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Reconstruction of a Fatal Accidental Shooting

The Scenario

A 20-year-old man was ordered to stand trial for murder in connection with the December 8, 2014 shooting death of his mother at their home near Lake Berryessa in Napa County, California.

Joseph Brooks Conkright, known as Brooks, told authorities that he accidentally shot Danae Dee Conkright, 54, while cleaning his rifle in the family's living room.

If found guilty Brooks could be sent to prison for life.

Joseph Brooks Conkright

3D Model of AR-15

The Challenge

How to use the physical evidence captured at the scene of a fatal shooting to determine the shooter's position relative to the victim and the victim's positioning at key moments during the event and at the point of rest. Further, to reconstruct the event with sufficient fidelity to the forensic evidence to successfully have the resulting 3D animation admitted at trial. PSI was asked by the young man's defense team to review and analyze the available data to determine whether the defendant's statements regarding the event are supported by the physical evidence.

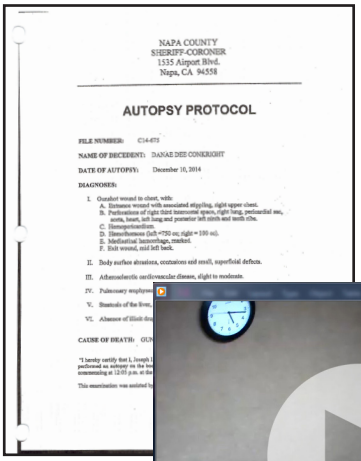
The Solution

Develop a 3D Working Model based upon laser scan data of the environment, 3D gunshot wound model based upon the medical examiner's report and compare them to the statements given by Brooks describing the event as an accidental discharge of his firearm. Then, if the statements are supported by the evidence, create a compelling 3D animation to illustrate the findings for the jury at Brooks' murder trial.

The Physical Evidence

In order to complete the analysis, PSI reviewed specific documents and performed specific tasks. The documents most critical of these were the following:

- Recorded Police Detective interview of Brooks.
- Drawings created by Police Detective during interview with Brooks.
- California Department of Justice Physical Evidence Examination Report.
- Serological Research Institute Analytical Report.
- First 911 call initiated by Brooks.
- Second 911 call initiated by Brooks' Father.
- Incident Scene Photography.
- Napa County Sheriff Coroner's Report.
- Autopsy Report.
- Napa County Sheriff Supplemental Reports.
- Napa County Sheriff scene measurements and diagram.


NAPA COUNTY
SHERIFF-CORONER
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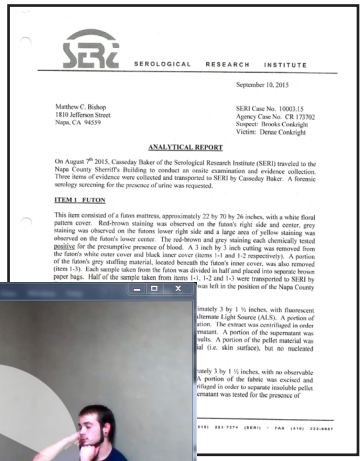
Napa, CA 94558

AUTOPSY PROTOCOL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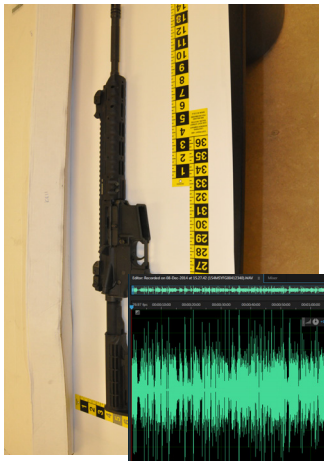
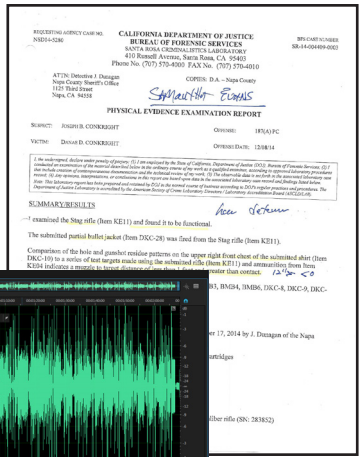
September 10, 2015

ANALYTICAL REPORT




CALIFORNIA DEPARTMENT OF JUSTICE
BUREAU OF FORENSIC SERVICES
SANTA ROSA CRIMINALISTICS LABORATORY
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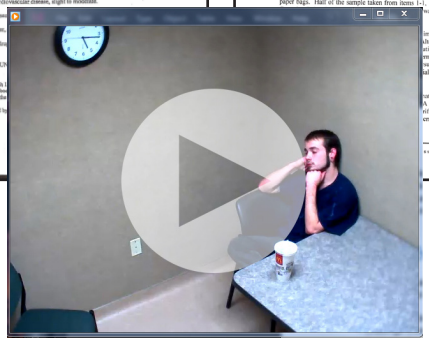
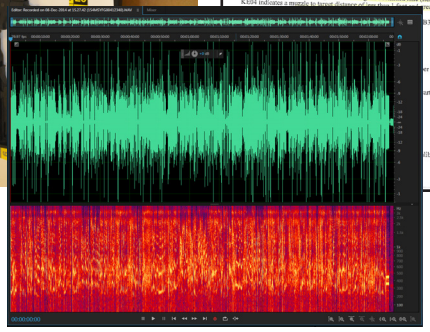
PHYSICAL EVIDENCE EXAMINATION REPORT

SUMMARY/RESULTS





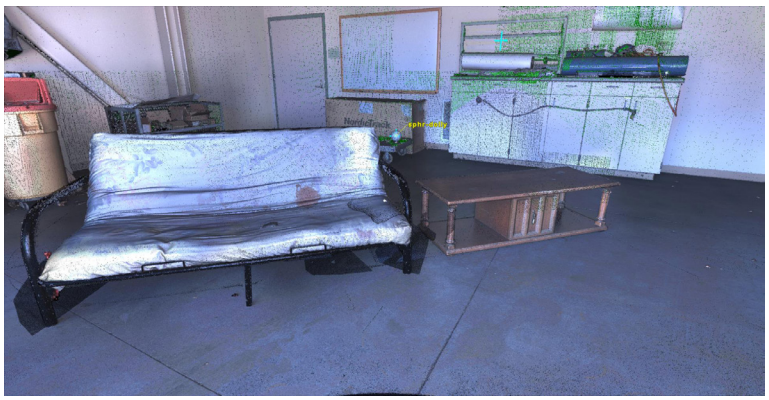
3D Laser Scanning

In addition to the above data compiled by others, PSI performed a field survey to document the incident scene and furniture with the intent to create an accurate 3D model of the scene, provide context to the locations described by witnesses, and locate physical evidence documented in the scene photos and measurements.

PSI pioneered the use of 3D laser scanning in the late 1990's. 3D laser scanning is a method of crime and accident scene documentation that uses a focused beam of laser light to measure the location of objects in the scene. The system sends out the laser beam up to 976,000 pulses/second, with each pulse measuring a portion of the scene. The millions of measurements that are returned create an accurate, thorough 3D model of the scene, preserving the scene in detail for later use in computer-aided analysis and visualization.

3D Laser Scan Data of Scene

The scene was measured from two locations, generating approximately 132,000,000 measurements. The resultant 3D model was used in the trajectory analysis, the 3D animation and to locate physical evidence as documented by the Napa County Sheriff's Department. PSI also performed a 3D laser scan of the futon upon which Danae Conkright was sitting when shot and her blood and urine were found, as well as the table that was adjacent to the futon in the original scene. The large urine stain on the seat area of the futon as well as the blood stain were clearly visible and thoroughly documented within the laser scan data. The resultant 3D models were used in the trajectory analysis and the 3D animation.



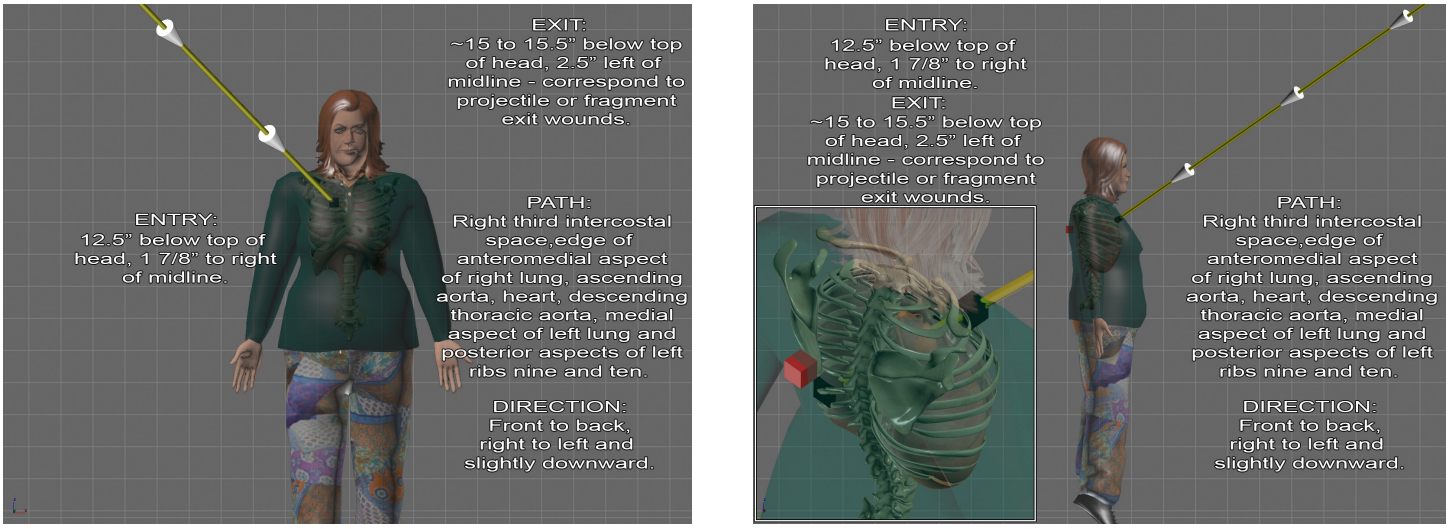
3D Laser Scan Data of Furniture

3D Ballistic Trajectory / Gunshot Wound Path Model

From the NAPA County Sheriff's Office Autopsy Report:

"There is a gunshot wound to the right upper chest consisting of a 1/8" circular/oval defect containing a 1/8" margin of abrasion that is more prominent on the superolateral aspect of the perforation. A 1/2" margin of contusion is on the medial aspect of the wound. The entrance wound is 12 1/2" below the top of the head and 1 7/8" to the right of midline. There is an approximate 5 x 3 1/2" area of stippling noted on the skin surrounding the entrance wound. Stippling is noted on the mid upper chest and right upper chest. Stippling is quite dense on the mid upper chest and moderately dense over the right upper chest, mostly lateral to the entrance wound. There is an area of relative sparing from stippling on the mid upper chest, adjacent to the aforementioned areas of stippling. There is no fouling on the adjacent skin.

After perforating the skin, the projectile perforated the right third intercostal space, the edge of the anteromedial aspect of the right lung, pericardial sac, ascending aorta, heart, descending thoracic aorta, medial aspect of the left lung and posterior aspects of left ribs nine and ten. There are transections of the ascending aorta adjacent to the root, and also of the descending thoracic aorta. The heart is pulpified. The perforation in the left lung caused pulpificaction of the parenchyma. There are comminuted fractures of left ribs nine and ten."



3D Anatomicals of Gunshot Wound Path and Resultant Injury

PSI used the measurements and descriptions of the wounds in the autopsy report to create a 3D model of Danae Conkright, 62 inches in height and created the entry location for the single gunshot wound detailed in the report. PSI then created a bullet path on this 3D model to match the bullet path described in the autopsy report. Based upon the photos available, the 3D model of Danae Conkright was scaled in girth to match, resulting in a torso thickness at the level of the gunshot wound in the chest of approximately 10 inches. The bullet path was then extended in order to align it with the described location of the AR-15 from which the projectile was fired.

Defendant's Videotaped Interview with Detective

During his videotaped interview, Brooks describes how the event occurred and he was involved in creating a diagram depicting the location of himself, Danae and the furniture. He reiterates that the rifle discharge was an accident and that the gun went off as he dropped it on the table.Brooks' statements that are of specific interest in analyzing his version of events and comparing it to the physical evidence:

- Brooks was cleaning his Stag model AR-15 at the time of the rifle discharge.
- Brooks was standing up adjacent to the table and on the opposite side of the table from the futon where Danae was sitting.
    - Although the diagram generated during his interview depicts Brooks standing on the far right end of the table (if facing the futon), during his interview he actually states that he was "more towards the middle" of the table at the time.
    - PSI analyzed both the location depicted in the drawing, as well as the location near the middle as Brooks actually stated.
- Danae Conkright was sitting on the futon, facing in Brooks' general direction.
- Brooks was holding the gun in one hand when he dropped it on the table, resulting in an unintentional discharge.
    - Brooks does not specify which hand he was holding the gun with, and he is not asked this during his interview.
    - Brooks states that the gun fell on the table butt first, while at an angle "not straight up and down".
    - PSI analyzed holding the weapon in both the left and the right hands and found no functional difference between the two in terms of aligning them with the physical evidence.
- Brooks stated that the end of the barrel of the gun was about 2 to 3 feet from Danae Conkright when he dropped it and it went off.

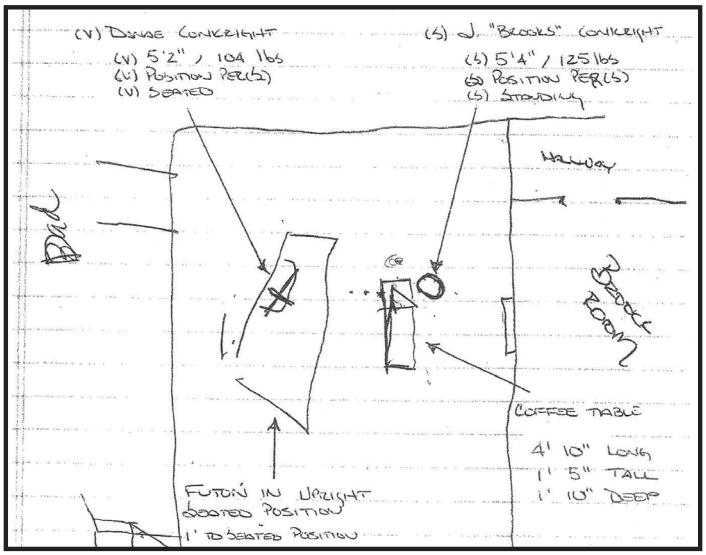
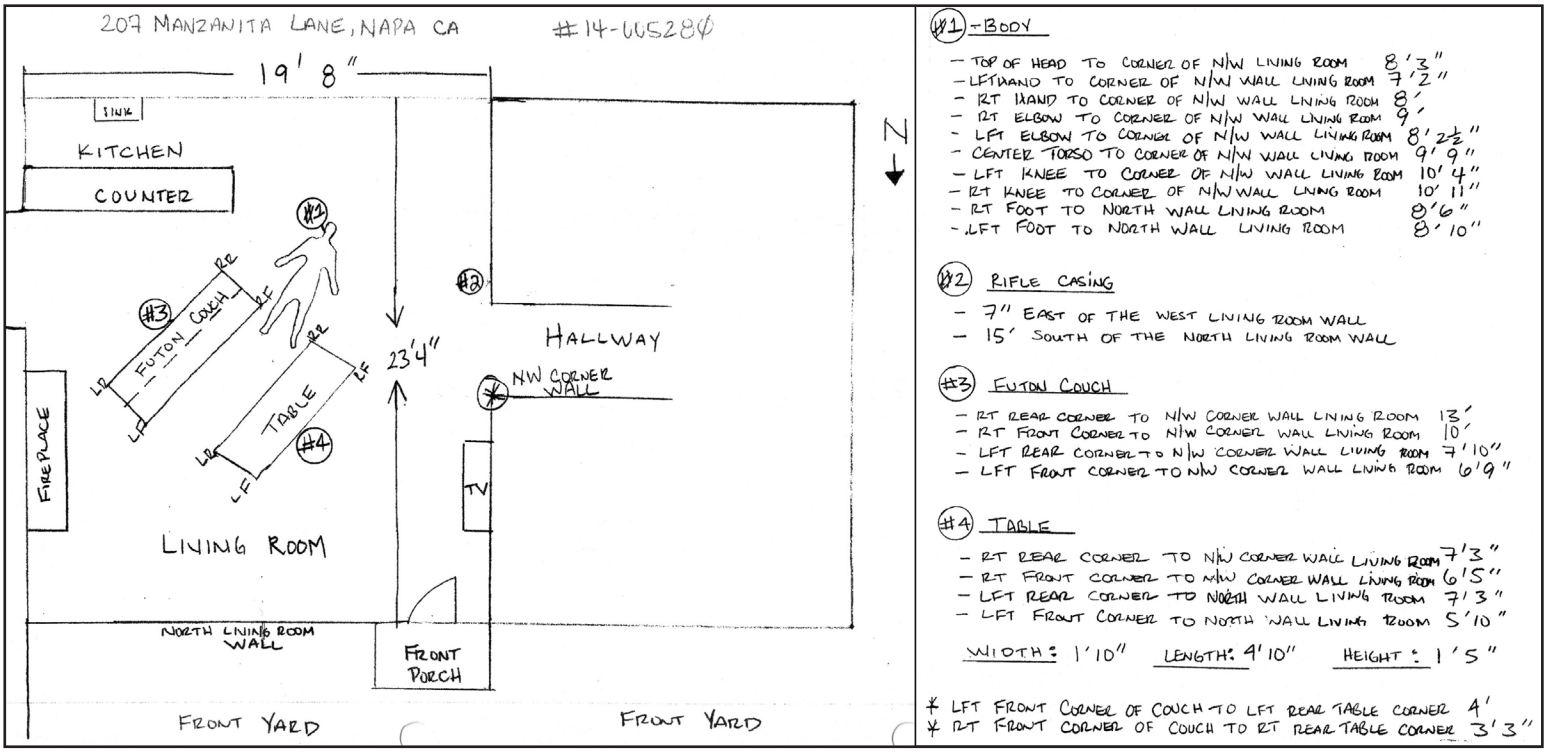


Diagram Made by Sheriff's Detective During Videotaped Interview

The 3D Working Model – Physical Environment and Physical Evidence

In order to determine whether Brooks' version of the events is supported by the physical evidence, it is first necessary to recreate the incident scene as accurately as possible. PSI used the 3D laser scanning data to generate an accurate and detailed 3D model of the scene.

PSI combined the 3D working model with the measurements of the physical evidence found at the scene, including the position of the expended casing, the location of the futon with the urine and blood evidence and the location of the table with pieces of gun cleaning equipment on its surface. As previously mentioned, the Napa County Sheriff's took measurements of the location of the furniture and physical evidence and created a rough diagram of the scene.



Napa County Sheriff's Department Diagram and Measurments

PSI attempted to use the measurements of the scene as the basis for the position of the furniture but found them to be inaccurate and internally inconsistent. The measurements were all taken from a single point within the house, a very crude method that leads to errors and does not lend itself to producing an accurate and unique solution when plotting the measurements against other available data. These measurements were abandoned in favor of photogrammetry techniques using the incident scene photographs.

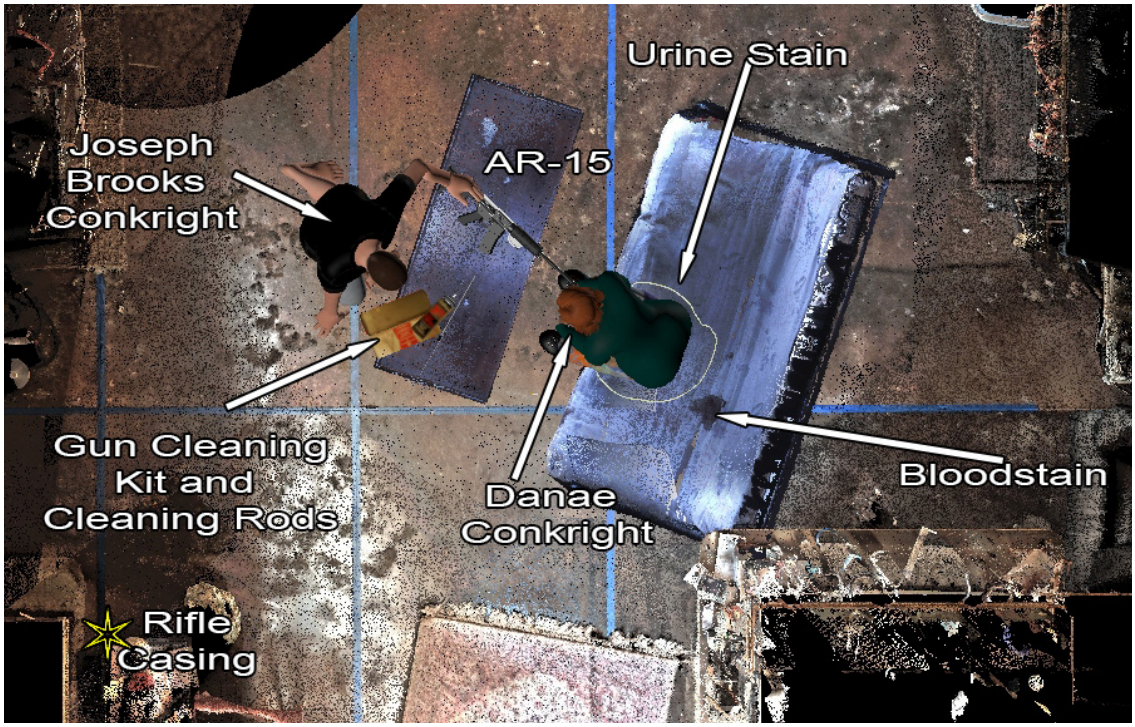
Laser Assisted 3D Photogrammetry

As discussed in previous PSI case studies, this process uses the 3D laser scan measurements in conjunction with the scene photos to accurately locate the objects within the crime scene, and generates images illustrating the accuracy of the match.

Scene Photograph

Camera Matched Laser Assisted Photogrammetry

This compiled 3D working model contained all the physical evidence needed to recreate the scene as it was immediately after the rifle discharge.

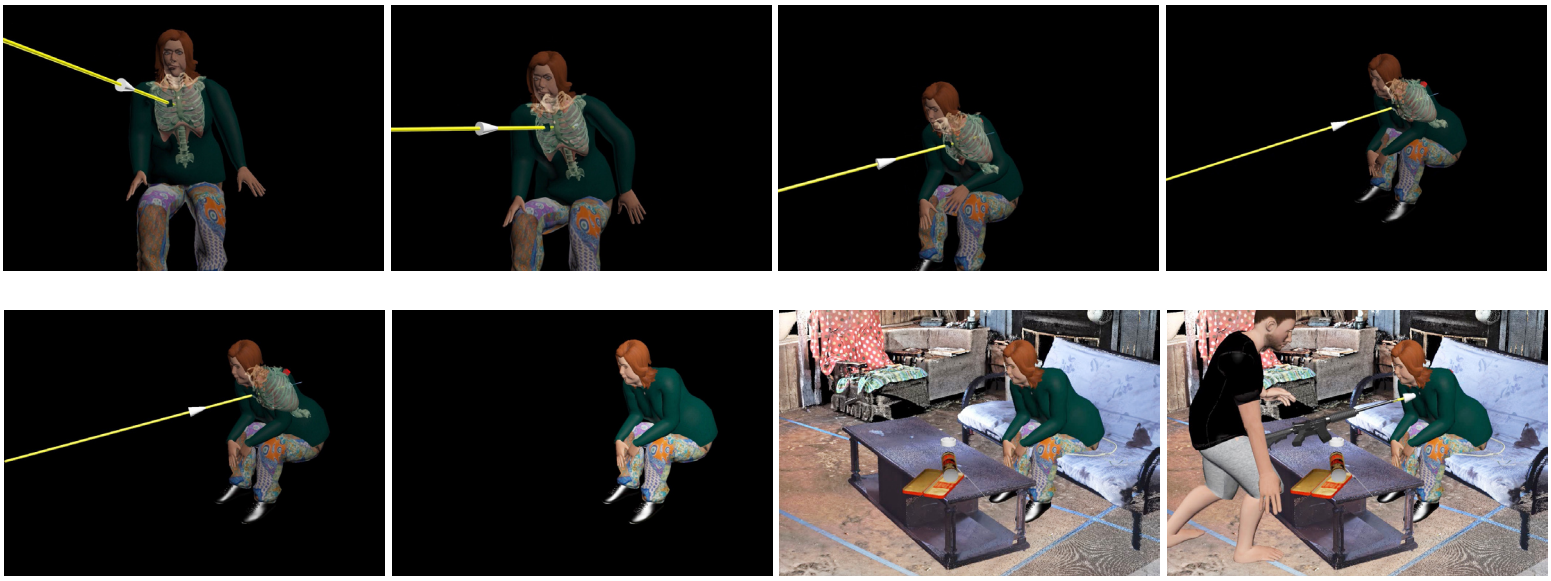


3D Model of Scene and Physical Evidence Locations

Articulating the 3D Model

With the 3D elements in place, PSI began the process of articulating the 3D model of Danae Conkright and the gunshot wound path to see if it matched a location of the AR-15 consistent with Brooks' statements.

A challenging aspect of the defendant's testimony was that he dropped the rifle on the table with the butt striking first, at an angle. At first look, this would suggest that the resultant bullet trajectory would be in an upward direction. Brooks agreed to this during his interview. However, the autopsy indicates that the bullet path through Danae Conkright's body was slightly downward, while she is in the anatomical position.



Articulating the 3D Model Into Position Before Fatal Shot

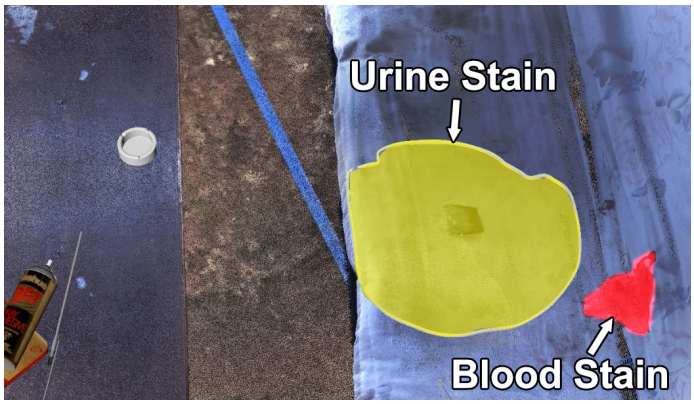
Besides the blood stains on the futon, the laser scan clearly recorded a large urine stain in the middle of the futon that was consistent with Danae voiding her bladder when shot. This provided a crucial clue as to exactly where to place her in the 3D model. When placed in the middle of the urine stain, the blood stain on the back of the futon clearly lined up with the exit wound on Danae Conkright's back.

By articulating the 3D model of Danae Conkright and the wound path, PSI found that this downward path could be easily matched to the upward direction of Brooks' rifle by leaning Danae Conkright forward, as if she was seated on the edge of the futon and watching TV.

Conclusion

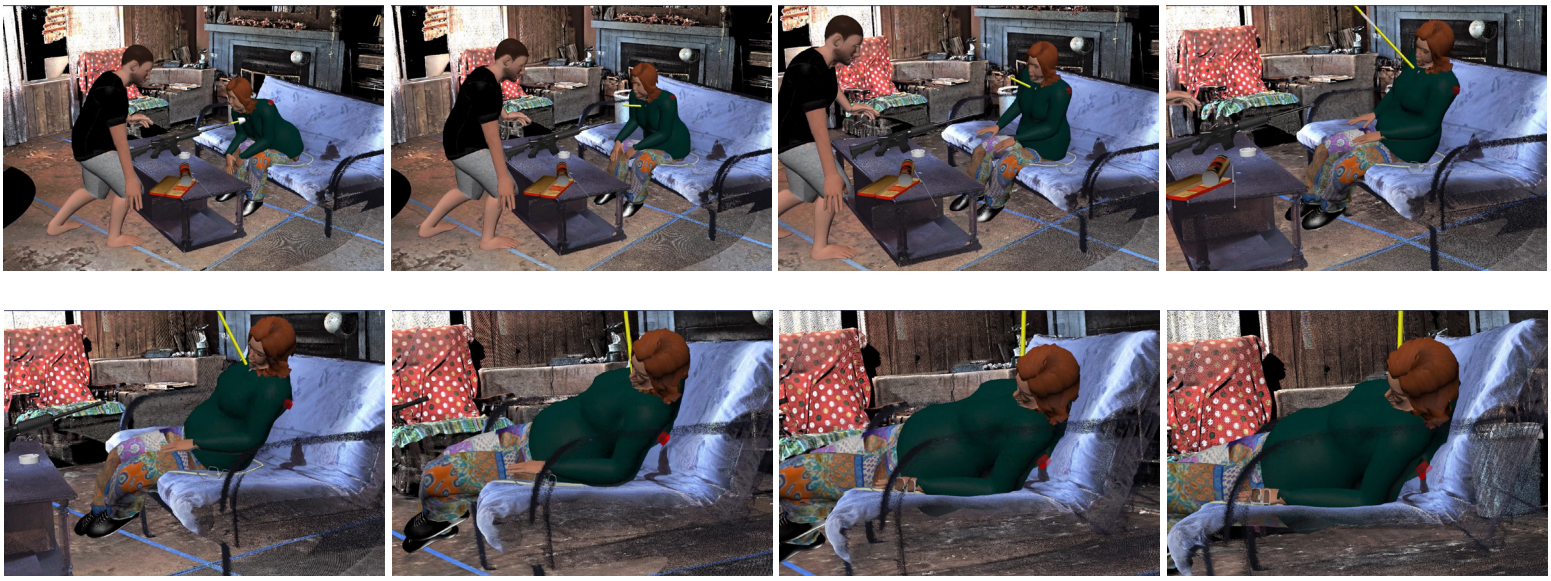
PSI concluded that the ballistic trajectory and gunshot wound path as described by Dr. Joseph Cohen are consistent with Brooks' statements. There is an additional piece of physical evidence that bears upon the validity of Brooks' statements. As previously noted, Dr. Cohen described two exit wounds on the back of Danae Conkright, consistent with either bullet or bone fragments. The Department of Justice Senior Criminalist tested these wounds and determined bullet fragments in fact caused them. In the Coroner's Report, it is noted that the wounds on Danae Conkright's back were oozing blood. This finding, along with the clear blood evidence on the backrest of the futon, are consistent with Danae Conkright's upper back coming into contact with the backrest of the futon after she suffered the gunshot wound.

To test if this evidence is consistent with Brooks' statements, PSI articulated the 3D model of Danae Conkright from her initial position seated on the couch and centered on the urine stain, to a position with her falling to her left and back, coming to rest on the futon. PSI then compared the location of the two bleeding exit wounds with the location of the bloodstain on the futon and found that the exit wounds and bloodstain on the couch are accurately matched in this position.



Urine and Blood Stain from Laser Scan on Futon

Urine and Blood Stain Match at Point of Rest



Articulating the 3D Model Into Position After Fatal Shot

Rebuttal

The 3D animation was shown at trial during the defense attorney's opening statements and multiple times while PSI's CEO and testifying expert, Craig Fries, was on the stand.

Expert's Note:
Although PSI's analysis and resultant visualization were shown to be internally consistent and maintained fidelity to all the physical evidence, there was an unexpected area of attack on PSI's work by the prosecution's expert. PSI showed that Brooks' statements matched the evidence if Danae Conkright was positioned such that she was leaning forward with her forearms resting on her upper thighs. As I was seated in the courtroom and watched, I was shocked to hear during his direct and cross-examination, the prosecution's expert claim that had Danae been shot in this posture she would have immediately dropped dead and been pulled forward due to gravity, not back and to the side as PSI depicted based upon the body fluid evidence. The expert made the claim that this was "not like in the movies and people don't get "blown" backwards by the momentum of a fired bullet." He further claimed on three separate occasions while under oath that it was a "fact", given the damage to her heart, Danae would have immediately expired and been pulled down by gravity and therefore could not have been seated as PSI showed. The expert allowed no wiggle room or question that his claims were true, saying he "knew for a fact" how her body would move/react to this gunshot wound.

During my later testimony, I agreed that fired bullets lack the momentum to move a person's body and that many illustrations of this truth could be found easily on YouTube. However, contrary to the ex-police officer's testimony, (the prosecution's expert had no medical training), people do NOT die immediately from massive damage to the heart caused by gunshot wounds. Additionally, the literature was clear that the blood supply already resident in the victim's brain would supply oxygen for up to 15 seconds. Finally, unless the bullet struck the brain or the upper part of the spinal cord, the victim would retain potential motor control until unconsciousness set in due to lack of oxygen to the brain. Illustrative of this fact, I presented multiple references on the topic in the literature where victims had been known to run up to a hundred yards after such an injury in an attempt to get aid.

Given this issue was a critical one and would determine whether the jury believed PSI's analysis was valid or not, I suggested the defense attorney retain as a rebuttal expert Forensic Pathologist Dr. Judy Melinek, with whom PSI has worked many times and whose knowledge in this area is unimpeachable. Dr. Melinek took the stand in rebuttal and educated the jury on the reality of gunshot wounds to the heart, providing the jury with the relevant and valid technical authority they required to reject the prosecutions expert's spurious claims.

After a single day of deliberation, the jury acquitted the defendant Joseph Brooks Conkright of murder, referencing the PSI analysis and visualization as critical in coming to their verdict.