appear stationary between these two frames (1/18-second), a physical impossibility in any case.

For all nearby frames, the motorcycle, the limousine, and other objects advance uniformly across the field of view, as they should-but Foster remains quite stuck for these two frames. She retains almost exactly the same lateral position. To the tracking camera she seems to stop within 1/18-second, and then immediately to resume her regular frame-to-frame displacement within the next 1/18-second. This physical impossibility cries out for an explanation, but none has been forthcoming from devotees of authenticity.

THE TRAIL OF DEBRIS ON THE SKULL X-RAY

This trail is totally inconsistent with a frontal head shot at Z-312 or Z-313. When JFK's head is tilted far forward, a shot from the knoll or from the storm drain on the north overpass (the latter is more likely) could not produce a bullet trail that rises from front to back with respect to the skull while JFK is tilted so far forward. Rather, such a shot should descend with respect to the skull (from front to back) in radical disagreement with the trail seen on the lateral skull X-ray. Only when the head is tilted back (e.g., at Z-321 could such a frontal shot produce such a trail. Obstinate adherents of the frontal shot (at about Z-313), as an explanation for the head snap prefer to ignore this paradox from the X-rays, just as they ignore the Ittek arguments against a frontal shot as an explanation for the head snap.

BLUR ANALYSIS BY WEATHERLY.

Daryll Weatherly notes that many frames show a seemingly impossible paradox between the 'camera tracking as predicted by:

1. The image content at the right side of two successive frames.
2. The image clarity actually seen on the second of these frames.

("A New Look at the 'Film of the Century'," Harrison Livingstone, Killing Kennedy 1995, Appendix.) These paradoxes exist for both moving and stationary objects. Not only are the predictions of image clarity often wrong, but also sometimes they are exactly opposite to what is seen. Such paradoxes recur in many, many Zapruder frames but were not seen in the Giuliano and Edwards simulations in Dealey Plaza during my brief review. Aside from the proposal of film alteration, these blur analysis paradoxes remain unexplained. Zavada did not address this issue; for him, this required an analysis of film content, a subject that lay outside his technically limited mandate. My own analysis of many additional frames

(unpublished) also frequently yields startling discrepancies. This is true for blurring seen both horizontally and vertically. One of Weatherly's examples is discussed next.

The right edge of the image is the same in Z-302 and Z-303; also, the highlights on the roll bar in both images are well defined, although they are somewhat sharper in the latter frame. These observations are consistent- they both indicate that the camera was tracking well. Therefore, all moving objects (the limousine and motorcycle) should be well defined, which is the case. All is well so far. It should also be noted, however, that the background figures in the grass are also well defined in Z-303. Between Z- 303 and Z-304 the camera falls slightly behind the limousine: in Z-304, more of the front of the limousine has been cut off. Therefore, the tracking is not accurate-the camera has slowed down slightly. Since the camera is moving more slowly now, the background (stationary) observers should be seen more clearly (the camera is moving slower with respect to them than in the prior frame). But what is seen is not consistent with this, in fact, the background observers are obviously much less clear in Z-304 than in Z-303. No logical explanation has been offered for such singular features.

WHAT OTHER PROOFS OF INAUTHENTICITY MIGHT BE POSSIBLE?

One possible proof would be the discovery of a film that shows (or even suggests) the leftover work of the forgers. There may actually be a candidate for this role, the odd 8 mm film given to me by David Lifton (*Assassination Science* 1998, pp. 321). Although this film, of uncertain ancestry, employs only frames from the extant film, many show a superposition of images or other odd features. For example, when Clint Hill tries to climb onto the back of the limousine, the curb can be seen through his leg. It is particularly striking that the manufacturing date of this film, based on the symbols in the edge prints, is 1941, 1961, or 1981.

The possibility that this film is left over from the actual forgery is conceivable for two reasons:

1. It is an 8 mm film.
2. The film could well have been manufactured in 1961, the same date as the extant film (both contain two triangles that identify the date of manufacture).

Proponents of authenticity have argued that it was difficult, perhaps even impossible for alterations to be made to an 8 mm film. But here is just such a film, it is in 8 mm format and it does contain irrefutable anomalies that may be proof of alteration. Furthermore, the film was almost certainly manufactured in 1961, so this copy could have been prepared as early as 1963.

That this copy was made soon after the assassination is also supported by the manufacturer's date code (the year was 1963) on SS #1, SS #2 and the LMH copy. Why would the date code of 1961 on this odd film precede the date on the Secret Service copies (especially if they really were first day copies)? On the other hand, if Lifton's copy were produced in 1981 (the next consistent date code) or later, what purpose would be served by making such an odd copy at such a late date?

DISCOVERY OF A FILM THAT SHOWS MORE FRAMES THAN THE EXTANT FILM

(ASSASSINATION SCIENCE 1998, PP. 298-300)

A surprising number of individuals claim to have seen just such a film. The Zavada report itself, indirectly, raises this very question. Early on 23 November 1963, two FBI agents came to Kodak to view the film for about one hour. They counted frames, cursed the sign, and exclaimed when bullets (plural) impacted between JFK's flinches. Such precision, even to the point of counting frames, is certainly not simple based on the extant film. To complete all of this in one hour, using the extant film would actually be a remarkable achievement.

If they truly succeeded in this on the original film, then the subsequent jiggle analyses would have been unnecessary—one could instead simply have counted JFK's flinches. Such an achievement raises the possibility that they were viewing a different film. One of the Kodak staff members, interviewed for the Zavada report, also recalled that he (and Zapruder, too) could see three distinct jumps by JFK, from which they concluded that at

least three shots had been fired. That conclusion would be very difficult to draw from the extant film. Furthermore, three successful shots, and one missed shot (that hit James Tague) would immediately require a second gunman. If three shots were indeed seen in the original, then that, by itself, may have been sufficient reason for the forgers to alter the film.

More recently, several additional witnesses (including Joe O'Donnell, see my essay, "The Medical Evidence Decoded") have recalled a different film. Three times over 25 years, Rich Della Rosa has seen a different film; he describes this film as high quality and he saw Greer make a wide turn onto Elm Street, an event not seen on the extant film. He also saw the limousine stop briefly on Elm Street, an event not seen today. It is remarkable that William Reymond also saw these same events in the film that he recently saw in France.

Finally, Scott Myers has also seen a film that is distinctly different from the extant film and which may have been the same version that Della Rosa (and possibly Reymond) saw. This has led to a peculiar situation, in which a small number of individuals know from personal experience that the extant film has been altered, but devotees of authenticity obviously do not regard these individuals, as credible, but no one has explained why they are not credible.

EPILOGUE

Like most concerned citizens, I, too, find it difficult at times to believe, at a deep emotional level, that anyone would deliberately and illegally falsify a movie film of such significance. Unfortunately, this issue cannot be decided by emotion alone, precedence must be given to the evidence. Just as most of our media now find it easier to ignore the enormous weight of evidence for conspiracy in the JFK assassination, some of our fellow critics now find it easier to believe in a more limited conspiracy, one that is too conservative to alter a movie film. But if the extant film is authentic, why then has so much suspicious evidence accumulated to the contrary? If the extant film were genuine, almost none of the evidence discussed here should exist.

As a specific example, in the Zapruder film why doesn't Moorman appear in the street where she must have stood-based both on the evidence of her own Polaroid and on her own recollections? Why does Foster stop so abruptly at Z-321 and then resume her regular displacement so quickly again? Why is there an image of the limousine in the intersprocket area of?

Z-318? Why do the first two re-enactments disagree so radically with the extant film? Why do various observers, over many years, report seeing a different film, starting as early as 22 November 1963, with Deke DeLoach of all people? Why do the Dealey Plaza witnesses (including the ten closest) disagree so fundamentally with the film? Why does Weatherly's blur analysis yield so much contradictory information? Why is the traditional critic's frontal head shot at about Z-313 in such arresting disagreement with the trail of metal debris on the lateral X-ray film?

For all of these questions, and many more besides, there are no easy answers, except that of film alteration. Although the easy road is to circumnavigate this mountain of evidence, the honest approach is to sift and weigh the evidence as a whole. And if we still cannot agree after all of this, then perhaps a re-reading of Ronald White's essay, "Apologists and Critics of the Lone Gunman Theory: Assassination Science and Experts in Post-Modern America," (Assassination Science 1998, pp. 377-410) will assist us at least in understanding the chasm that divides the "realists," like myself, who consider the authenticity of the film to be a theory that has been falsified, from the "relativists," like Josiah Thompson, who consider the theory to be a paradigm laden with anomalies, burdened but unbroken.

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I am often plied with tantalizing hints that time constraints prohibit me from pursuing as thoroughly as I would wish. I hope that these investigators will understand that my sometimes, slow responses do not reflect a lack of interest. If anything, the opposite is typically true; I wish that I had more time for them. So I strongly encourage them to pursue their original ideas vigorously. Eventually, I believe, the growing trove of evidence will persuade most serious students that the Zapruder film has indeed been altered.

ADDENDUM: LMH "FIRST DAY COPY"

In 1999, Roland J. Zavada examined the LMH Co. "First Day Copy" (hereafter described as LMHFDC) and published a report: "Addendum to Technical Report #318420P: Analysis of Selected Motion Picture Photographic Evidence." In this report Zavada claims that the third copy made by Jamieson on 22 November 1963 is the LMH copy (also known as the Life copy). In an unrelated matter, but still one of great interest, Zavada also reports (letter to Douglas P. Home, 14 March 2000) that the Zapruder family transferred their copyright and complete inventory of films to the Sixth Floor Museum in Dallas.

Zavada's chief new finding is that the optical density of LMHFDC lies between SS #1 (a dark copy) and SS #2 (a light copy). New measurements show that the LMHFDC density is closer to SS #2, and Zavada advances technical arguments for why this is a reasonable expectation, although he did not predict it. He claims that this result proves that Jamieson bracketed the printing exposure level in order to achieve at least one good copy. Critics, on the other hand, might well argue that, since Jamieson had initially denied that such bracketing was done, these new results only constitute further proof that the bracketing of these films (SS # 1, SS #2, LMHFDC) was done at a later date and at some other site. In other words, since Jamieson reportedly did not use bracketing, he could not have made these copies.

LMHFDC begins at about Z-214, when the limousine is near the Stemmons freeway sign. Therefore, nothing can be said about initial loading fog or the perforated number supposedly placed during developing. However, as in SS #1 and SS #2, terminal fog, and then an image of 0183, appears after the final image (of a scene) on the home movie side.

Zavada again claims (as he did in his initial September 1998 report) that the septum line is characteristic of the Jamieson printer. He also adds that the line is the same in each of SS #1, SS #2, and LMHFDC. In his September 1998 report, however, Zavada had stated: I'm sure the reader is aware that our attempt to exactly replicate the 1963 JAMIESON [printer to] produce [a] septum line has not been successful." (What he should have said is that his attempt to match the septum line on the home movie sequence was not successful, he merely assumes that these copies were made on the Jamieson printer, but this is exactly what is being questioned.) Doug Mizzer (in a memo to Harry Livingstone) summarized this evidence: the septum line on the SS copies is about 0.036 inches wide, whereas the line on the filmstrip cited by Zavada and that produced on the Bell & Howell Model J Printer in 1959 was only 0.020 to 0.025 inches wide-a large, and easily visible, difference. This means that Jamieson's printer might very well not have made these purported first day copies.

This question of the septum line is not trivial. It is Zavada's hypothesis that the intersprocket images on the home movie side were produced by a separate light source that also produced the septum line. But if the septum line is not authentic, then Zavada's explanation for the intersprocket images (on the home movie side) is also in doubt. In fact, Zavada reports on his trial with an old Model J printer that used an independent tungsten lamp. He concludes: "A trial print was made to determine the extent and penetration of the light along the perforation edge [intersprocket area] of the film. The results showed that although edge illumination was achieved, no light penetrated between the perforations."

To make the above negative result even worse, Jamieson quotes Robert Colley (Jamieson letter of 21 October 1997 to Zavada), a printer operator who was actually in the lab on 22 November: " ...in order to retain the original edge numbers, the B-Wind originals were printed FULL APERATURE [sic] (pix and sound area) from TAILS." Despite this clear statement, however, Zavada concludes exactly the opposite (Study 3, p. 3): " ...the initial belief that the prints were printed 'full aperture,' picture plus sound, also proved incorrect based on the examination of the images of the resulting prints." In my view, this is a perfect example of circular reasoning- the question is whether the copies in question are indeed first day copies, but Zavada merely assumes that they are, and then proceeds to draw conclusions based on his assumption.

Based on the above data, Doug Mizzer argues that because the SS copies do have edge printing, then, if they were made on the Jamieson printer, they should not have a septum line (on the home movie side). Therefore, since both SS copies do have a septum line and edge printing, they could not have been made on Jamieson's printer. The reverse statement is this (quoting Mizzer): " ...if the copies were made on Jamieson's printer in the pix only mode, there would be a septum line on both sides of the film [i.e., the motorcade side, too], but there would be NO EDGE PRINTING." (Author's note: In fact, both sides contain edge printing and the motorcade side in the SS copies has no septum line.)

To further confound matters, Zavada received a letter from Herb Farmer (1 August 1998) of the USC School of Cinema and Television. Farmer, who had four old Model J's, stated: "None of our model J printers have had any modification for edge marking printing at the picture printing aperture." Furthermore, he then added: "If I were faced with the original printing problem, I would probably have printed the film on the model J with the printing aperture wide open which would expose everything from the inside edge of the sprocket hole on the printing sprocket side to the opposite edge of the film (the picture and track area)." In other words, both Robert Colley and Herb Farmer have implied that the motorcade side (for the first day copies) should contain intersprocket images, but, in fact, none are seen.

In view of all of the above, many of Zavada's conclusions must remain in grave doubt. Unfortunately, he seemed quite unable to conceive of the possibility that the present three copies are not Jamieson copies. Instead, he obviously preferred to accept what he had been told-namely that these three are authentic first day copies. There is a distinct sense of 'deja vu here, this is the same mental state that so hampered prior investigations of the medical evidence. (See my essay, "The Medical Evidence Decoded," elsewhere in this volume.)

NOTES:

The opening quotation for this essay is from the Preface to Dino A. Brugioni, *Photo fakery: The History and Techniques of Photographic Deception and Manipulation* (1999). Brugioni, a founder of the CIA's National Photographic Interpretation Center, examines many methods for faking and for detecting faked photographs.

1. In a letter to me (26 February 2000) Douglas P. Horne noted that Zavada actually had not seen any such double images during his shooting experiments in Dealey Plaza.
2. Regarding such written affirmations, four autopsy personnel (Humes, Boswell, Ebersole, and Stringer) signed a document entitled, "Report of inspection by naval medical staff on November 1, 1996, at the National Archives of X-rays and photographs of autopsy of President John F. Kennedy." Nonetheless, subsequent comments by several of these signatories made it clear that the closing assurances in this document were false: contrary to their statements, not all of the autopsy photographs were included in the collection. Therefore, there already exists in this JFK case a demonstration of how little reliance can be placed on written affirmations prepared by attorneys for the signature of others.
3. Subsequently, the foundation that owns Monticello also acknowledged that Jefferson was the father of one, if not all six, of Sally's children (San Bernardino County Sun, 27 January 2000, p. All)
4. Even the ARRB, in its final report, disparaged eyewitness testimony in general. In particular, their report seems to mock a Parkland physician for describing Jackie as dressed in white (instead of pink) surely a non-salient item!
5. Livingstone has recently published a series of five articles ("The Zapruder Film: A Study in Deception," *The Fourth Decade*, May 1999 through January 2000). Livingstone's energy and passion have greatly advanced the discussion of Zapruder film authenticity. His work also initially ignited my own interest in this complex issue.
6. Douglas P. Horne has reviewed the factual content of the preceding paragraphs (regarding the film maps) and has confirmed their accuracy.

Also:

Since I had missed the full implications of this issue in my initial reading of the Zavada report, I am greatly indebted to Douglas Horne for bringing it to my attention again.

Douglas Horne made these comments in a letter to me (26 February 2000). In view of Zavada's own test results, this decision seems shortsighted. I also spoke by telephone, and sent a certified letter, to the Department of Justice before they paid \$16,000,000 for the film (which price did not include the copyright). My letter strongly recommended one simple test: just shoot some film through Zapruder's camera. Department of Justice never responded to my letter and this undemanding test has never been done.

[Editor's note: Mantik's letter to Department of Justice, which appears on the following page, was one of a series of communications between the editor, David W. Mantik, and Jack White with Leslie Batchelor, Assistant Deputy Attorney General, who was representing the ARRB in negotiations over compensation for the government taking possession of the Zapruder film as an "assassination document." The question of authenticity not only affects the film's value as an historical artifact but even extends to the question of copyright, since presumably the copyright privilege would attach only to the original "out of camera" version shot by Abraham Zapruder on 22 November 1963 and not to any subsequently altered version. (See Appendix B.)]

August 14 1998

Ms. Leslie Batchelor

Civil Division

Department of Justice,

Room 3736 950

Pennsylvania Avenue,

NW Washington, DC 20530

Re: Authenticity of the Zapruder film

Dear Ms. Batchelor:

Thank you for your courteous response to me today on the telephone. I think no one in the JFK assassination research community could ask for much more than a film (or films) shot through the original Zapruder camera. Such an experiment has already been done within the past year with a virtually identical camera with nearly the same serial number. I have seen these films. This experiment has succeeded only in raising even more questions. It is critical that this experiment be repeated with the original camera, which, I am told, has been on display at the Sixth Floor Museum in Dallas, Texas.

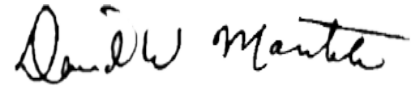
There has been serious speculation that the images on the extant Zapruder film have been magnified in the process of alteration and therefore cannot be the original. I have personally calculated the expected angle of view from the known optical parameters of this camera. Using known sized objects in the actual field of view (e.g., the limousine, the background buildings) it is also possible to calculate the angle of view that is actually seen in the film. The disagreement between these two numbers is larger than I would expect at the full zoom (telephoto) setting that Zapruder said he used. And if the camera had actually been set at less than full zoom, the mismatch is even worse. The direction of this disagreement does suggest that the extant images are too large, as has been implied previously. Furthermore, I did not find this problem for the Nix film.

It is absolutely critical that the actual angle of view be determined for the original camera when set at full zoom. This will be trivial for any expert to do. I suggest, however, that one simple additional step be taken. To satisfy the critics, some well-known object should be filmed from a well-known position (e.g. the Lincoln Memorial as seen from the Washington Monument). This will allow anyone afterwards to do his or her own measurements of size and distance and to calculate the angle of view, which can then be compared to the actual film. If these simple steps are taken, they will go a long way toward satisfying the questions of many chronic students of this case.

My understanding is that the Assassination Records and Review Board has been reluctant to engage in investigations of this type, apparently interpreting such steps as beyond their charter. However, I note that the FBI will soon be examining material found on one of the bullets discovered in JFK's limousine. That is obviously an investigation, so, if that can be justified, then surely shooting film through the original Zapruder camera can also be justified.

Thank you again for your attention to this matter. I am very pleased that you are positioned to assist in a matter that is so central to our national history.

*Sincerely yours,
David W. Mantik, M.D., Ph.D. (Physics)*



Letter of 14 August 1998 from David W Mantik, M.D., Ph.D., to Leslie Batchelor, Assistant Deputy Attorney General, proposing that the authenticity of the film be tested by taking new images with the original camera, which might server to settle many important questions. The Department of Justice, however, declined to accept this recommendation and, as a consequence, these questions remain unsettled.

Date: Thu, 03 Sep 1998 16:11:05-0500

To: Ms. Leslie Batchelor US Department of Justice Dear Ms. Batchelor:

Let me introduce myself. I am Jack White, historical researcher of the JFK case for 35 years. My specialties are the JFK photographic evidence and the identity of Lee Harvey Oswald. I was a photographic consultant to the House Select Committee on Assassinations in the late 70's.

Dr. James Fetzer has asked me to send you on a regular basis the results of ongoing studies of the Z film and the MPI video for consideration in the Justice Department assessment of the Zapruder film. This is an ongoing study by Dr. Fetzer, Dr. David Mantik, me, and about a half dozen other qualified researchers. This is message number 1.

I will be sending you additional email messages the next few days or weeks, covering the following:

- 1. A listing of possible anomalies observed in the film.*
- 2. A listing of possible anomalies observed in the MPI video/DVD version.*
- 3. Various graphic depictions of anomalies as computer attachments. I am attaching to this message one of the graphics which I believe clearly shows tampering.*

Please respond by email as soon as possible IF you receive this graphic. Many of my explanations will depend on your ability to receive photos on your computer screen, so I need to know as soon as possible so I may proceed.

Please let me know by return email if you receive the attachment. It is a photo I took in Dealey Plaza in July from the Z pedestal. Overlaid is Z frame 304, showing Jean Hill and Mary Moorman in their exact position and sized as closely as possible to actuality.

Clearly the Z frame shows much more area than is seen from the Z viewpoint. I plan to re-shoot the July scene with far greater accuracy, using an 8-foot pole marked in feet for exact scale. I will describe each graphic I send, and will answer any questions, which may occur to you.

I have many VERY CONVINCING exhibits indicating tampering. After I hear back from you I will start sending study results.

Cordially, Jack White

An email of 3 September 1998 from Jack White to Leslie Batchelor, Assistant Deputy Attorney General volunteering to submit evidence of alteration of the original Zapruder film at her request. He has received no response from the Department of Justice in this matter.