IN THE CIRCUIT COURT OF THE SIXTH JUDICIAL CIRCUIT
OF THE STATE OF FLORIDA IN AND FOR PASCO COUNTY
CRC14-00216CFAES

STATE OF FLORIDA

V.

CURTIS J. REEVES

STATE'S MOTION IN LIMINE TO EXCLUDE
EVIDENCE GENERATED BY MICHAEL KNOX

COMES NOW, BERNIE McCABE, State Attorney for the Sixth Judicial Circuit in and for Pasco County, Florida, by and through the undersigned Assistant State Attorney, hereby respectfully request this Honorable Court to enter an order excluding evidence generated by Michael Knox and as good cause would show:

State's Position

- The photographic demonstrative aids created by Mr. Knox using mannequins in the theater seating area where the shooting took place while the Star Wars movie trailer is played in the background and at various theater lighting settings does not fairly and accurately representation the lighting at time of the shooting. Brown v. St., 550 So.2d 527, 528 (Fla. 1st DCA 1989)

- The various lighting scenarios of the demonstrative aids will not be helpful to the trier of fact in understanding or determining a material issue or fact. Pierce v. St., 718 So.2d 806, 809 (Fla. 4th DCA 1997)

- The various lighting scenarios of the demonstrative aids will lead only to a confusion of the issue and mislead the jury. The probative value of the demonstrative aids is substantially outweighed by the danger of unfair prejudice. Id. at 809, F.S.A. §90.403.

- Many of the photographs depict a "red string" anchored to the chest of the male mannequin. Mr. Knox denies that he made any attempt to establish the trajectory of the bullet and that the "red string" in the photographs was a measuring aid. Regardless of the caveat, subliminally the trier of fact is going to equate the "red string" with a perceived trajectory, which will only lead to confusion and misunderstanding of the facts. Id. at 809, F.S.A. §90.403.

- Mr. Knox's testimony and opinions fail to meet the Daubert standard for admissibility. Daubert v. Merril Dow Pharmaceuticals, Inc., 509 U.S. 579, 113 S.Ct. 2786 (1993)

- Mr. Knox's 88 photographs will not aid or assist the fact-finder in understanding or determining a material issue or fact. Daubert v. Merril Dow Pharmaceuticals, Inc., 509 U.S. 579, 113 S.Ct. 2786 (1993)

- The content of Mr. Knox's 88 photographs is based on reasoning and methodology that cannot be properly applied to the facts in issue. Daubert v. Merril Dow Pharmaceuticals, Inc., 509 U.S. 579, 113 S.Ct. 2786 (1993) A photograph taken with a camera lens cannot substantially depict the amount of light that a human eye can detect and translate into sight. See, Exhibits #1 & #2, attached.

Factual Background

Excerpts from deposition of Michael Knox, April 7, 2016, pages 189 - 258 (Referred hereafter as Depo) (See Exhibit # 3, Deposition Transcript)

1. On July 28, 2015, Michael Knox, Forensic Consultant conducted an investigation in the Cobb Theater, Theater #10, on behalf of the defendant, Mr. Reeves. See, Exhibit #4, attached)(C.V.)

2. The lighting condition inside Theater #10 at the time of the shooting on January 13, 2014 was part of his investigation.

3. At the request of Mr. Knox the theater management ran the Star Wars movie trailer, while he photographed from the seat Mr. Reeves was sitting at the time of the shooting, life-size male and female mannequins in various positions, single and together with the movie trailer in the background. Mr. Knox also had the theater house lights set at "Mid-1", the house light setting at the time of the shooting event, while he took photographs of the mannequins in their various positions. Depo, page 194.

4. Mr. Knox did not attempt to reenact or recreate the exact lighting condition at the time of the shooting. Nor did he attempt to take photos representing what he believed to be substantially similar to the lighting conditions at the time of the shooting. Depo, pages 200 – 2008.

5. Mr. Knox explained "[a]gain, its just sort of the same as the boundary values with the measurements. What I'm doing is getting photographs with a variety of different background lighting to basically be able to cover the gamut of what could be reasonably possible. Depo, page 196.

6. Mr. Knox took a total of 88 photographs[1] representing the many different lighting scenarios that might have existed at the time of the shooting. See, Exhibit #5, attached. Depo, pages 195 – 196.

7. Mr. Knox used a Nikon D800 with a 55 mm lens to take the 88 photographs. Depo, pages 190 – 193.

8. Though the photographs appear to represent the defense theory of the relative positions of Mr. and Mrs. Oulson contemporaneous with the shooting event, Mr. Knox proffered the 88 photographs as what Mr. Reeves could have seen during the event.

9. Mr. Knox does not represent any array of photographs as being accurate or substantially similar to the lighting conditions at the time the Defendant made any of his observations. He simply states that all of the photographs represent what the lighting conditions could have been and depict what the Defendant could have seen. Depo, pages 196 – 197.

10. In many of the 88 photographs, what Mr. Knox describes as a "red string" appears in the photographs. The "red string" is anchored in the chest of the male mannequin suggesting the trajectory of the bullet that struck Mr. Oulson. Mr. Knox denies that he made any attempt to establish the trajectory of the bullet and that the "red string" in the photographs was a measuring aid. Depo, page 214.

11. Even though Mr. Knox took body measurements of the Defendant before taking the photographs, he did not use the measurements to place the camera in a position consistent with the Defendant's eyes when seated. Depo, pages 197 – 200.

Evidence Code: F.S.A. §90.701 & §90.702

§ 90.701 Opinion testimony of lay witnesses

If a witness is not testifying as an expert, the witness's testimony about what he or she perceived may be in the form of inference and opinion when:

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[1] Deposition Exhibits
Exhibit #25, Frames 1 – 13 (Discussed pages 196 – 209)
Exhibit #26, Frames 14 – 23 (Discussed pages 209 – 215)
Exhibit #27, Frames 24 – 28 (Discussed pages 215 – 221)
Exhibit #28, Frames 29 – 37 (Discussed pages 221 – 230)
Exhibit #29, Frames 38 – 45 (Discussed pages 230 – 236)
Exhibit #30, Frames 46 – 51 (Discussed pages 236 – 239)
Exhibit #31, Frames 52 – 59 (Discussed pages 239 – 243)
Exhibit #32, Frames 60 – 67 (Discussed pages 243 – 248)
Exhibit #33, Frames 68 – 75 (Discussed pages 248 – 252)
Exhibit #34, Frames 76 – 83 (Discussed pages 252 – 253)
Exhibit #35, Frames 84 – 88 (Discussed pages 253 – 255)

(1) The witness cannot readily, and with equal accuracy and adequacy, communicate what he or she has perceived to the trier of fact without testifying in terms of inferences or opinions and the witness's use of inferences or opinions will not mislead the trier of fact to the prejudice of the objecting party; and

(2) The opinions and inferences do not require a special knowledge, skill, experience, or training. FLA. STAT. § 90.701 (2015)

90.702. Testimony by experts

If scientific, technical, or other specialized knowledge will assist the trier of fact in understanding the evidence or in determining a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify about it in the form of an opinion or otherwise, if:

(1) The testimony is based upon sufficient facts or data;

(2) The testimony is the product of reliable principles and methods; and

(3) The witness has applied the principles and methods reliably to the facts of the case. FLA. STAT. § 90.702 (2015)

The Evidence Code may be applicable in hearings under the "Stand Your Ground" Act in criminal cases. See, McDaniel v. State, 24 So.3d 654 (Fla. 2d DCA 2009); See generally, Dennis v. State, 51 So.3d 456 (Fla. 2010).

Daubert Issue

Can a camera lens duplicate what two human eyes can collectively gather, interpret & translate into what we see in any given lighting situation?

Daubert Standard

Prior to 2013 the admissibility of scientific testimony and opinions was governed the *Fye* standard. In July, 2013 the Florida Legislature enacted 90.702, FSS setting forth the Daubert standard to govern the admissibility of both expert scientific testimony and opinions and lay opinions. F.S.A. Section 90.702, Amended by Laws 2013, c. 2013-107, Section 1, eff. July 1, 2013. (See, Exhibit #6, attached) (Chapter 2013-107, House bill No. 7015)

The federal courts have long used the Daubert standard to govern the admissibility of scientific testimony and opinions. In federal Court, Federal Rule of Evidence 702 governs the admissibility of exert testimony in federal courts. Daubert v. Merrill Dow Pharmaceuticals, Inc., 509 U.S. 579, 113 S.Ct. 2786 (1993): Kumho Tire Co., Ltd. V. Carmichael, 256 U.S. 137, 119 S.Ct. 1167 (1999). Under Daubert, a federal district court applying Rule 702 is charged with the gate-keeping role of ensuring that scientific evidence is both relevant and reliable. 509 U.S. at 589-95. The objective of the screening is to ensure that expert testimony, in order to be admissible, must be "not only relevant, bur reliable". 509 U.S. at 589. "Rule 702 further requires that the evidence or testimony "assist the trier of fact to understand the evidence or to determine a fact in issue. This condition goes primarily to relevance". 509 U.S. at 591. Relevancy is found when the expert's theory is tied sufficiently to the facts of the case and the expert's testimony assists the trier in resolving a factual dispute. 509 U.S. at 591-92. The helpfulness standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility. 509 U.S. at 591-92. Thus if the proposed scientific evidence is not helpful in that the proposed science does not advance the inquiry in question, then the evidence does not meet the helpfulness standard. Reliability, on the other hand is grounded in the methods and procedures of science. 509 U.S. at 590.

Daubert set forth a non-exclusive list of factors to guide the reliability inquiry: (1) whether the scientific theory or technique can or has been tested; (2) whether the scientific theory or technique has been subjected to peer review and publication: (3) in the case of a particular scientific technique, the known or potential rate of error: and (4) whether the theory or technique has gained general acceptance in the scientific community. 509 U.S. at 593-95. In Kumho Tire, 526 U.S. 137, 119 S.Ct. 1167 (1999), the Supreme Court further held that gate-keeping obligation extends not just to scientific testimony, but also to technical or other specialized knowledge, including testimony base on an expert's own experience. 526 U.S. at 141. The Kumho Tire court applied Daubert to scientific evidence and to evidence based on technical or other specialized knowledge. 526 U.S. at 151. Therefore, Daubert applies to skill or experience-based observations.

The Supreme Court has repeated emphasized that Rule 702 inquiry is "flexible". Daubert, 509 U.S. at 594; Kumho Tire, 526 U.S. at 150. "Not only must the trial court be given broad discretion to decide whether to admit expert testimony, it must have the same kind of

latitude in deciding how to test an expert's reliability." United States v. Hankey, 203 F.3d 1160, 1168 (9th Cir. 2000) (citation omitted). Thus, a district court's decision to admit or exclude testimony may be reversed only for abuse of discretion. Kumho Tire, 526 U.S. at 142 (citation omitted).

A district court may, but is not required to hold a pre-trial hearing to determine admissibility of expert testimony. United States v. Alatorre, 222 F.3d 1098, 1099 (9th Cir. 2000). As an alternative to a pre-trial hearing, admissibility determination may be made during trial. Id. The question of admissibility may be raised by the court sua sponte. See Kirsteing v. Parks Corp., 159 F.3d 1065, 1067 (7th Cir. 1998)("We have not required that the Daubert inquiry take any specific form and have, in fact, upheld a judge's sua sponte consideration of the admissibility of expert testimony")

Conclusion

The demonstrative aid, consisting of 88 photographs failure to show the lighting conditions that actually existed or depict lighting conditions that in his opinion is substantially similar to the lighting conditions at the time of the shooting event. Collectively, the 88 photographs represent a plethora of lighting scenarios that may or may not have existed at the time of the shooting event. The trier of fact viewing the 88 photographs have no better understanding of the lighting conditions at the time of the shooting event than if there were no photographs at all.

The lack of specificity or even substantial specificity can only lead to confusion and misunderstanding by the trier of fact.

Although the lighting condition at the time of the shooting is of a material interest and evidence depicting lighting at substantially the same level is relevant, the probative value of the demonstrative aid, consisting of the 88 photographs taken by Mr. Knox, is substantially outweighed by the danger of unfair prejudice, confusion of the issue and misleading of the trier of fact.

The prejudicial effect of the 88 photographs is further exacerbated by the fact that in many of the photographs a "red string" appears in the photographs. The "red string" is anchored in the chest of the male mannequin suggesting the trajectory of the bullet that struck Mr. Oulson. Mr. Knox denies that he made any attempt to establish the trajectory of the bullet and that the "red

string" in the photographs was a measuring aid. Regardless of the caveat, subliminally the trier of fact is going to equate the "red string" with a perceived trajectory, which will only lead to confusion and misunderstanding of the facts.

As previously stated, the lighting at the time of the shooting event is a relevant issue in this case. Mr. Knox's methodology and reasoning to use a camera lens to capture the lighting condition in the theater at a given moment cannot be applied properly to the issued of what was the lighting condition at the time the Defendant made his observations leading up to his decision to shoot Mr. Oulson.

"Our eyes are able to look around a scene and dynamically adjust based on subject matter, whereas camera capture a single still image. This trait accounts for many of our commonly understood advantages over cameras. For example, our eyes can compensate as we focus on regions of varying brightness, can look around to encompass a broader angle of vies, or can alternately focus on objects at a variety of distances. ... What we really see is our mind's reconstruction of objects based on input provided by the eyes – not the actual light received by our eyes." *Cameras v. The Human Eye*, www.cambridgeincolour.com/tutorials/cameras-vs-human-eye.htm. See, Exhibit #1, attached.

Because the methodology used by Mr. Knox cannot be properly applied to the factual issue of "lighting conditions", the 88 photographs will not aid or assist the fact-finder in understanding or determining that particular factual issue.

If the 88 photographs were submitted to the trier of fact, it would have to be explained that 1) the position of the male and female mannequins is not a recreation or an reenactment of how the defense believes Mr. and Mrs. Oulson were positioned at various times during the shooting event; 2) it is not known if the Star Wars trailer playing in the background was substantially similar to the trailer playing at the time of the shooting event; 3) it cannot be determined in what combination the ever changing background lighting from the movie trailer and the static house light setting existed at the time of the shooting event; 4) it cannot be determined in what combination the ever changing background lighting from the movie trailer and the static house light setting existed when the Defendant made his observations that lead him to believe that it was necessary to shoot Mr. Oulson in or to prevent death or great bodily harm; 5) the "red string" depicted in many of the photographs does not represent the trajectory of the bullet, but is

only a measuring aid and 6) a camera lens cannot capture and a photograph cannot reproduce the lighting lever two human eyes can collectively determine. See, Exhibit #2 and #3, attached.

So many caveats to the presentation of the 88 photographs can only lead to a substantial likelihood of confusion and misunderstanding of the material issues.

WHEREFORE, the State respectfully requests this Honorable Court to enter an order exclude the above-described photographs generated by Michael Knox.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the State's Motion In Limine To Exclude Evidence Generated by Michael Knox was furnished to Richard Escobar, Esq., Escobar & Associates, P.A., 2917 West Kennedy Blvd., Ste 100, Tampa, FL 33609, Attorney for the Defendant by U.S. Mail / Hand / Facsimile this 6th day of February, 2017

BERNIE McCABE, State Attorney
Sixth Judicial Circuit of Florida

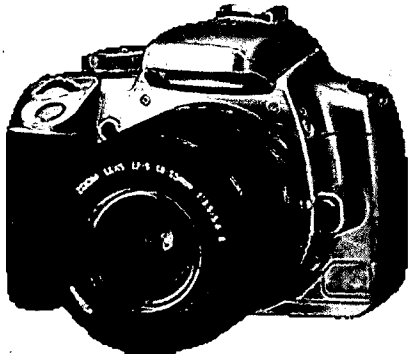
[redacted]

Glenn L. Martin, Jr.
Assistant State Attorney

Exhibit # 1

CAMERAS vs. THE HUMAN EYE

Why can't I just point my camera at what I'm seeing and record that? It's a seemingly simple question. It's also one of the most complicated to answer, and requires delving into not only how a camera records light, but also how and why our eyes work the way they do. Tackling such questions can reveal surprising insights about our everyday perception of the world — in addition to making one a better photographer.



VS.

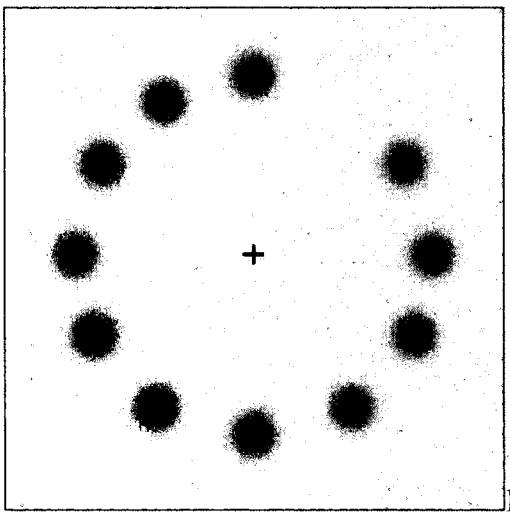
Chapter 1 INTRODUCTION

Our eyes are able to look around a scene and dynamically adjust based on subject matter, whereas cameras capture a single still image. This trait accounts for many of our commonly understood advantages over cameras. For example, our eyes can compensate as we focus on regions of varying brightness, can look around to encompass a broader angle of view, or can alternately focus on objects at a variety of distances.

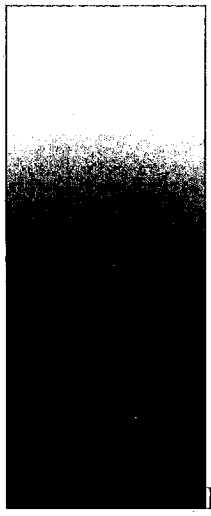
However, the end result is akin to a video camera — not a stills camera — that compiles relevant snapshots to form a mental image. A quick glance by our eyes might be a fairer comparison, but ultimately the uniqueness of our visual system is unavoidable because:

What we really see is our mind's reconstruction of objects based on input provided by the eyes — not the actual light received by our eyes.

Skeptical? Most are — at least initially. The examples below show situations where one's mind can be tricked into seeing something different than one's eyes:



False Color



Mach Bands

False Color: Move your mouse onto the corner of the image and stare at the central cross. The missing dot will rotate around the circle, but after a while this dot will appear to be green — even though no green is actually present in the image.

Mach Bands: Move your mouse on and off of the image. Each of the bands will appear slightly darker or lighter near its upper and lower edges — even though each is uniformly gray.

However, this shouldn't discourage us from comparing our eyes and cameras! Under many conditions a fair comparison is still possible, but *only if* we take into consideration both what we're seeing *and* how our mind processes this information. Subsequent sections will try to distinguish the two whenever possible.

Chapter 2 OVERVIEW OF DIFFERENCES

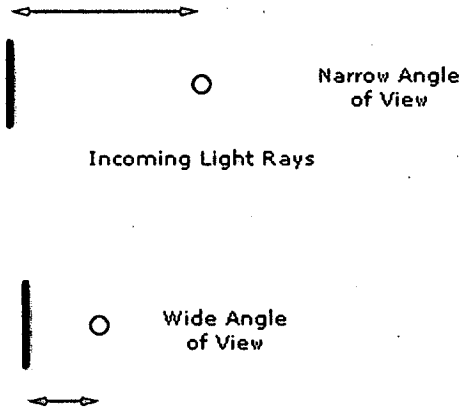
This tutorial groups comparisons into the following visual categories:

1. **Angle of View**
2. **Resolution & Detail**
3. **Sensitivity & Dynamic Range**

The above are often understood to be where our eyes and cameras differ the most, and are usually also where there is the most disagreement. Other topics might include depth of field, stereo vision, white balancing and color gamut, but these won't be the focus of this tutorial.

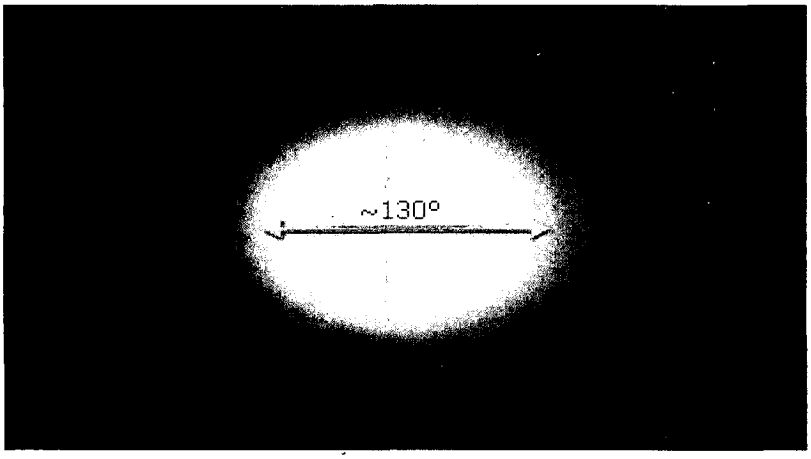
Chapter 3 1. ANGLE OF VIEW

With cameras, this is determined by the focal length of the lens (along with the sensor size of the camera). For example, a telephoto lens has a longer focal length than a standard portrait lens, and thus encompasses a narrower angle of view:



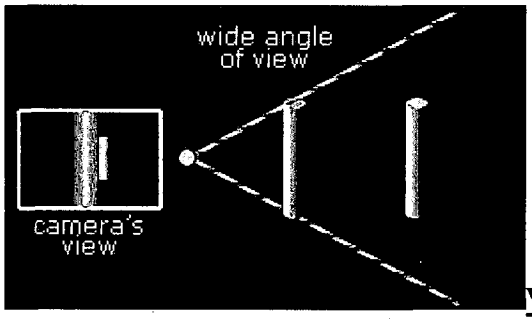
Unfortunately our eyes aren't as straightforward. Although the human eye has a focal length of approximately 22 mm, this is misleading because (i) the back of our eyes are curved, (ii) the periphery of our visual field contains progressively less detail than the center, and (iii) the scene we perceive is the combined result of both eyes.

Each eye individually has anywhere from a 120-200° angle of view, depending on how strictly one defines objects as being "seen." Similarly, the dual eye overlap region is around 130° — or nearly as wide as a fisheye lens. However, for evolutionary reasons our extreme peripheral vision is only useful for sensing motion and large-scale objects (such as a lion pouncing from your side). Furthermore, such a wide angle would appear highly distorted and unnatural if it were captured by a camera.



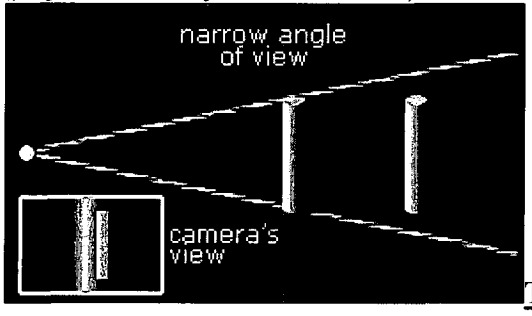
Left Eye Dual Eye Overlap Right Eye

Our central angle of view — around 40-60° — is what most impacts our perception. Subjectively, this would correspond with the angle over which you could recall objects without moving your eyes. Incidentally, this is close to a 50 mm "normal" focal length lens on a full frame camera (43 mm to be precise), or a 27 mm focal length on a camera with a 1.6X crop factor. Although this doesn't reproduce the full angle of view at which we see, it *does* correspond well with what we perceive as having the best trade-off between different types of distortion:



Wide Angle Lens

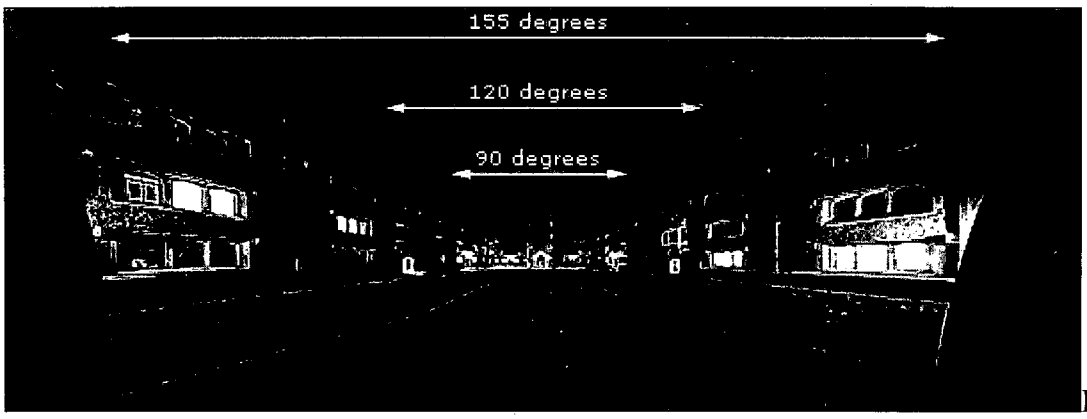
(objects are very different sizes)



Telephoto Lens

(objects are similar in size)

Too wide an angle of view and the relative sizes of objects are exaggerated, whereas too narrow an angle of view means that objects are all nearly the same relative size and you lose the sense of depth. Extremely wide angles also tend to make objects near the edges of the frame appear stretched.



Depth Distortion

(if captured by a standard/rectilinear camera lens)

By comparison, even though our eyes capture a distorted wide angle image, we reconstruct this to form a 3D mental image that is seemingly distortion-free.

Chapter 4 2. RESOLUTION & DETAIL

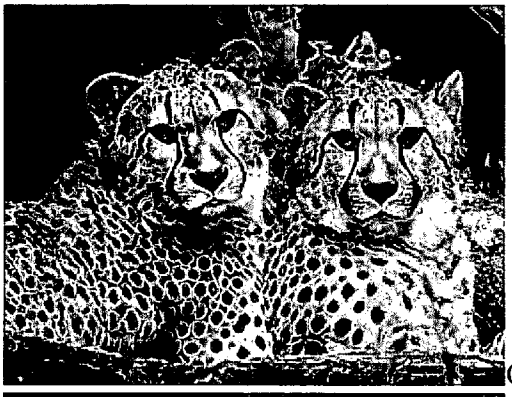
Most current digital cameras have 5-20 megapixels, which is often cited as falling far short of our own visual system. This is based on the fact that at 20/20 vision, the human eye is able to resolve the equivalent of a 52 megapixel camera (assuming a 60° angle of view).

However, such calculations are misleading. Only our central vision is 20/20, so we never actually resolve that much detail in a single glance. Away from the center, our visual ability decreases dramatically, such that by just 20° off-center our eyes resolve only one-tenth as much detail. At the periphery, we only detect large-scale contrast and minimal color:

Qualitative representation of visual detail using a single glance of the eyes.

Taking the above into account, a single glance by our eyes is therefore only capable of perceiving detail comparable to a 5-15 megapixel camera (depending on one's eyesight). However, our mind doesn't actually remember images pixel by pixel; it instead records memorable textures, color and contrast on an image by image basis.

In order to assemble a detailed mental image, our eyes therefore focus on several regions of interest in rapid succession. This effectively paints our perception:


Original Scene


One Person's Regions of Interest

The end result is a mental image whose detail has effectively been prioritized based on interest. This has an important but often overlooked implication for photographers: even if a photograph approaches the technical limits of camera detail, such detail ultimately won't count for much if the imagery itself isn't memorable.

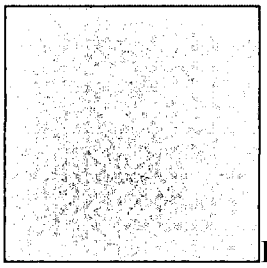
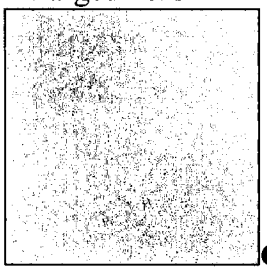
Other important differences with how our eyes resolve detail include:

Asymmetry. Each eye is more capable of perceiving detail below our line of sight than above, and their peripheral vision is also much more sensitive in directions away from the nose than towards it. Cameras record images almost perfectly symmetrically.

Low-Light Viewing. In extremely low light, such as under moonlight or starlight, our eyes actually begin to see in monochrome. Under such situations, our central vision also begins to depict less detail than just off-center. Many astrophotographers are aware of this, and use it to

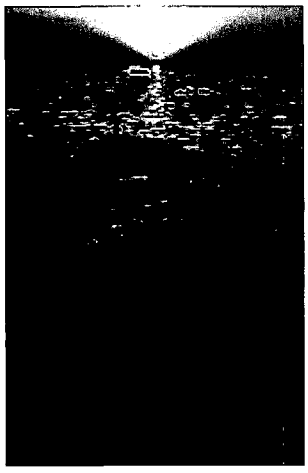
their advantage by staring just to the side of a dim star if they want to be able to see it with their unassisted eyes.

Subtle Gradations. Too much attention is often given to the finest detail resolvable, but subtle tonal gradations are also important — and happen to be where our eyes and cameras differ the most. With a camera, enlarged detail is always easier to resolve — but counter-intuitively, enlarged detail might actually become less visible to our eyes. In the example below, both images contain texture with the same amount of contrast, but this isn't visible in the image to the right because the texture has been enlarged.

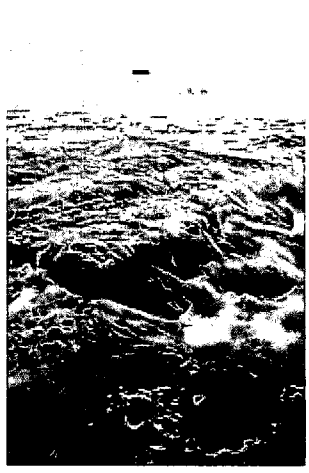

Fine Texture
(barely visible)
→
Enlarged 16X

Coarse Texture
(no longer visible)

Chapter 5 3. SENSITIVITY & DYNAMIC RANGE

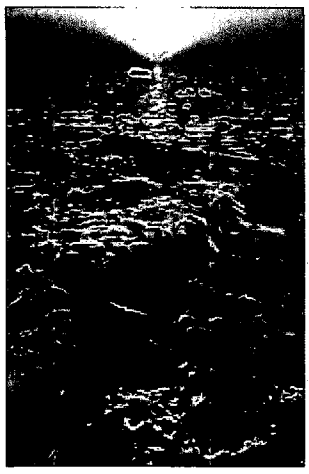
Dynamic range* is one area where the eye is often seen as having a huge advantage. If we were to consider situations where our pupil opens and closes for different brightness regions, then yes, our eyes far surpass the capabilities of a single camera image (and can have a range exceeding 24 f-stops). However, in such situations our eye is dynamically adjusting like a video camera, so this arguably isn't a fair comparison.



Eye Focuses on Background



Eye Focuses on Foreground

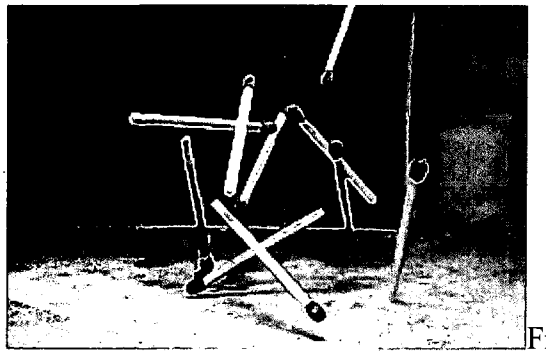


Our Mental Image

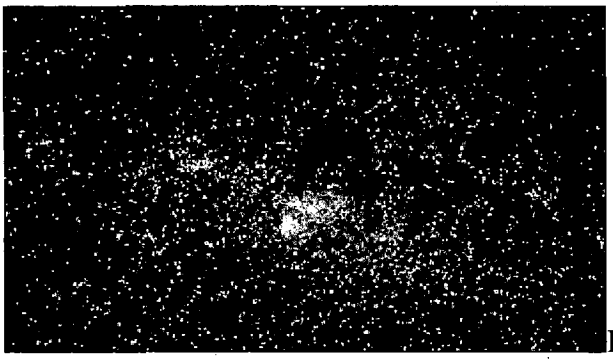
If we were to instead consider our eye's instantaneous dynamic range (where our pupil opening is unchanged), then cameras fare much better. This would be similar to looking at one region within a scene, letting our eyes adjust, and not looking anywhere else. In that case, most estimate that our eyes can see anywhere from 10-14 f-stops of dynamic range, which definitely surpasses most compact cameras (5-7 stops), but is surprisingly similar to that of digital SLR cameras (8-11 stops).

On the other hand, our eye's dynamic range also depends on brightness and subject contrast, so the above only applies to typical daylight conditions. With low-light star viewing our eyes can approach an even higher instantaneous dynamic range, for example.

***Quantifying Dynamic Range**. The most commonly used unit for measuring dynamic range in photography is the f-stop, so we'll stick with that here. This describes the ratio between the lightest and darkest recordable regions of a scene, in powers of two. A scene with a dynamic range of 3 f-stops therefore has a white that is 8X as bright as its black (since $2^3 = 2x2x2 = 8$).



Freezing Motion

 Low-Light Sensitivity

Photos on left (matches) and right (night sky) by lazlo and dcysurfer, respectively.

Sensitivity. This is another important visual characteristic, and describes the ability to resolve very faint or fast-moving subjects. During bright light, modern cameras are better at resolving fast moving subjects, as exemplified by unusual-looking high-speed photography. This is often made possible by camera ISO speeds exceeding 3200; the equivalent daylight ISO for the human eye is even thought to be as low as 1.

However, under low-light conditions, our eyes become much more sensitive (presuming that we let them adjust for 30+ minutes). Astrophotographers often estimate this as being near ISO 500-1000; still not as high as digital cameras, but close. On the other hand, cameras have the advantage of being able to take longer exposures to bring out even fainter objects, whereas our eyes don't see additional detail after staring at something for more than about 10-15 seconds.

Chapter 6 CONCLUSIONS & FURTHER READING

One might contend that whether a camera is able to beat the human eye is inconsequential, because cameras require a different standard: they need to make realistic-looking prints. A printed photograph doesn't know which regions the eye will focus on, so every portion of a scene would need to contain maximal detail — just in case that's where we'll focus. This is especially true for large or closely viewed prints. However, one could also contend that it's still useful to put a camera's capabilities in context.

Overall, most of the advantages of our visual system stem from the fact that our mind is able to intelligently interpret the information from our eyes, whereas with a camera, all we have is the raw image. Even so, current digital cameras fare surprisingly well, and surpass our own eyes for several visual capabilities. The real winner is the photographer who is able to intelligently assemble multiple camera images — thereby surpassing even our own mental image.

Exhibit # 2

The Camera Versus the Human Eye

NOV 17, 2012
ROGER CICALA

Chapter 1 2278
Chapter 2 Shares

This article started after I followed an online discussion about whether a 35mm or a 50mm lens on a full frame camera gives the equivalent field of view to normal human vision. This particular discussion immediately delved into the optical physics of the eye as a camera and lens — an understandable comparison since the eye consists of a front element (the cornea), an aperture ring (the iris and pupil), a lens, and a sensor (the retina).

Despite all the impressive mathematics thrown back and forth regarding the optical physics of the eyeball, the discussion didn't quite seem to make sense logically, so I did a lot of reading of my own on the topic.

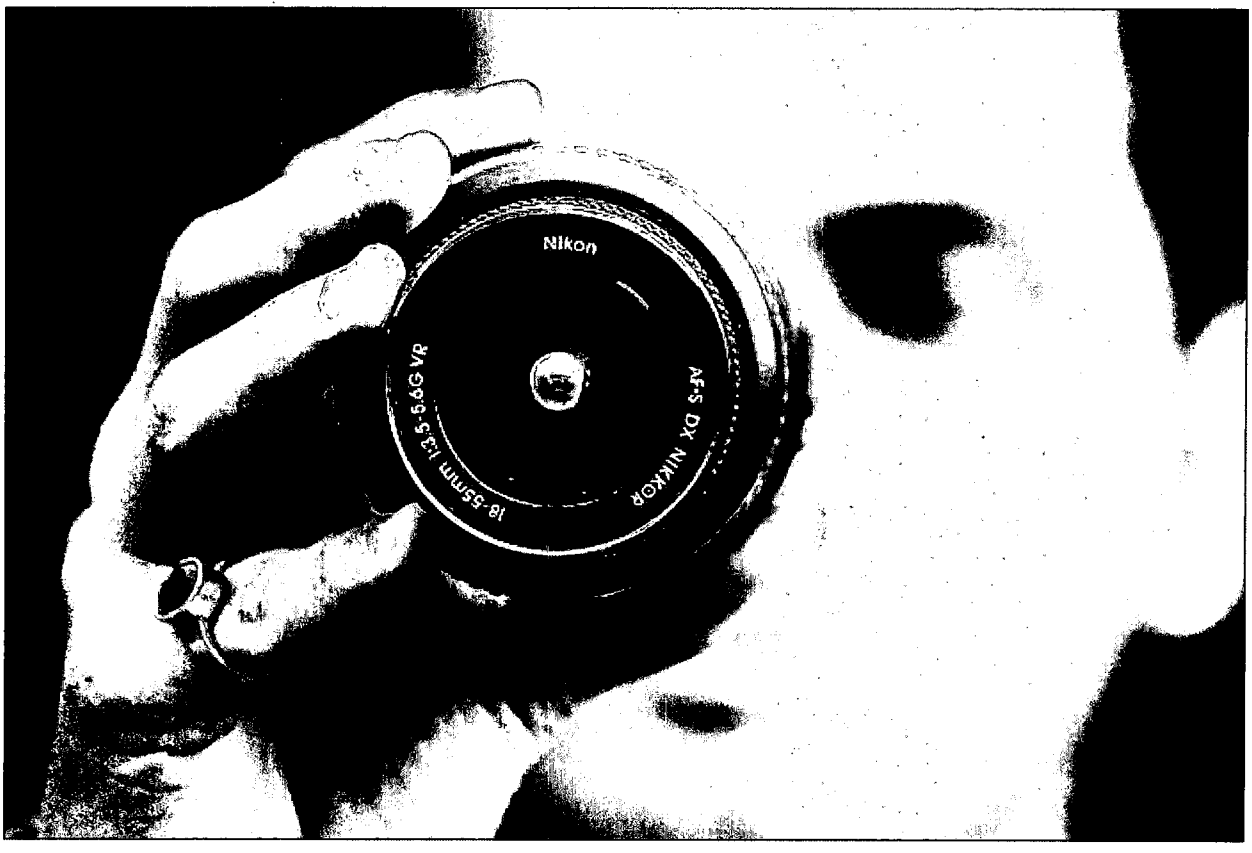
There won't be any direct benefit from this article that will let you run out and take better photographs, but you might find it interesting. You may also find it incredibly boring, so I'll give you my conclusion first, in the form of two quotes from Garry Winogrand:

A photograph is the illusion of a literal description of how the camera 'saw' a piece of time and space.

Photography is not about the thing photographed. It is about how that thing *looks* photographed.

Basically in doing all this research about how the human eye is *like* a camera, what I really learned is how human vision is *not like* a photograph. In a way, it explained to me why I so often find a photograph much more beautiful and interesting than I found the actual scene itself.

The Eye as a Camera System



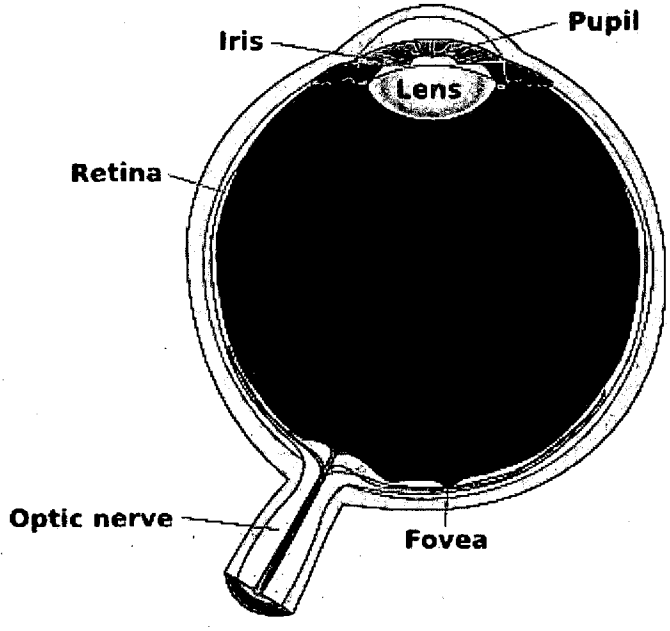
Superficially, its pretty logical to compare the eye to a camera. We can measure the front-to-back length of the eye (about 25mm from the cornea to the retina), and the

diameter of the pupil (2mm contracted, 7 to 8 mm dilated) and calculate lens-like numbers from those measurements.

You'll find some different numbers quoted for the focal length of the eye, though. Some are from physical measurements of the anatomic structures of the eye, others from optometric calculations, some take into account that the lens of the eye and eye size itself change with the contractions of various muscles.

To summarize, though, one commonly quoted focal length of the eye is 17mm (this is calculated from the Optometric diopter value). The more commonly accepted value, however, is 22mm to 24mm (calculated from physical refraction in the eye). In certain situations, the focal length may actually be longer.

Since we know the approximate focal length and the diameter of the pupil, its relatively easy to calculate the aperture (f-stop) of the eye. Given a 17mm focal length and an 8mm pupil the eyeball should function as an f/2.1 lens. If we use the 24mm focal length and 8mm pupil, it should be f/3.5. There have actually been a number of studies done in astronomy to actually measure the f-stop of the human eye, and the measured number comes out to be f/3.2 to f/3.5 (Middleton, 1958).



At this point, both of you who read this far probably have wondered "If the focal length of the eye is 17 or 24mm, why is everyone arguing about whether 35mm or 50mm lenses are the same field of view as the human eye?"

The reason is that the the measured focal length of the eye isn't what determines the angle of view of human vision. I'll get into this in more detail below, but the main point is that only part of the retina processes the main image we see. (The area of main vision is called the cone of visual attention, the rest of what we see is "peripheral vision").

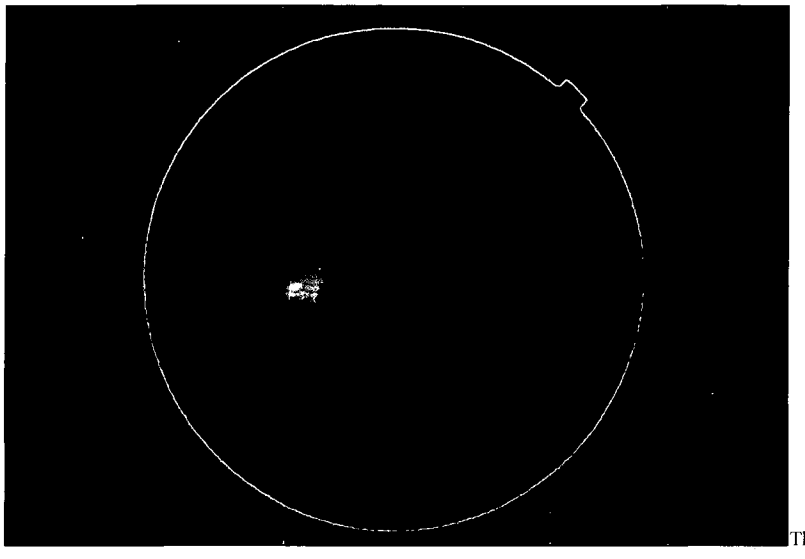
Studies have measured the cone of visual attention and found it to be about 55 degrees wide. On a 35mm full frame camera, a 43mm lens provides an angle of view of 55 degrees, so that focal length provides exactly the same angle of view that we humans have. Damn if that isn't halfway between 35mm and 50mm. So the original argument is ended, the actual 'normal' lens on a 35mm SLR is neither 35mm nor 50mm, it's halfway in between.

The Eye is Not a Camera System

Having gotten the answer to the original discussion, I could have left things alone and walked away with yet another bit of fairly useless trivia filed away to amaze my online friends with. But NOOoooo. When I have a bunch of work that needs doing, I find I'll almost always choose to spend another couple of hours reading more articles about human vision.

You may have noticed the above section left out some of the eye-to-camera analogies, because once you get past the simple measurements of aperture and lens, the rest of the comparisons don't fit so well.

Consider the eye's sensor, the retina. The retina is almost the same size (32mm in diameter) as the sensor on a full frame camera (35mm in diameter). After that, though, almost everything is different.



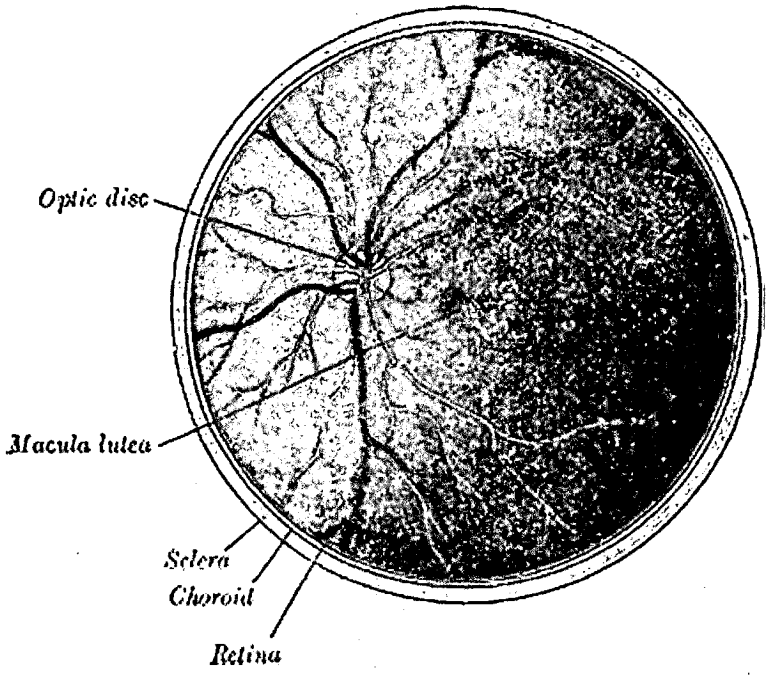
The retina of a human eye

The first difference between the retina and your camera's sensor is rather obvious: the retina is curved along the back surface of the eyeball, not flat like the silicon sensor in the camera. The curvature has an obvious advantage: the edges of the retina are about the same distance from the lens as the center. On a flat sensor the edges are further away from the lens, and the center closer. Advantage retina — it should have better 'corner sharpness'.

The human eye also has a lot more pixels than your camera, about 130 million pixels (you 24-megapixel camera owners feeling humble now?). However, only about 6 million of the eye's pixels are cones (which see color), the remaining 124 million just see black and white. But advantage retina again. Big time.

But if we look further the differences become even more pronounced…

On a camera sensor each pixel is set out in a regular grid pattern. Every square millimeter of the sensor has exactly the same number and pattern of pixels. On the retina there's a small central area, about 6mm across (the macula) that contains the densest concentration of photo receptors in the eye. The central portion of the macula (the fovea) is densely packed with only cone (color sensing) cells. The rest of the macula around this central 'color only' area contains both rods and cones.



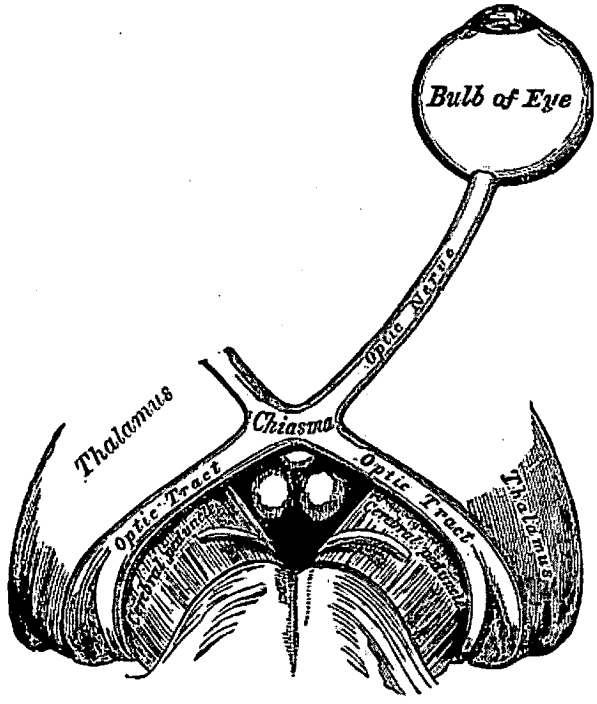
The macula contains about 150,000 'pixels' in each 1mm square (compare that to 24,000,000 pixels spread over a 35mm x 24mm sensor in a 5DMkII or D3x) and provides our 'central vision' (the 55 degree cone of visual attention mentioned above).

Anyway, the central part of our visual field has far more resolving ability than even the best camera.

The rest of the retina has far fewer 'pixels', most of which are black and white sensing only. It provides what we usually consider 'peripheral vision', the things we see "in the corner of our eye". This part senses moving objects very well, but doesn't provide enough resolution to read a book, for example.

The total field of view (the area in which we can see movement) of the human eye is 160 degrees, but outside of the cone of visual attention we can't really recognize detail, only broad shapes and movement.

The advantages of the human eye compared to the camera get reduced a bit as we leave the retina and travel back toward the brain. The camera sends every pixel's data from the sensor to a computer chip for processing into an image. The eye has 130 million sensors in the retina, but the optic nerve that carries those sensors' signals to the brain has only 1.2 million fibers, so less than 10% of the retina's data is passed on to the brain at any given instant. (Partly this is because the chemical light sensors in the retina take a while to 'recharge' after being stimulated. Partly because the brain couldn't process that much information anyway.)

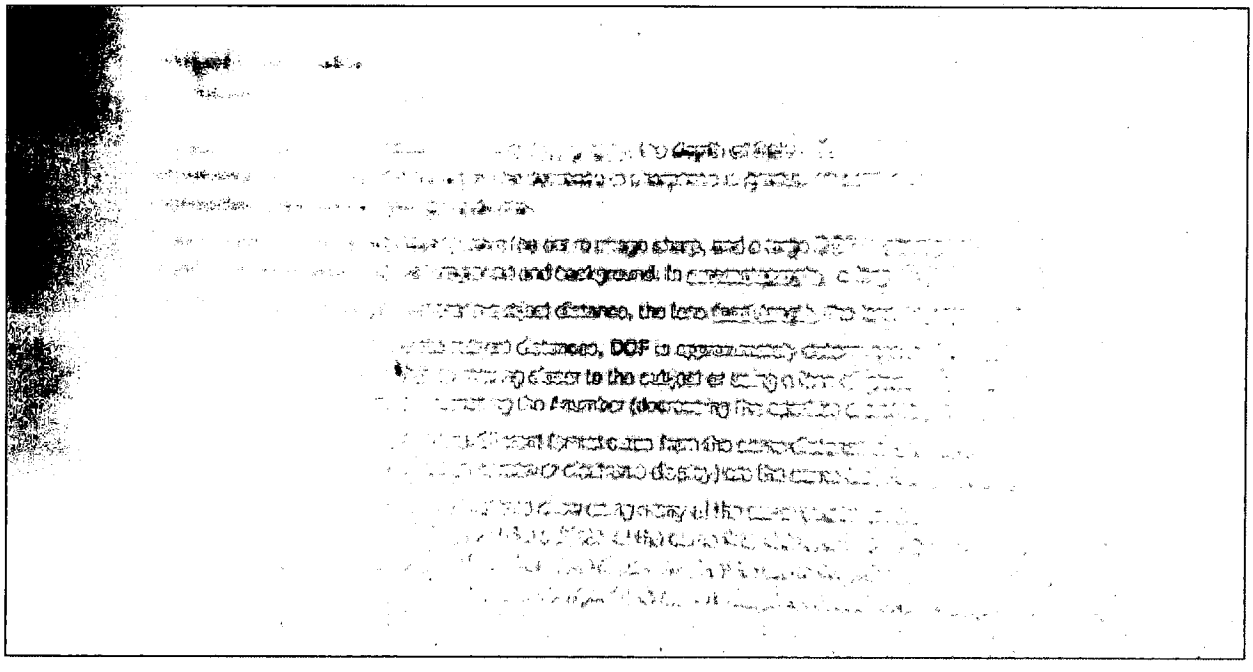


And of course the brain processes the signals a lot differently than a photography camera. Unlike the intermittent shutter clicks of a camera, the eye is sending the brain

a constant feed video which is being processed into what we see. A subconscious part of the brain (the lateral geniculate nucleus if you must know) compares the signals from both eyes, assembles the most important parts into 3-D images, and sends them on to the conscious part of the brain for image recognition and further processing.

The subconscious brain also sends signals to the eye, moving the eyeball slightly in a scanning pattern so that the sharp vision of the macula moves across an object of interest. Over a few split seconds the eye actually sends multiple images, and the brain processes them into a more complete and detailed image.

The subconscious brain also rejects a lot of the incoming bandwidth, sending only a small fraction of its data on to the conscious brain. You can control this to some extent: for example, right now your conscious brain is telling the lateral geniculate nucleus "send me information from the central vision only, focus on those typed words in the center of the field of vision, move from left to right so I can read them". Stop reading for a second and without moving your eyes try to see what's in your peripheral field of view. A second ago you didn't "see" that object to the right or left of the computer monitor because the peripheral vision wasn't getting passed on to the conscious brain.



If you concentrate, even without moving your eyes, you can at least tell the object is there. If you want to see it clearly, though, you'll have to send another brain signal to the eye, shifting the cone of visual attention over to that object. Notice also that you can't both read the text *and* see the peripheral objects — the brain can't process that much data.

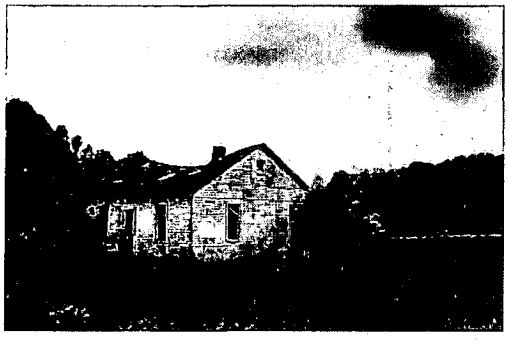
The brain isn't done when the image has reached the conscious part (called the visual cortex). This area connects strongly with the memory portions of the brain, allowing you to 'recognize' objects in the image. We've all experienced that moment when we see something, but don't recognize what it is for a second or two. After we've recognized it, we wonder why in the world it wasn't obvious immediately. It's because it took the brain a split second to access the memory files for image recognition. (If you haven't experienced this yet, just wait a few years. You will.)

In reality (and this is very obvious) human vision is video, not photography. Even when staring at a photograph, the brain is taking multiple 'snapshots' as it moves the center of focus over the picture, stacking and assembling them into the final image we perceive. Look at a photograph for a few minutes and you'll realize that subconsciously your eye has drifted over the picture, getting an overview of the image, focusing in on details here and there and, after a few seconds, realizing some things about it that weren't obvious at first glance.

So What's the Point?

Well, I have some observations, although they're far away from "which lens has the field of view most similar to human vision?". This information got me thinking about what makes me so fascinated by some photographs, and not so much by others. I don't know that any of these observations are true, but they're interesting thoughts (to me at least). All of them are based on one fact: when I really like a photograph, I spend a minute or two looking at it, letting my human vision scan it, grabbing the detail from it or perhaps wondering about the detail that's not visible.

Photographs taken at a 'normal' angle of view (35mm to 50mm) seem to retain their appeal whatever their size. Even web-sized images shot at this focal length keep the essence of the shot. The shot below (taken at 35mm) has a lot more detail when seen in a large image, but the essence is obvious even when small. Perhaps the brain's processing is more comfortable recognizing an image it sees at its normal field of view. Perhaps it's because we photographers tend to subconsciously emphasize composition and subjects in a 'normal' angle-of-view photograph.

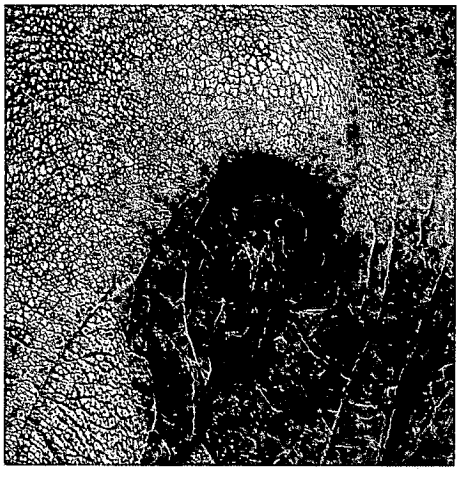


The photo above demonstrates something else I've always wondered about: does our fascination and love for black and white photography occur because it's one of the few ways the dense cone (color only) receptors in our macula are forced to send a grayscale image to our brain?

Perhaps our brain likes looking at just tone and texture, without color data clogging up that narrow bandwidth between eyeball and brain.

Like 'normal-angle' shots, telephoto and macro shots often look great in small prints or web-sized JPGs. I have an 8 × 10 of an elephant's eye and a similar-sized macro print of a spider on my office wall that even from across the room look great. (At least they look great to me, but you'll notice that they're hanging in my office. I've hung them in a couple of other places in the house and have been tactfully told that "they really don't go with the living room furniture", so maybe they don't look so great to everyone.)

There's no great composition or other factors to make those photos attractive to me, but I find them fascinating anyway. Perhaps because even at a small size, my human vision can see details in the photograph that I never could see looking at an elephant or spider with the 'naked eye'.



On the other hand, when I get a good wide angle or scenic shot I hardly even bother to post a web-sized graphic or make a small print (and I'm not going to start for this article). I want it printed BIG. I think perhaps so that my human vision can scan through the image picking out the little details that are completely lost when its downsized. And every time I do make a big print, even of a scene I've been to a dozen times, I notice things in the photograph I've never seen when I was there in person.

Perhaps the 'video' my brain is making while scanning the print provides much more detail and I find it more pleasing than the composition of the photo would give when it's printed small (or which I saw when I was actually at the scene).

And perhaps the subconscious 'scanning' that my vision makes across a photograph accounts for why things like the 'rule of thirds' and selective focus pulls my eye to certain parts of the photograph. Maybe we photographers simply figured out how the brain processes images and took advantage of it through practical experience, without knowing all the science involved.

But I guess my only real conclusion is this: a photograph is NOT exactly what my eye and brain saw at the scene. When I get a good shot, it's something different and something better, like what Winogrand said in the two quotes above, and in this quote too:

You see something happening and you bang away at it. Either you get what you saw or you get something else — and whichever is better you print.

***About the author**: Roger Cicala is the founder of LensRentals. This article was originally published here.*

Exhibit # 3

IN THE CIRCUIT COURT OF THE SIXTH JUDICIAL CIRCUIT, IN AND FOR PASCO COUNTY, FLORIDA

CASE NO: CRC1400216CFAES

VOLUME 2 (PAGES 109 - 258)

STATE OF FLORIDA

-vs-

CURTIS JUDSON REEVES,

Defendant.

STATE OF FLORIDA)

COUNTY OF DUVAL)

Deposition of MICHAEL KNOX, a witness on behalf of the State of Florida, taken at Official Reporters, Inc., 421 West Church Street, Suite 430, Jacksonville, Duval County, Florida, on Thursday, April 7, 2016, commencing at 9:10 a.m., before Karen Waugerman, a Notary Public in and for the State of Florida at Large and Registered Professional Reporter.

APPEARANCES:

GLENN L. MARTIN, JR., Esquire, Assistant State Attorney, appearing on behalf of the State of Florida.

RICHARD ESCOBAR and DINO MICHAELS, Esquires, appearing on behalf of the Defendant.

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you --

MR. ESCOBAR: Glenn, can I stop you for a quick second? I just got a call. It's important one.

MR. MARTIN: All right. We'll be off the record. Madam Court Reporter, would you like to take your break now?

We'll take a 15-minute break.

(Short recess.)

MR. MARTIN: We're back from our midafternoon break.

Mr. Knox, we've been discussing your work at Cobb Theatre on January 26th, 2015, where you provided me a series of photographs, 1 through 185, particular frames. We have been going through those particular photographs with a critical eye, trying to determine the measurements you took and how it aided in your investigation.

It's now about 3:30 in the afternoon. I'm going to stop at that point; however, that doesn't mean that I don't have a lot more questions regarding your work on January 26th.

What I'd like to do with the remainder

of the time we have this afternoon is to work on and to discuss with you your work at Cobb Theatre on July 28th, 2015, where you took photographs using mannequins at Cobb Theatre. All right?

THE WITNESS: All right.

BY MR. MARTIN:

Q I'll begin with the same line of questioning that I had regarding your equipment, the camera equipment, on July 28th, starting with the make and model of the camera.

A Nikon D800.

Q Do you know the focal length of the lens or lens that is you used on July 28th, 2015?

A 55 millimeter.

Q Only?

A Only.

Q What would be the difference as far as the -- let me ask that question a different way. How would the perspective of the photograph taken with a 55-millimeter lens different from a 50-millimeter lens?

A Well, 50 to 55 is a fairly slight difference because you're talking five-millimeter difference. The 55 millimeter would be just a slightly longer lens, slightly tighter perspective than what you would get

from a 50 millimeter.

Q When we're talking about shooting reconstruction -- and I'm going to assume that part of your shooting reconstruction was the placement of the mannequins within Cobb Theatre and attempting to do certain things that we're going to talk about. Is that part of your shooting reconstruction?

A Yes.

Q Okay. In preserving a visual representation of your shooting reconstruction, how important is it to have those visual documentations be as close to real life as possible? What I'm talking about, as far as what the human eye sees in real life.

A Well, when you're doing photographs for that purpose, to render what somebody would see, then you would -- you would want to use as close an approximation as you can reasonably get with a camera. A camera is never going to replicate human vision for multiple reasons, but there are certain accepted practices that are what you would use as opposed to --

Q What are the accepted practices?

A Well, generally, if you're talking about a camera with a 35-millimeter frame, which the Nikon D800 is a full-frame camera -- so the size of the sensor is same size as a 35-millimeter negative in a film

camera -- then the use of a 50- to 60-millimeter lens is generally what's accepted for rendering human vision.

Q And where do you get that information from?

A Multiple sources. I mean, you see it in texts on forensic photography. It's taught in courses. It's taught at courses that I help teach at IPTM. That's generally the framing that you want to use on what's called a "crop sensor" or APSC sensor. You would go with 35-millimeter to 45-millimeter range. Generally 35ish is closer to human perspective, but even then, it depends on exactly what you're trying to render.

70 millimeter gets you closer to the actual distance perspective, but 70 millimeter has a more cropped view than obviously human vision. We have wider frame of view than you have. So what is -- appears throughout the literature is 50 to 60 millimeter on a 35-millimeter frame is the lens choice of option.

Q Other than the focal length of the lens, which, when you went back in July of 2015, was 55 millimeters, was the camera basically the same, having the came of same capabilities we previously discussed?

A Yes.

Q Did you use solely a manual setting in order to take the photos, or did you use any time value or aperture values?

A Manual setting.

Q All right. And all that will be reflected in the metadata?

A Yes.

Q As far as your light source, I assume it was theater settings, what we talked about for lighting and --

A Right. It would have been -- at the time the mannequins were done, the movie -- the lights were set to the Mid 1 setting, which is the middle setting.

Q Were all of the photographs relating to the mannequins set at the Mid 1 setting by the theater management?

A Yes.

Q And other than the light -- the ambient light that is produced by Mid 1 setting, did you use any type of artificial lighting at all as far as flash photography, any light stands?

A No, entirely ambient light from the theater.

Q Once you took the photograph with the mannequins, was there any type of post processing done,

as in enhancements or anything like that with the photographs?

A No.

Q And did you treat the photographs the same as you explained to me when you were at Cobb Theatre in January of 2015 as far as the frame numbers and how you downloaded them from your camera and how they were preserved?

A Yes.

Q As far as the photographs with the mannequins, all the metadata is still readily available regarding those photographs?

A Yes.

Q In the photographs that were taken, a trailer was played, as you previously testified, behind the mannequin on the screen, which was apparently the trailer for Star Wars. How was that one selected?

A I didn't select it. That was what the theater management provided. We asked them to have something playing, so they had a looping trailer that was a Star Wars trailer, several minutes long.

Q Based on your investigation, do you know what trailer was being played at the time of the shooting on January 13th, 2014?

A Not other than it was a Star Wars trailer. I

don't know the differences between all of those.

Q In 2014, at the time of the shooting?

A In terms of the shooting, no. That also, likewise, does not appear to be documented anywhere as to what exactly the trailer was that was played.

Q In doing the shooting reconstruction, how important is it for you to have the environment that you're trying to document as similar as possible as to when the actual event took place?

A Well, I mean, obviously, you want it to be as similar as it can be. With any dissimilarities, you have to assess to determine how much it affects the outcome of the reconstruction.

Q As far as the background lighting, running the Star Wars trailer looped as opposed to the actual trailer that was being played at the time of the event, how did that impact on your shooting reconstruction?

A Well, what I did with the trailer that was looping is that -- and you can see from the photographs that there's -- there were a number of different scenes. There were darker scenes, where there's much darker background. There were scenes where there's bright white background. So as I shot the photographs, I'd take pictures intentionally as it looped through that.

Again, it's just sort of the same as the boundary values with the measurements. What I'm doing is getting photographs with a variety of different background lighting to basically be able to cover the gamut of what could be reasonably possible.

MR. MARTIN: Madam Court Reporter, what's my next number, please?

THE REPORTER: 25.

(The item last above referred to was marked for identification as State's Exhibit No. 25.)

BY MR. MARTIN:

Q Let me show you Depo Exhibit No. 25, which is Frame No. P1, series of photographs that you gave me. It appears in the review of the photographs -- and you can look at the pictures that are in front of you -- Frames 1 through 13 are basically the mannequin in the position we see in Frame No. 1 with different screen backgrounds.

A That's right.

Q All right. So using Depo Exhibit No. 25, Frame No. 1, what are you attempting to document with the mannequin in that particular position with the different screen lighting in the background? What are you trying to document?

A Well, this is showing -- the mannequin is

positioned standing in front of Mr. Oulson's seat, which would mean the No. 8 seat in the second to last row. And then the camera is from me taking the photograph while seated in Mr. Reeves' seat, which is the No. 9 seat in the last row.

Q All right.

A And what I'm attempting to do here is render images that will give a sense of what the visual perspective is from Mr. Reeves' vantage point as he's looking at Mr. Oulson, if Mr. Oulson were standing there in front of his seat.

Q All right. Did you take any measurements of Mr. Reeves?

A Yes.

Q What measurements did you take and what are they?

A His standing height, six feet, one inches. Then in the standing position, I measured to his -- from his shoulder seam to the tip of his middle finger, which was two feet, 4.5 inches. Then the shoulder seam to his elbow was ten inches. And the shoulder seam to his wrist was one foot, eight inches. And then in a seated position, measured from the seat up to his -- the top of his right shoulder, which was one foot, 11 inches.

Q Well, when you talk about the seat, we're talking about the cushion part, the plastic part underneath? Where was the start of the measurement?

A Well, this was not measured in a theater seat. This was with him seating on a chair at his residence, a wooden kitchen chair. All I'm trying to do is get the measurement from the bottom of his body in a seated position, up to the top of his shoulder in a normal upright fully erect seating position.

Q All right. Basically from his buttocks to the top of his shoulder?

A That's right.

Q Regardless of what kind of chair he's in.

A Right. 'Cause I'm measuring, not including any -- on a wooden chair so there was no compression of the chair to interfere with that.

Q What was that measurement?

A One foot, 11 inches.

Q Okay. What other measurements did you take?

A That's the measurements. That's all of them.

Q How did you determine the eye level of Mr. Reeves in a seated position, relative to any furniture that he may be in?

A Well, all I would be able to know in any measurement of him is what's his maximum eye level. I

didn't know exactly what his eye level was at the time, you know, because obviously, me sitting up here right now, fully erect in this seat, my eye level's different than if I'm leaned back relaxed in a chair. It drops considerably.

Q That's why I'm trying to figure out is when you took the photograph of Frame No. 1, Depo Exhibit No. 25, you placed the lens at a particular height above the floor. How did you make a determination that that was Mr. Reeves' level at the time that -- we haven't gotten to when this represents but at any time?

A Well, I don't have any way of knowing exactly what his eye level was at any point given. In fact, his eye level changes throughout the course of the event. I mean, there are times when his head is visible above the chair. There are times when it is not. So there's no way to really bring that to a particular eye level and say it's this level to the exclusion of anything else.

What I did is use me in a seated upright position at my eye level. I'm a little shorter than he is so that would probably -- would be something below what his fully upright eye level would be and something probably above what his leaning back eye level would be.

Q Did you -- when you took the picture, did you measure, as far as the center of your lens down to the floor, as to what the height was at the time Frame No. 1, Depo Exhibit No. 25, was taken?

A I don't remember measuring that. I gauged it from my height in a seated, upright position. I wasn't slouching or anything in the seat. I was in a fully seated position just like this.

Q When you took the measurements that we've been discussing that you did in January, you did some bracket values. Did you do any such bracket valuing, Frames 1 through 13, represented by Depo Exhibit No. 5 -- 25, as far as different levels that you held your camera to try to do a boundary -- bracket value boundary? No, that's not it?

A Boundary value.

MR. MARTIN: I thought of it and still screwed it up. I even took time.

MR. ESCOBAR: It just didn't come out.

BY MR. MARTIN:

Q All right. Start over. We discussed earlier in the taking of the measurements that you bracketed your measurements so that you could give a range of when certain things could take place. So my question to you is in July of 2015, when you were holding the

camera and taking the pictures of the mannequins, represented by Frames 1 through 13, did you do the same or similar process, where you held the camera at different levels from that same position to give us a boundary, if you will, a range of where Mr. Reeves' level could be?

A No, no.

Q Is that something you normally do or never thought of doing or doesn't matter?

A No. I considered that obviously because what I actually did is I look at, as I would do in any case, what is the affect. So I can take the camera before I start taking photographs, looking through viewfinder and seeing what's the effect of the photograph? Is there any substantial change occurring within the frame of the photograph if I move the camera down lower, if I move it up higher? What I found is that there's basically insignificant change in terms of what you would see and the vantage point, and so I shot it from my fully upright eye level. I actually had the camera on a tripod directly in front of me, and I shot it from that level. So basically it would be the mid point between what I consider to be the boundary values for his eye level.

Q Now, you were seated in the seat.

A Yes, sir.

Q The camera was on a tripod on the floor in front of you.

A Right. I had to position legs where I didn't have it -- like, fully open tripod. I had to basically open it and lean back so that the camera was right here in front of me.

Q What do you mean, leaned back?

A Well, if I were to sit in the seat right here and set up a tripod, the camera would obviously be way out here. What I needed is the camera to be back here at my eye 'cause I want the film plane to be as close to -- or sensor plane to be as close to my eye as possible. So what I did is set the tripod up so that the camera was leaned back, and the camera was directly in front of my eye.

Q And how did you determine where to place the mannequin representing Mr. Oulson? You had to stick him in space and time three-dimensionally somehow. What were the facts that you used to put him in a particular position?

A Well, in relation to Exhibit 25 and the series of photographs that are depicted in that position, he is in a standing position in front of the seat, just fully standing upright with the seat back

lifted up. And we positioned the mannequin so the top of its head would be at the top of his height, which was six feet, four inches is what was documented in the autopsy. So that's the positioning for that.

And then as the series of photographs progress, then I moved him to different locations to show different possibilities.

Q We'll go over those. But representative of the photographs, Frames 1 through 13, for static, we just have the different backgrounds.

A That's right. What I did is he's positioned there, and then I actually waited as the trailer went through and as the background would change. Bright background, I snapped a picture. Background changes and then you go through that series. So you can see there's probably a half dozen or so in that position but with different backgrounds.

Q Okay. When you placed the mannequin in its position, the seat back on the row below Mr. Reeves where Mr. Oulson was seated you indicated was up? Is that what you said?

A Yes, the seat back and seat bottom.

Q I meant the seat bottom is up.

A Yes.

Q Then you place the mannequin flush against

the seat?

A Yes, yes, basically as if he had just stood up from his seat and was standing in that position.

Q Okay. At what point in time is Frames 1 through 13 supposed to represent?

A It doesn't represent any specific point in time in the -- because we don't know from the video any specific location or stance or body positioning of Mr. Oulson other than the couple of times that his arm reaches into the frame. What I'm doing here is just took a number of different possibilities and presented those to be able to give, again, a sense to the viewers, to the jury, the Court or whoever may be considering it, what the lighting conditions would appear to be to Mr. Reeves at the time.

Q And regarding Depo Exhibit No. 25, Frames -- Frame 1 -- which we have marked as exhibit, being representative of Frames 1 through 13, based on the procedure that you followed in producing those photographs, how it is they are a fair and accurate representation of what Mr. Reeves observed at some unknown time in the theater while he was seated in his seat? I assume it would have to be a time when Mr. Oulson is standing since you put the mannequin in the standing position, which is a very limited time

period.

MR. ESCOBAR: I'm going to object to that last assumption because Mr. Martin does not know what that time period is.

BY MR. MARTIN:

Q Well, let start over. Mr. Knox, is there any other time, any time, other than one time, that Mr. Oulson stood up? Based on witness testimony, anybody, video, anything, how many times did Mr. Oulson stand up?

MR. ESCOBAR: I'm going to object. I don't believe this witness can answer that particular question. And you can't assume it either.

BY MR. MARTIN:

Q Based on all the witness testimony, all the depositions, all the police reports --

MR. ESCOBAR: He doesn't have all the witness testimony.

BY MR. MARTIN:

Q Based on what you know of this particular case, how many times did Mr. Oulson stand up?

A Well, I don't have any way of knowing, outside of what the testimony is, which is incomplete. Nobody's testimony is that he stood up at this time and

then got shot at this time and nothing else occurred in between. But obviously, when the beginning of this altercation took place, he stood up.

Q Who stood up?

A Mr. Oulson.

Q At what point in the altercation?

A Shortly after Mr. Reeves returned from speaking to management, but exactly when, I don't really know because it's not depicted in the video. I mean, if you base it on the video, the only thing you know is the two times that Mr. Oulson's arm appearing within the frame. From that, I can't really discern much other than that his -- he's obviously reaching in the direction of Mr. Reeves.

Q So he'd have to be standing at that point, when the popcorn was tossed?

A Well, he could be -- he could be standing. He could be leaning over his seat. He could have a knee on the seat. There's a number of possibilities from that. I don't have any way of discerning that.

Q Well, that's what I'm trying to figure out is exactly what you're trying to document in Frame No. 1 through 13, Depo Exhibit No. 25. You have the mannequin standing. You indicated how you positioned it standing, standing close with the seat -- with his

seat back up, and you pressed it all the way forward. Now, there's something in the facts that you've determined that that's the appropriate place to put this mannequin and you took pictures. At what point in time did that occur?

A Well, you've assumed that I picked that location because of the facts of the case. If it were relying on the facts of the case and the evidence that we have, there would be no way to really know exactly what position he was in at any given point within the time.

Q So how does Frames 1 through 13, represented by Depo Exhibit No. 25, fairly and accurately represent what Mr. Reeves saw at any point since you don't know?

A Well, I don't -- you have to understand, what I'm doing here is a simulation, not a representation of what he saw. This is -- this is a representation of what the lighting conditions are like under those circumstances when you have a person that's standing or in the various different positions that I had the mannequins in. It's not intended to be this is what Mr. Reeves saw. There's no way to duplicate that.

But this is what it looks like if a person is standing here in this position, while you have various scenes playing on the screen, and you have the house

lights set at the level that they were set. That's what I'm representing is various possibilities and various different configurations to give a sense of what that lighting is like as far as what a person can see. Because other than that, not being in the movie theater, nobody that's reviewing this case can really know or get any sense of what it would be like -- what Mr. Reeves would see, apart from testimony which is very difficult to describe in words to people what this would look like.

Q Well, that's why I was asking the question because you just said this is what Mr. Reeves would see.

A Well, no. It's not what Mr. Reeves would see as far as -- this is not Chad Oulson. This is not the exact time, distance. You know, we don't have that information. But this is a representation of what it looks like if you have a person standing, who is basically the size and shape of Chad Oulson, who's standing in this location. You have the movie -- something playing, a trailer playing, on the screen, and you have the house lights set at the setting that they are. This is what the lighting conditions appear like to a person who is sitting in that seat.

It is not meant to represent every detail

of -- accurately of what actually took place. It is meant to give a sense of what that lighting looks like to a person in this position.

(The item last above referred to was marked for identification as State's Exhibit No. 26.)

BY MR. MARTIN:

Q Let me show you Depo Exhibit No. 26, Frame No. 14, representing a series of photographs, Frames 14 through 23. The reason I grouped them together is because in all those photographs, there is a red line, which I believe is indicative of your interpretation of the path of the bullet or trajectory. You see that in the photograph?

A Yes.

Q Okay. So I guess we're going to have to tackle two areas because when we were talking about Depo Exhibit No. 25, you indicated that you took photographs with the trailer being looped in the back at different distances, right?

A That's right.

Q All right. So Depo Exhibit No. 26, Frame No. 14, the distance between the lens and the mannequin is either through adjustment of the lens itself or physically moving the camera. It appears to be different. Can you explain to me what you're trying to

depict as far as not the trajectory but just the mannequin and the trailer that's being looped in the background? What are you attempting to depict?

A Well, this depiction here is repositioning -- basically positioning him in an alignment with the chest trajectory. I think there are some other ones in here where we actually have the hand up and --

Q And we're going to get to those. What I'm concerned with is does this group of photographs, Frames 14 through 23, serve a purpose other than the trajectory? Because you indicated when we were discussing Frames 1 through 13 that you actually took pictures closer. And this appears to be closer. I'm just trying to determine if these series of photographs have a multiple use.

A I -- I don't think this series actually is closer. It is -- the camera has been tilted down a little bit.

Q All right. So what are we attempting?

A Instead of looking -- instead of centering on here, what I've I done in Exhibit 25 and the associated photographs with that one is positioning frame so that it's as if you're looking at his head. Mr. Oulson's head or the mannequin's head would be within the frame.

What I've done here would be if you shifted

your eye. So in Exhibit 26, if you shifted you're towards looking at the chest.

Q All right. Again, you took a series of photographs with different screen backgrounds at that same angle. What were you trying to document with that series of photographs, 14 through 23, when we have the red trajectory? Is that a laser?

A No. I think we did this with just a string on this.

Q String?

A Yeah.

Q So what were you trying to document with this series of photographs?

A This is just the same type of view but showing if you moved your ey level down to looking at the body. The key is with this and with several of the other configurations is that as you're moving and looking at different portions of the body, obviously the amount of background lighting changes. Because if you're looking at the torso as opposed to the head, you're seeing more of the body, less of the background.

So that's what I'm doing is just taking several different series of photographs from different positionings to demonstrate what's the net effect of changing eye positioning and then several that show

changing in position of the mannequin.

Q And how did taking the series of photographs -- I'm going to lump them together -- Depo Exhibit No. 25 and 26, Range 1 through 23, when you're just changing your focal point of where you're looking with the background? How did that aid in your investigation as far as reconstructing of this crime? What does that -- what does that go to? I'm trying to figure out how you use that information.

A Well, what this is doing is providing some representation of what that lighting would be like.

Q And how is that relevant to the shooting reconstruction?

A Well, because part of reconstruction is to be able to determine what Mr. Reeves would be able to see. I mean, we do that all the time in officer-involved shootings. You know, where a police officer on duty shoots somebody, it becomes big issue as far as perception. There are police-involved shootings all the time where a person pulls out a fake gun or they pull out a cell phone or they pull out some other object, a wallet, and the police end up shooting them, mistaking that object to be something different, thinking it's a weapon.

So you document and in this similar fashion

to be able to show what was the officer's perspective because the issue isn't whether or not it was a wallet or an innocuous object or an actual weapon. The issue is what did the person firing perceive it to be, and how do they perceive the situation.

So part of reconstructing it is to be able to show and demonstrate to the best of our ability what -- what Mr. Reeves would be able to see and perceive in this situation.

Q I'll ask you the same question I did with Depo Exhibit No. 25 with Depo Exhibit No. 26, the taking of the series of photographs, Frames 14 through 23. Explain to me how those photographs fairly and accurately then represent what Mr. Reeves saw. That's what you just said was important.

A Well, again, with this representation -- which frames did you say?

Q Frames 14 through 23.

A This is giving another representation of -- this is -- basically the same positioning of the mannequin as the first 13 frames but with the eye looking downward.

Q All right. So --

A I'm giving a different possibility of what could occur.

Q I appreciate that. My question was, explain to me how that is a fair and accurate representation of what Mr. Reeves saw.

A Because this is a fair and accurate representation of what the lighting conditions would appear to be, the silhouetting of a human figure and things like that. It is not a representation of what he actually saw. But it is a representation of what it looks like when you have a human figure in this location, in this theater, with this lighting.

Q And what was the purpose of the red string, Frames 14 through 23?

A Well, a lot of that was for setup because we wanted it to use for positioning so that we could get proper alignment where Mr. Oulson's body would be when the shot was fired. This is not a representation that that's his positioning at the time that the shot is fired because clearly, he had his hand up and things like this. But what we had put the string on there to be able to help with our alignment and make sure that the positioning fit with the physical evidence.

Q Are you then suggesting that Frames 14 through 23, represented by Depo Exhibit No. 26, is what Mr. Reeves saw at the time that the gun was fired?

A No.

Q In looking at Depo Exhibit No. 25 and 26, is the distance between the camera lens and the mannequin any different?

A No. I believe that's the same distance. It's just that the camera has been tilt down slightly in 26 as compared to 25.

Q Frames 14 through 23, are they in any way representative of what you determine to be the trajectory or the path of the bullet at the time of the shooting? We're getting into whether or not these frames have a dual purpose.

A No. These do not represent the trajectory because, again, obviously, the bullet actually went through his finger. We don't have that depicted.

(The item last above referred to was marked for identification as State's Exhibit No. 27.)

BY MR. MARTIN:

Q Okay. Let me show you Depo Exhibit No. 27, being Frame No. 24 of the mannequins, representing a series of photographs, Frames 24 through 28, where we see both a male and female mannequin within the frame, further described in a little more detail with the female mannequin having the left hand up in front of the male mannequin's chest. You agree, Mr. Knox?

A Yes.

Q All right. 'Cause when we start with Frame No. 29, we don't have the female hand in front of the chest, correct? That's why I bracketed them that way.

A Yes.

Q Okay. So let's talk about Depo Exhibit No. 27 and Frames 24 through 28. What were you attempting to depict there?

A What I did here is we moved the female mannequin in because obviously the net effect of having a second person there is that you're blocking more of the background.

Q And why is that significant?

A Well, I mean, based both on testimony and physical evidence, you know at some point during the sequence that Mrs. Oulson was also present in that some way, her finger obviously was shot. And her testimony was that she had put her hand on her husband's chest. Right. Well --

Q You recall the rest of her testimony as to where her body was?

A I don't recall without going back and looking through it.

Q All right. And why was it that you placed the mannequin, the female mannequin, standing upright almost shoulder to shoulder with the male mannequin

facing -- I'm sorry -- with the female mannequin's back to the screen? Why did you place the female mannequin in that position?

A Well, this is to give a representation of what happens when you put a second person within view.

Q All right. So the question then becomes what facts are you relying on in order to put the mannequin in that position?

A Well, this is, again, based on the fact that given her testimony, we know she's got to be within reach. She's got to be in a position to be able to put her hand out and get shot and be able to put her hand toward his chest. Now, exactly what that positioning is, there's no way to discern that.

Q You're talking about from the shoulder back. You don't know what her position was?

A Right, right. I wouldn't have anyway of knowing that. I don't --

Q Do you know if it was even blocking the screen as we depicted in Frames 24 through 28?

A No. It might not have been and that's why I -- we have photographs where that -- the female mannequin is not in place, and I have photographs where she is in place. Again, think boundary values here, not -- there's no way that I can render photographs --

well, I'll put it this way: If I were to render photographs to render every single possibility, we wouldn't be looking at coming back one or two or maybe three more times for a deposition. This deposition would probably take a month because I would have to -- I mean, it would have taken me days just to take all those photographs.

I'm not trying to depict every single possibility or any position that I think this is representative of exactly where she was at any point. It's to demonstrate that when you move another person into the frame, you're changing the background lighting. It does affect it. And it's not meant to represent that this is exactly what occurred, and this is exactly what Mr. Reeves saw. It's meant to represent what are the affects of these different variables in terms of lighting.

Q And what is the import, if you will, of having more of the trailer screen, the background lighting, blocked? How does that fit into your shooting reconstruction?

A Because it -- it affects the amount of contrast between background and foreground.

Q How is that significant?

A Because that's -- that's the key to being

able to see and perceive things. We don't see light and dark. We see in contrast. We could be in a bright room, you know, paint in a room entirely white. Everything in it is white. And you're standing there in a white shirt. Your shirt is very difficult to discern versus if you're standing there in a black shirt in a white room, then your shirt is very easy to discern. It's about the contrast.

So representing the silhouetting or the -- the difference between the lighting that is up close on -- falling on their bodies versus the lighting that's coming from behind them is key to being able to understand what the lighting would appear to be to a person in this position at this theater.

Q And based on your investigation, are you able to come to any type of conclusion as to specifically what was the background lighting at the time that -- or in the bracketed time frame where the popcorn was grabbed from the left thigh of Mr. Reeves to the time he pulled the trigger?

A No.

Q Do you know what the background was?

A No. Because the only way to really know that would be to be able to duplicate the trailer and know exactly where in the -- align the sequence of the

trailer to the video or to the sequence of events as they actually occurred. And unfortunately, we have two problems with that. One is nobody ever documented what actual trailer was playing so we don't even know that. And then secondly, we don't have any way of knowing exactly what -- where within that trailer it was at the time of the shooting.

Q Well, I mentioned that there was a difference between Frames 24 through 28, where you have the female mannequin's hand in front of the chest of the male mannequin. And then beginning with Frame No. 29, you have the mannequin -- female mannequin, basically shoulder to shoulder with the male mannequin with the hand down. Why did you do a series of photographs with hand up and series of photographs with hand down?

A Again, just illustrating several different possibilities as far as what -- foreground versus background. So if you move the arm, it changes the contrast between the foreground and background because you're seeing more of the background.

And then in the subsequent series, the female mannequin is actually further away from the male mannequin. So it's just to provide several of the possibilities of what the lighting conditions would be like, dependent upon their relative positioning.

Q And none of these photographs you are representing as being specifically what Mr. Reeves saw at the time, in the same bracketed time period from the time that the popcorn was grabbed until he pulled his -- until he fired the gun.

A Yeah. That is correct. I am not representing what he saw. I'm representing what the conditions are like in my examination. As I sit there and we put the mannequins in place, what are the conditions like, and how do these different variables affect things?

(The item last above referred to was marked for identification as State's Exhibit No. 28.)

BY MR. MARTIN:

Q Let me show you Depo Exhibit No. 28. You mentioned that there was a series of photographs where the hand was down, correct?

A Yes.

Q And is that representative of one of those photographs, Frame No. 29?

A Yes.

Q And, again, Frames 29, 30, those two, why did you place the female mannequin in relation to the male mannequin in that position?

A Because it's just another possibility. It's

another -- another positioning. When the arm is not there, then you have a difference in the contrast.

Q Let me go back to the Depo Exhibit No. 25, which is Frames 1 through 13, where the female mannequin is not present. We talked about difference in contrast. Based on your understanding of how we perceive being in -- difference in contrast, like the examples that you give, would Mr. Reeves have a better opportunity to perceive the events taking place if the lighting was the same as in Frames 1 through 13 because there's more light in the back?

A I'm not sure if I followed your question.

Q Sure. You said that you're doing these series of photographs to give different scenarios, and you talked about how they're -- we -- our perception is based on contrast. You gave an example, black shirt, white background. You remember that?

A Right.

Q All right. The photographs you took representative of Frames one through 13, which is represented by Depo Exhibit No. 25, the female mannequin is not present.

A Right.

Q All right. Based on your explanation to me as to why you're doing these, would Mr. Reeves have a

better opportunity to see events transpiring if the ambient light condition was as in Frames 1 through 13 because there is more background light?

A It increases the silhouetting. It does not necessarily increase the ability to perceive what's in front of the mannequins. The majority of the light in this situation is coming from the movie screen. That's by design in a movie theater. The theater itself's supposed to be dark. The screen is where all the light is coming from. So all you're really doing is changing what's occurring in terms of the silhouetting.

Now, what happens is depending upon what the background is. We you put a very bright -- I think we probably have all been in movie theater at one time or another, and then they put something really bright on the screen to the point that you almost have to squint your eyes because it's so bright.

If you put two figures in there and then you put a bright scene on there, you're not going to have to squint as much because a lot less that bright light is coming through. When it's a darker scene on the screen, then you're going to have less effect as far as placing two mannequins or two figures versus one in front of the screen. So I think -- I mean, hopefully I answered your question as best as I can.

Q Not even close.

A Okay. Well, I mean what you're asking me is what's better and what's worse? That's very subjective qualitative terms. I don't know what --

Q That's why I'm asking the question is because you've done these series. And you keep saying, we want the people who's looking at this to have an idea of what Mr. Reeves could see.

A Right.

Q So we have a different gamut, a different range.

A Right.

Q We've bracketed. Ones has got to be better than the other as far as perceiving.

A Well, no, no. That's entirely incorrect. It's not about better or worse. It is about representing what's net effect of the change of different variables on his ability to perceive things and what he would see.

Q Okay. So why isn't there a difference between better and worse if there's -- if you just said that you tried to show the difference of what he could perceive?

A Define better and worse.

Q Ability to see the events taking place with a

more critical eye as proposed to pitch black; you can't see your hand in front of your face.

A But the question is defining what is a better ability to perceive. I mean, the lighting in here doesn't change. The amount of background that comes through changes, depending on the positioning of the figures or the mannequins.

Q So my question is why -- what is significant about the background that you previously told me had to do with perception of Mr. Reeves? I'm trying to figure out, is there something in the background that would make it better or easier, have more detail with the human eye as opposed to some other scenario?

A Well, if you have, for example, a moderate background, if you go to Frame No. 12, where you have sort of a reddish colored background, you'll see that there's distinct difference in the appearance versus when you have a very bright background. I mean, if you look at the difference between Frames 1 and 2, there is a difference. But you're asking me to put a better or worse on it. I -- I can't give you what's better or worse because there's just no real way to define that. What's best or worse to you may not be better or worse to me.

Q Then what is the significance, then, of the

series of photographs? What are we trying to show? What are you trying to preserve for someone else to look at that would be relevant and material to this case?

A Well, I think that I've, multiple times, answered the question. That it is to show the net effect of these different variables. I'm not here to decide what was good or better or what's the lighting. I think I made it clear in my testimony, I can't tell you exactly what position they were in. I can't tell you exactly what was on the screen or any of those types of things. The jury or the judge, depending on what setting we're in, is going to have to make that determination. The idea here is that this is to provide information on which to understand the effect of these different variables.

Q Effect on what?

A On his ability to see, on what he would see. But effect doesn't mean better or worse. You're trying to pin me into saying, you know, one's better. I'm not defining the difference. I'm not intending to define the difference. It's intending to show -- this is a representation and then trier of fact can make a determination for themselves; how does that affect his ability to see, and how does that play into this

particular case.

Q Are you familiar enough with the anatomy of the human eye to discuss with me your understanding how the eye adapts from one lighting source to another? You know, your iris opens up --

A Right.

Q -- gets more light?

A Right. I'm familiar with those concepts, yes.

Q All right. How does that relate to a camera lens? When you're taking a picture with a camera lens that is set, its iris doesn't change. The aperture, you've set it manually a certain way. How do we get that camera to be the same as an eye that has adapted to a low light environment so that events can be perceived? And we all know that that happens. You've been in a movie theater. You know it does.

A Rights.

Q So how do you set a camera lens to replicate that?

A What you do, when you're representing photographically what the lighting conditions are, is you -- you have to look at the scene, observe what you can see as you sit there in the movie theater under those circumstances and then check your exposures to

make sure that what you're seeing represented on the photograph is what you're seeing represented live in person with your eye. That's the process that you have to go through.

Q So subjective on your part. You're making the determination based on your perception of what you perceive with your eyes at the environment at the time you're taking the picture and comparing that with what you see in the camera frame and saying, yeah, that's similar.

A Well, it's not subjective in that I'm not just winging it. I'm not just looking and going, yeah, that looks about right. I mean, you actually look at the photograph, and you look at, okay, I can see this. Look at the photograph. Okay. I can see that in the photograph. I can't see this live. Look at the photograph. Okay. I can't see that either in the photograph. So I'm matching the representation of what I see there live with the representation that the camera is rendering. That's -- that's the way that it works.

It's not just a subjective approach. It's quite objective. It's just -- obviously it requires my interpretation from my eye, looking, just as any other scientific testing requires the interpretation of the

tester.

Q Which is subjective, based on your interpretation.

A Well, no. See, there is -- there is always some level of subjectivity in any type of scientific research or any time of scientific endeavor. It's nearly impossible to take that out because there is always a human person that has to interprets data.

Even when you take DNA analysis, there is a human person who has to make interpretations and carry out calculations and all those sorts of things.

Within the context of a scientific investigation or any type of scientific inquiry, it is objective and acceptably so when you are following some time of rigorous protocol to do it, rather than just looking at it and saying, that looks about right. So that's -- that's the difference.

Q The interpretation of what you perceive the environment to be at the time that you took the picture, how do you know that would be a fair and accurate representation of Mr. Reeves' interpretation of the environment at the time the picture was taken? Eyes are different. People are different.

A Eyes are different. But I think it's reasonable to assume. For me, uncorrected, my

uncorrected vision is about 20/15. You know, corrected, it doesn't get a whole lot sharper than that. I mean, my corrected vision is. It's reasonable to assume that a 71-year-old man's vision wouldn't be any better than that. So what I'm seeing and able to represent is he's probably not going to see anything more than that. I think it's quite reasonable to assume that he probably doesn't see as well.

So that extent I'm giving you a boundary value. I'm giving you what's the best and clearest because obviously the camera sees much more clearly than, you know, somebody with bad vision might see. And I certainly am seeing better than somebody with bad vision.

(The item last above referred to was marked for identification as State's Exhibit No. 29.)

BY MR. MARTIN:

Q I'm going to show you Depo Exhibit No. 29, Frame No. 38, representing a series of photographs, 38 through 45, in which the female mannequin is in a -- much closer to the male mannequin -- would you agree? -- than the other photographs. I don't know how else to put it.

A Yes.

Q And her hand is down.

A Yes.

Q And it appears that -- I know it's not on his shoulder, but it appears in two-dimensional photograph that the head of the female mannequin is right next to the shoulder of the male mannequin, basically blocking a lot of the background.

A That's right.

Q Is that the purpose of the photograph?

A Right, again, to show here where the human figure's basically blocking out as much of the background as could be blocked out with them. So if they were both standing in there between Mr. Reeves and the screen, then this would be about as close a representation as you could get of what the lighting conditions would appear to be.

Q If that occurred. But you're not saying based on your investigation that that is what occurred.

A That's correct.

Q In fact, just so the record's clear, all of the frames, 1 through 88, you're not representing that your investigation revealed that any of those scenarios actually occurred.

A That's right. These are possibilities that are representative of the changing and different variables.

Q Now, with the blocking of the background we see in Frames 38 through 45, how does that affect the perception of the observer facing and looking at those two individuals?

A Depends on what the background is. I mean, if you have the brighter background, it would probably help you see a little bit better because it's blocking out that bright background that would tend to impair your vision of what's closer. On the other hand, with the darker background, it might actually decrease it a little bit because you're not getting as much ambient light coming around --

Q Decreasing what?

A Decreasing the amount of light which would affect the ability to see because --

Q In what way, advantageous or disadvantageous?

A Well, decreased light is going to be disadvantageous because less light falling on what's close, which is what you're concerned with and your trying to see, means that you're not going to see it as well.

Q And what was the distance between the end of your camera lens to the chest of the mannequin in all of these frames that we've been looking at? Did it change at all or the same stagnant --

A It's the same through all of those. It changes further down in --

Q We'll get to the very last ones, but these are all standing with either a male or female in it. What was the distance between the end of your focal lens to the chest of the male mannequin, since it stays stagnant or status?

A The distance would be -- the distance would have been -- from the end of the lens to the chest of the male mannequin would be about three feet.

Q As the distance between the observer -- and I'm going to use the mannequins. All right? You're sitting there in the seat. As you take the focal lens of your camera and move it closer and pretend it's your eye, as you get closer to the mannequins, two feet away, one feet away, how does that affect the perception being closer and closer to the two mannequins? And, again, with the varying backgrounds, would you be able to see better, worse? I know you don't like those words. More detail, less detail?

A It doesn't -- it doesn't really change so much in terms of lighting. The amount of light that's on the mannequin doesn't change as your eye moves closer or further back.

Q That's right.

A But you -- obviously with -- there is some slight change when you move away from objects versus moving closer in terms of the amount of light that comes to your eye. Further away you are, the less light returns from the subject to your eye. The difference here, though, because we're talking about such very short distances, I don't think it's enough -- the effect would be negligible.

Q What do you base that on? What life experience do you base that on? What training?

A Well, a combination of things. I mean, obviously years and years of doing forensic photography and documenting these sorts of things as well as training that I've had as well as the fact that I was there at the theater to be able to see and perceive these differences, not only through my eye but also looking through viewfinder of the camera and looking at the results of the photographs. There's not a whole lot of difference in terms of the amount of light from the person being at three feet away versus being two feet away or closer. In terms of the amount of detail that you can see, the change is that obviously the closer the object becomes in your foreground, the less you see of the background.

Q And does that help the observer have more

detail of what's in the foreground, the events that are taking place in front of them?

A It might have some small effect because of two things that you have. Particularly, if you have bright background on the screen, you're going to have less -- less of that is going to be affecting your version are vision because if you have a lot of bright light, you're not going to see what's close. You're going to see the bright light, and that's going to impair your vision.

Also you will have a slight increase, although very, very slight increase, in the amount of light that falls on the subject because some of that light that's falling on the mannequins here is actually reflecting off of the -- me sitting there, the seats, the background wall that's reflecting off of that from the screen and then to the mannequin. So obviously if they move a little closer to that, there's going to be slight increase in the amount of light falling on them.

But overall, in terms of what you can see, the visual change is really basically negligible. You'd be hard-pressed to perceive a difference.

Q As far as the amount of detail that you can see?

A That's right, yes.

Q We continue to see, in Frame No. 38, which I believe is Depo Exhibit No. 29, the red string, other than just positioning the male mannequin, does it have any other multiple import as far as that picture, as far as trajectory, of what you're trying to depict or educate the jury on or anything?

A No, no, no. None of these photographs were done for the purpose of being able to show or illustrate the trajectory. I wouldn't take those in this format.

(The item last above referred to was marked for identification as State's Exhibit No. 30.)

BY MR. MARTIN:

Q Okay. Let me show you Depo Exhibit No. 30, which is Frame No. 46, representing a series of photographs, 46 through 51. 46 through 51, the female mannequin has been removed. What is the -- what were you attempting to depict with series of photographs, Frames 46 through 51, represented by Depo Exhibit No. 30?

A I think with those, I was going back and taking some additional ones with different backgrounds. Because as you look through those, you can see that there's a lot of variance in the different backgrounds, particularly some of the brighter portions of what was

on the screen, so I believe that what I did was that series and several that followed it. Where the female mannequin is back in place was just to capture more of the different backgrounds.

Q Did you change the house setting at all, the house setting, the theater setting?

A No, no.

Q Everything on these series of photographs stayed at Mid 1?

A Yes.

Q And explain to me, then, the difference that we see in Frame No. 38 as far as the details that you can see with the male mannequin and as represented, then, by Depo Exhibit No. 30, which is Frame 46. See the male mannequin has just developed -- it's just a black silhouette. Why is there a difference if the house setting had not change and the distance between your lens and the mannequin had not changed. What are you attempting to document there?

A Well, the difference here is the difference in background illumination.

Q We're not running the same Star Wars loop? I see Star Wars back there.

A Well, it's the same Star Wars loop but difference is the portions of the frame, what's on the

screen because if you go to, say, Frame 37, the screen's almost all white behind there.

Q Oh, I understand.

A It's very bright, whereas if you go to the other frame that you were referring to, there's a difference in the --

Q Well, No. 46, which is Depo Exhibit No. 30, it's not all white; it's not all black.

A It's a difference in the background.

Q That's the only difference?

A Yeah. Because if you go to 47 immediately after and 46, you see much less of the mannequin and much more of the screen versus in 47, now you're seeing more -- a little bit more detail in the face and stuff of the mannequin, and the difference is the difference in that -- what's on the screen.

Q Are -- we still have the lens focused more on the mannequin's chest, as we did in Frame 14?

A Yes.

Q So that's the only difference then. Frames 46 through 51, you just snap the picture at a different time when the trailer was playing in the background.

A That's right. That's right.

(The item last above referred to was marked

for identification as State's Exhibit No. 31.)
BY MR. MARTIN:
Q All right. Let me show you Depo Exhibit No. 31, represented by Frame 52, basically a series of Frames 52 through 59, where we now have the female mannequin back. However, again referencing back to Frame No. 14, comparing the two, the mannequins in Frame 52 are just black silhouettes. What is the difference? What did you do different to produce these series of photographs, Frames 52 through 59?
A I think, again, this is differences in the background, went back and then shot pictures as the background changed to different colors and different brightness.
Q That's the only difference.
A I believe so.
Q Well, it always makes me nervous when a deponent says "I believe so."
A Well, I'd have to look through the -- look at the metadata for any each individual photograph and see if the camera exposure changed. I don't recall it changing.
Q Did you keep it on the same exposure? What was your manual setting for all these pictures? Did you change at all?

A Well, that's what I'd have to look. I don't recall changing it. I think it was all the same.

Q Would you look at just one for me, please, if you don't mind?

A We're set at f/2.8. ISO is on 400 and...

Q You have the 28-millimeter lens?

A No. This is 55-millimeter lens on all these photographs.

Q 55?

A Yeah. It's 55, manual.

Q Okay. On the January 2015, you were using the 28-millimeter.

A Right.

Q And on the mannequins, you were using the 55.

A That's correct.

Q Okay. So 55-millimeter lens, f-stop, 2.8. ISO was what?

A 400.

Q 400?

A Okay. I'm trying to find the shutter speed here.

Q None of these were timed, right, time exposure?

A No. None of them were timed.

Q So just give me the shutter speed, I'd

appreciate it.

A Looks like it's half-second shutter speed, and I'm looking at the first photograph.

Q So what was the shutter speed?

A Half second.

Q That's the way you left it on, all as far as your memory is. We can look at the metadata later, though. But basically that was the setting.

A It appears so. I've gone through a bunch of them here in the metadata. Looks like it's half second.

Q Okay. So this was your manual setting. Why did you choose these particular settings? Why did you choose an f-stop of 2.8?

A Well, what I had done before I did any of these particular photographs, I did some test photos. I took a meter reading, both with an in-camera meter as well as with a handheld meter and got what was both a reflected light and an ambient light meter reading and then --

Q And the chart said 2.8?

A Right, right. F-stop f/2.8, ISO 400 at a half second.

Q All right. So once you used the meter to determine the reflected light and the ambient light,

you then look at a standardized chart that suggested this would be the appropriate setting?

A Right.

Q Without any type of flash or anything.

A Right. That's correct.

Q So Frames 52 through 59, let me ask you one other question. The focal -- the length -- or I'm sorry. The distance between the lens -- camera lens at the time the picture was taken and the mannequins, it stays status too, stagnant. You didn't change that. You leaned it back so it would be at your face?

A Yeah, yeah, yeah, stays in the same place the entire time.

Q So those are constants then, camera to mannequin --

A That's right.

Q -- and your -- and your settings.

A That's right.

Q Okay. So why do we see a difference in Frames 52 through 59, where the male and female mannequins are basically black silhouettes?

A That -- that all comes down to that there are significant changes in the ambient lighting, based upon what's coming off the screen. That's the main supply of light in there, and that's -- as that changes, then

it is going to affect what can be seen.

(The item last above referred to was marked for identification as State's Exhibit No. 32.)

BY MR. MARTIN:

Q Let me show you Depo Exhibit No. 32, represented by Frame 60 of 88, again, a series of frames. 60 through 67 appear to be a set of photographs depicting the head of the mannequin tilted down with a downward gaze. So Depo Exhibit No. 32 and its representative frames, 60 through 67, what are you attempting to document or preserve with those frames?

A There, what we've done is moved the mannequin into a position of basically to be able to reach to the popcorn.

Q And how -- did you take any photographs of the entire mannequin so that a third party could see how you positioned the mannequin in relation to the seats?

A No, no. I don't have any other photographs other than the ones taken from my position.

Q Okay. Then orally explain to me, what did the mannequin look like? How did you position it so that it came in that position where you took the picture? I assume the picture was taken with you in the seat with the camera the same?

A Camera is the same. What we did is move the mannequin, basically leaned over the seat to the extent that at what would be approximately Mr. Oulson's arm distance to be able to reach to where the popcorn was. So, you know, I'm sitting here, and basically in that cup area, here's the popcorn. And then we basically --

Q Wait, wait, wait. The reader won't be able to understand any of that, so let's you and I try to do it a different way. We had a series of photographs that we talked about that you took in January of -- in January of 2015, where you took the measurements.

A That's correct.

Q All right. And there was a series of measurements that we bracketed a particular area.

A That's right.

Q All right. Tell me where you put that mannequin and represented to a bracket that we've already talked about. Did you put the mannequin on the far left-hand side of Mr. Oulson's seat, the far right-hand side? Where was it in that bracket, and why did you choose that position?

A The mannequin was to the far left-hand side of Mr. Oulson's seat and then leaned over the seat such that the arm would be able to reach to basically the left armrest, cup holder area of Mr. Reeves' seat.

Q Is that represented, then, in the measurements in Depo Exhibit No. 22? And give me the frame number. I'm sorry. I handed it to you too quick. What's the frame number?

A It's Frame No. 89.

Q Is that how -- what we're talking about?

A Well, this photograph doesn't really represent the positioning, but, yes, I mean, it's from -- if you're measuring from this corner --

Q That's the reach we're talking about.

A The reach from the corner of the seat to here would be -- it's about two and a halfish feet. So but obviously that's the actual reach to reach the popcorn would be something a little bit less than that because two and a half feet would be -- if you measured from Mr. Oulson's shoulder joint basically, the seam of his shirt sleeve out to the tip of his middle finger, you probably wouldn't quite reach two and a half feet. And you have to reach --

MR. ESCOBAR: You don't know how long his arms are, though.

THE WITNESS: Well, what I can tell you is that the length of a human arm is very much proportional to height. He's slightly taller than Mr. Reeves, whose reach was, I

think, two, four to the tip of his middle finger. But his actual reach would be something a little bit less than that, probably no more than about two feet if you're talking about reaching and grabbing something in the hand.

BY MR. MARTIN:

Q All right. So with Depo Exhibit No. 32, what was the distance, then, between where the end of your camera lens was to the mannequin's head that you leaned over? What was the distance?

A That distance is probably -- I was just checking the EXIF data to see whether or not the recorded focal -- or distance would provide me with those distances, camera to subject, and in this case, it does not because it provides the same. It reads 0.01 meters but it's the same in every one of the picture. It is a manual focus lens so the lens is not communicating that to the camera.

Q So did you take that measurement manually?

A We did when we set it up, and I don't recall the off the top of my head the measurement, but it's about two feetish, in that range.

Q And, again, with this particular series, Frames 60 through 67, are you representing, based on

your investigation and doing the shooting reconstruction, that this is what occurred at the time of the shooting?

A No, no. I think for all 88 of these photographs, I'm not representing that this is how it was or how it appeared or how it looked. This is a representation of what you would see lighting-wise in terms of detail and things like that as that's -- a figure is moved in the various different positions and the lighting is changed as -- according to what is changing on the screen.

Q And based on sequencing of events, when would Mr. Reeves had such a view? Do you know, if he had one at all?

A Well, this view, as represented in Exhibit No. 32, which is Frame 60 -- and there are other frames with that --

Q 60 through 67.

A -- that is -- would be at the time of the popcorn being grabbed from him.

Q Did you make any sort of adjustments for Frames 60 through 67 to represent the self-serving statement of Mr. Reeves that at the time the popcorn was grabbed that he was pressing himself further back into his seat, stretching out? So my question to you

is did you change your position to replicate that?

A No. The camera position remains the same in this photograph, as with all of the other 88 photographs.

Q All right. So explain to me, then, how Frames 60 through 67 would be a fair and accurate representation of what Mr. Reeves saw if you did not change the position of your camera to correspond with Mr. Reeves' statement.

A This is not a representation of what Mr. Reeves saw. This is a representation of what's the effect of bringing the figure closer to the camera versus further away from the camera. So what I've done is brought the camera in, the mannequin into -- within the distance it would take to reach to the popcorn, but this is not a representation that this is where his figure was, where his face was or anything at the time of that.

(The item last above referred to was marked for identification as State's Exhibit No. 33.)

BY MR. MARTIN:

Q Let me show you Depo Exhibit 33. Is that correct? 33, represented by Frame 68, a series of frames, 68 through 75, again, with the male mannequin in the same position as we see in Frames 60 through 67,

represented by Depo Exhibit No. 32. With the addition in Depo Exhibit No. 33, you have placed a female mannequin, at least from the perceptive of looking at the photograph, behind the male mannequin. What were you trying to document in Frames 68 through 75? If this represents the time where Mr. Oulson was reaching for the popcorn, why did you put a female mannequin behind there?

A Well, this does not represent the time that Mr. Oulson was reaching for the popcorn.

Q Well, let me go back, then, Mr. Knox because -- and I apologize for interrupting you. But we just talked about Depo Exhibit No. 32, and I have written right here, time of popcorn grabbed. That's what you told me that this represents.

A No, no. You misunderstood me. It does not represent the time. It represents what would be the net effect of Mr. Oulson or a figure -- I'm not even representing it's Mr. Oulson. I'm representing it's a figure moving closer to what -- the distance that I used would be the distance that he was at that time.

Q The time that he grabbed the popcorn.

A The time that he grabbed the popcorn would be approximately that distance.

Q So my question to you, since Depo Exhibit

No. 33 had the male mannequin in exactly the same position, if that is what could be seen at the time the popcorn is grabbed, why did you put a female mannequin behind Mr. -- the male mannequin? Why is there a female mannequin back there? What are you trying to document?

A The same as throughout this entire series. It's different variances to show what different variables the effect that different variables have on the lighting. I mean, obviously, she was there. She didn't disappear or go away, so if she were standing in the background, behind her husband, at the time he reached across and grabbed the popcorn, then I'm representing what would be the effect, that obviously as you move her head in there, you're blocking out more of the background, and so that does have some effect on the lighting.

Q You're not representing that based on your investigation and shooting reconstruction that at the time that Mr. Oulson reached for the popcorn that Mrs. Oulson was standing next to him or behind him. You're not representing that?

A No, I'm not representing that. I don't know where she was at that particular moment. I don't think that's really spelled out in any of the information

that I've seen. I certainly can't discern that from physical evidence.

Q You did read Mrs. Oulson's deposition, did you not?

A Yes.

Q And do you recall where she indicated she was at the time the popcorn was thrown? You just told me you don't know where she was but there's one source. Did you read that?

A Right, I did. But the photographic representation isn't related to where she was. It's related to where she was within Mr. Reeves' field of view. All I'm represent is if you moved her into his field of view, the field of view of the camera and that effect of her is obviously different, the lighting changes with her head there versus not there. I'm not representing anything about where she exactly was because I don't have any way to do that.

Q Going to show you Defendant's Exhibit -- sorry -- Depo Exhibit No. --

MR. ESCOBAR: Don't make that my exhibit. Okay? It's not my depo. Y'all have to pay for it now.

MR. MARTIN: Probably would.

(The item last above referred to was marked

for identification as State's Exhibit No. 34.)
BY MR. MARTIN:
Q Depo Exhibit No. 34, represented by Frame No. 76, a series of photographs, a series of frames, 76 through 83, which appears to be the same photographs, frames -- photographs in Frames 68 through 75. Again, is this where you took the background and shot it different times with a darker -- like you explained to me before?
A Yes.
Q And that's the only reason for Frames 76 through 83.
A That's right.
Q Doesn't represent anything else.
A That's correct.
Q Doesn't represent where Mr. Oulson was at the time he grabbed the popcorn or tossed the popcorn.
A That's correct. It's just -- the only thing that I've done is as far as his distance, his approximate distance at that time.
Q And it doesn't represent where Mrs. Oulson was at the time the popcorn was grabbed or thrown.
A That's correct.
(The item last above referred to was marked for identification as State's Exhibit No. 35.)

BY MR. MARTIN:

Q I'm going to show you D35, which is Depo Exhibit No. 35, simply Frame No. 84, a series of photographs, 84 through 88. Again, it's with the mannequin, simply the head. What are you attempting to document or preserve, Frames 84 through 88?

A This is at the same distance as the prior series, and the camera is tilted up slightly in order to bring the whole face into view of the camera. The mannequin's head is tilted to basically be looking directly at the camera. And what that is to do is when we're looking at face, obviously contour of the person's face affects the shadow and casting light across the face. So what I wanted to do was give a representation at that distance, what kind of detail would you see of a person's face.

Q All right. And what distance is that?

A The camera-to-face distance is about two feet.

Q And how did you determine that two feet was relevant and material to -- in your shooting reconstruction?

A Because that would be the approximate distance between Mr. Reeves and Mr. Oulson at the time that the popcorn was grabbed.

Q The distance between Mr. Oulson's face and Mr. Reeves?

A Yes, yes.

Q And when you measured that distance -- or let's do an approximate. Are you talking about the tip of nose of Mr. Reeves to the tip of nose of Mr. Oulson. How are we -- where is that distance? You know, from Mr. Reeves' chest to Mr. Oulson's to nose?

A No. It would be from face-to-face, not tip of nose but basically from his eye to Oulson's eye.

Q And how did you determine approximately two feet. Where in the series of either grabbing the popcorn and coming back or tossing the popcorn did the face of Mr. Oulson become approximately two feet away from Mr. Reeves in that scenario?

A At the time of the grabbing of the popcorn.

Q At the time of the maximum reach, where he actually had his hand on the top of the popcorn.

A Yes.

Q And then you took a series of photographs with different backgrounds?

A Yes, yes.

Q All right. And that's the difference.

A That's right.

Q I notice after Frame 88, of course, it stops.

You didn't take a series of photographs with the darker backgrounds like you did with the other scenarios. Any reason why you didn't do that?

A No. I just wanted to represent what you would see in terms of facial features. If you notice, even as you move through 84, 85, 86, 87, 88, you don't see a substantial difference in the facial features. You just see a little bit more in 87 with the brighter background, but that's enough to answer the question as far as the variables go.

MR. MARTIN: I'm not done. We're going to have to come back. I still have all the measurement photographs to go through.

MR. ESCOBAR: I'm not going to hardball you. Why are you looking at me like that? You know, I'm good.

MR. MARTIN: At least another two or three hours.

MR. ESCOBAR: Okay.

(Whereupon the deposition was adjourned, to be continued on a date not yet determined.)

C E R T I F I C A T E

STATE OF FLORIDA)
COUNTY OF DUVAL)

I, Karen Waugerman, Registered Professional Reporter and Notary Public in and for the State of Florida at Large, do hereby certify that I was authorized to and did stenographically report the deposition of MICHAEL KNOX; that a review of the transcript was requested; and that the transcript is a true and correct record of my stenographic notes.

I further certify that I am not a relative, employee, attorney or counsel of any of the parties, nor am I a relative or employee of any of the parties' attorney or counsel connected with the action, nor am I financially interested in the action.

DATED this 21st day of April, 2016.

/s/ Karen Waugerman
KAREN WAUGERMAN
Registered Professional Reporter

C E R T I F I C A T E O F O A T H

STATE OF FLORIDA)
COUNTY OF DUVAL)

I, the undersigned authority, certify that MICHAEL KNOX personally appeared before me and was duly sworn.

WITNESS my hand and official seal this 21st day of April, 2016.

/s/ Karen Waugerman
KAREN WAUGERMAN
Notary Public - State of Florida
My Commission No. EE 875299
Expires: June 15, 2017

ERRATA SHEET

DO NOT WRITE ON TRANSCRIPT - ENTER CHANGES HERE

In Re: STATE OF FLORIDA v. CURTIS JUDSON REEVES
Taken: April 7, 2016
Reporter: Karen Waugerman, RPR

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Reason: _____

Under penalties of perjury, I declare that I have read the foregoing document and that the facts stated in it are true.

_____ _____
DATE MICHAEL KNOX

Exhibit # 4

Michael A. Knox
Forensic Science & Criminology Consultant

CURRICULUM VITAE
February 5, 2014

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Areas of Specialty

Firearms, Ballistics & Shooting Incident Reconstruction
Crime Scene Reconstruction
Death Investigations & Equivocal Death Analysis
Bloodstain Pattern Analysis
Traffic Accident Reconstruction

Summary of Qualifications

Fifteen Years of Law Enforcement Experience
Master of Science in Forensic Science
Bachelor of Science in Mechanical Engineering
Investigated & Reconstructed Hundreds of Traffic Crashes Including Over 100 Fatal & Life-Threatening Crashes
Handled 350+ Forensic Death Scene Investigations
Court-qualified Expert Witness in Firearms, Shooting Reconstruction, Crime Scene Reconstruction, Bloodstain Pattern Analysis, Photogrammetry & Traffic Accident Reconstruction

SUMMARY

Mr. Knox reconstructs traffic accidents and crime scenes, particularly those involving gunfire, and is an expert in firearms, ballistics, crime scene reconstruction, shooting incidents, bloodstain pattern analysis, photogrammetry, evidence collection procedures, traffic accident reconstruction, and other related topics. Mr. Knox brings with him over 15 years of law enforcement experience in patrol, DUI enforcement, crime scene investigations, and traffic homicide investigations. Combined with an education in mechanical engineering, forensic science, and criminology, he is capable of reconstructing virtually any type of crime scene or traffic accident. He has reconstructed crime scenes and traffic accidents in Florida, Georgia, Alabama, Mississippi, Texas, Ohio, Illinois, Pennsylvania, Massachusetts, and New Jersey. He has provided law enforcement training in Florida, Georgia, Missouri, Connecticut, the United Arab Emirates, Peru, and the Republic of Georgia. Mr. Knox has testified at trial as an expert witness in state and federal courts in Florida, Georgia, Alabama, Mississippi, Texas, and Illinois.

EDUCATION

Doctor of Philosophy, Criminal Justice, Nova Southeastern University, Currently Enrolled
Master of Science, Forensic Science, University of Florida, 2012
Bachelor of Science, Mechanical Engineering, University of North Florida, 2010
Associate in Science, Criminal Justice Technology, Florida Community College at Jacksonville, 2000

ACCREDITATION & CERTIFICATION

Certified Crime Scene Reconstructionist, IAI, 2011 – Present
Accredited Traffic Accident Reconstructionist, ACTAR, 2001 – Present
Certified Glock Armorer/Advanced Glock Armorer, Glock Perfection, Inc., 2011 – Present

PROFESSIONAL EXPERIENCE

Forensic Consultant/Owner, Knox & Associates, LLC, Jacksonville, FL, 2008 – Present
Detective/Police Officer, Jacksonville, Sheriff's Office, Jacksonville, FL, 1994 – 2010 *(Patrol, DUI Enforcement Unit, Crime Scene Unit, Traffic Homicide Unit)*

PROFESSIONAL ASSOCIATIONS

Association for Crime Scene Reconstruction
International Association for Identification
American Society of Criminology
Academy of Criminal Justice Sciences
American Society of Mechanical Engineers

AREAS OF STUDY & RESEARCH

Computational Analysis in Traffic Accident Reconstruction
Computational Analysis in Crime Scene Reconstruction
Kinematic Biomechanics in Crime Scene Reconstruction
Human Factors in Shooting Incidents & Crime Scene Reconstruction
Crime Scene Behaviors of Homicide Offenders
Serial, Mass, and Spree Homicide

COMPUTATIONAL SKILLS & EXPERIENCE

Microsoft Windows & Linux Operating Systems
CAD/Drafting with Various Proprietary and Open Source CAD Packages
3D Modeling with Google Sketchup, Pro/E
FEM/FEA with NX6-Ideas
Programming with Python, MATLAB, C/C++, BASIC
Web Development with HTML, CSS, PHP, JavaScript
Photogrammetry using Photomodeler
Image, Video & Audio Analysis & Enhancement Using Computational Tools
Specialize in Computational Analysis in Firearms, Crime Scene Reconstruction & Traffic Accidents

MECHANICAL SKILLS & ENGINEERING EXPERIENCE

Traffic Accident Reconstruction
Reconstruction of Firearms-Related Incidents
Analysis of Firearms Failures & Accidental Discharges

Mechanical Function of Motor Vehicles Involved in Traffic Crashes
Automotive Mechanical Failures
Analysis of Door Handle Failures

PROFESSIONAL TRAINING

Glock Advanced Armorer's Course, Glock Professional, Inc., 16 hours (Smyrna, GA, 2011)
Street Survival Seminar, Calibre Press, Inc., 16 hours (Myrtle Beach, SC, 2011)
Optics, Lighting, & Visibility for the Forensic Investigator, Clearly Visible Presentations, 32 hours (West Chester, OH, 2011)
Glock Armorer's Course, Glock Professional, Inc., 8 hours (Smyrna, GA, 2011)
Occupant Kinematics for the Traffic Crash Investigator, IPTM, 40 hours (Jacksonville, FL, 2010)
Investigation & Inspection of Commercial Vehicle Accidents, IPTM, 40 hours (Jacksonville, FL, 2010)
Collision Reconstruction Using PhotoModeler, EOS Systems, Inc., 24 hours (Chicago, IL, 2009)
Advanced Roadside Impaired Driving Enforcement, IPTM, 16 hours (Jacksonville, FL, 2008)
Traffic Engineering for Police, IPTM, 16 hours (Jacksonville, FL, 2007)
Methodology & Techniques of Crash Data Retrieval, IPTM, 24 hours (Jacksonville, FL, 2007)
Homicide Investigation, IPTM, 40 hours (Jacksonville, FL, 2006)
Advanced Bloodstain Pattern Analysis, IPTM, 40 hours (St. Petersburg, FL, 2006)
Crime Scene Reconstruction of Shooting Incidents, IPTM, 40 hours (Maitland, FL, 2006)
Firearms Instructior, NE Fla. Crim. Just. Training Ctr., 44 hours (Jacksonville, FL 2005)
Digital Photography for Law Enforcement, IPTM, 24 hours (Jacksonville, FL, 2005)
Vehicle Operations Instructor, NE Fla. Crim. Just. Training Ctr., 40 hours (Jacksonville, FL, 2004)
Applied Physics for Traffic Accident Reconstruction, IPTM, 40 hours (Jacksonville, FL, 2004)
Field Training Officer, NE Fla. Crim. Just. Training Ctr., 40 hours (Jacksonville, FL 2003)
Bloodstain Pattern Analysis, IPTM, 40 hours (St. Petersburg, FL, 2003)
Crime Scene Reconstruction, IPTM, 40 hours (Jacksonville, FL, 2002)
Instructor Techniques, NE Fla. Crim. Just. Training Ctr., 80 hours (Jacksonville, FL, 2002)
Hazardous Materials/Weapons of Mass Destruction, Jacksonville Regional Fire-Rescue Trg. Ctr., 40 hours (Jacksonville, FL, 2001)
Scene Mapping Using Speed Lasers, IPTM, 40 hours (Jacksonville, FL, 2001)
Light Energy Applications for Law Enforcement, IPTM, 24 hours (Jacksonville, FL, 2001)
DUI Instructor Update, IPTM, 16 hours (Jacksonville, FL, 2001)
Crime Scene Processing Workshop, IPTM, 40 hours (Jacksonville, FL, 2000)
Crime Scene Techniques for Buried Bodies & Surface Skeletons, IPTM, 40 hours (Jacksonville, FL, 2000)
Interviewing Techniques for the Traffic Accident Investigator, IPTM, 24 hours (Jacksonville, FL, 1999)
Police Traffic Radar Instructor, IPTM, 40 hours (Jacksonville, FL, 1999)
Traffic Accident Reconstruction, IPTM, 80 hours (Jacksonville, FL, 1999)
Motorcycle Accident Investigation, IPTM, 40 hours (Jacksonville, FL, 1998)
Pedestrian & Bicycle Accident Investigation, IPTM, 40 hours (Jacksonville, FL, 1998)
Investigation & Inspection of Commercial Vehicle Accidents, IPTM, 40 hours (Jacksonville, FL, 1998)
Advanced Traffic Accident Investigation, IPTM, 80 hours (Jacksonville, FL, 1998)
Traffic Homicide Investigation, IPTM, 40 hours (Jacksonville, FL, 1998)
Traffic Enforcement's Role in Community Policing, IPTM, 8 hours (Orlando, FL, 1997)
Modile Videotaping Instructor Course, IPTM, 40 hours (Jacksonville, FL, 1997)
At-Scene Traffic Accident/Traffic Homicide Investigation, IPTM, 80 hours (Jacksonville, FL, 1997)
Investigative Interview, NE Fla. Crim. Just. Training Ctr., 40 hours (Jacksonville, FL, 1997)
DUI Case Preparation & Courtroom Testimony, IPTM, 40 hours (Daytona Beach, FL, 1996)
DUI Instructor Course, IPTM, 40 hours (Jacksonville, FL, 1996)
In-Car Video Requirements for DUI Enforcement, IPTM, 8 hours (Jacksonville, FL, 1996)
Radar Speed Measurement, Northeast Florida Criminal Justice Training Center, 40 hours (Jacksonville, FL, 1996)
DUI Detection & Standardized Field Sobriety Testing, IPTM, 24 hours (Jacksonville, FL, 1996)
Criminal Patrol Drug Enforcement, IPTM, 40 hours (Jacksonville, FL, 1996)
Basic Evidence Technician, NE Fla. Crim. Just. Training Ctr., 40 hours (Jacksonville, FL, 1996)
Concealment Areas Within a Vehicle, IPTM, 16 hours (Jacksonville, FL, 1996)
Case Preparation & Courtroom Testimony, NE Fla. Crim. Just. Training Ctr., 40 hours (Jacksonville, FL, 1995)
Advanced Report Writing & Review, NE Fla. Crim. Just. Training Ctr., 40 hours (Jacksonville, FL, 1995)

Police Officer Indoctrination Training, NE Fla. Crim. Just. Training Ctr., 200 hours (Jacksonville, FL, 1995)
Verbal Judo: Train the Trainer, IPTM, 40 hours (Jacksonville, FL, 1994)
Street Survival Seminar, Calibre Press, Inc., 24 hours (Myrtle Beach, SC, 1994)
Street Gangs Identification & Investigation, IPTM, 40 hours (Jacksonville, FL, 1994)
Basic Law Enforcement, St. Augustine Crim. Just. Training Ctr., 762 hours (St. Augustine, FL, 1994)

PEER-REVIEWED JOURNAL ARTICLES & TECHNICAL PAPERS

Knox, Michael A. "Forensic Engineering Analysis Methods Employed for the Purpose of Determining the Location of a Long-Range Shooter Based on Terminal Bullet Trajectory." *Proceedings of the ASME 2012 International Mechanical Engineering Congress & Exposition,* November 15-21, 2013, San Diego, California. New York: American Society of Mechanical Engineers.

Knox, Michael A. "Forensic Analysis of an Accidental Firearm Discharge Due to a Blow to an Exposed Hammer Spur." *Proceedings of the ASME 2012 International Mechanical Engineering Congress & Exposition.* November 9-15, 2012, Houston, Texas. New York: American Society of Mechanical Engineers, 2012.

Knox, Michael A. "Forensic Engineering Analysis of Ejected Cartridge Case Patterns for the Reconstruction of Firearms-Related Incidents." *Proceedings of the ASME 2012 International Mechanical Engineering Congress & Exposition.* November 9-15, 2012, Houston, Texas. New York: American Society of Mechanical Engineers, 2012.

Knox, Michael A. "Multivariable Monte Carlo Analysis Methods in Traffic Accident Reconstruction Using Python." *Proceedings of the ASME 2011 International Mechanical Engineering Congress & Exposition.* November 11-17, 2011, Denver, Colorado. New York: American Society of Mechanical Engineers, 2011.

Knox, Michael A. "Forensic Engineering Applications in Crime Scene Reconstruction." *Proceedings of the ASME 2010 International Mechanical Engineering Congress & Exposition.* November 12-18, 2010, Vancouver, British Columbia, Canada. New York: American Society of Mechanical Engineers, 2010.

BOOKS & BOOK CONTRIBUTIONS

Knox, Michael A. *Intermediate Range: The Forensic Evidence in the Killing of Trayvon Martin*. Jacksonville, FL: Crime Science Books, 2012.

LaForte, Michael F., and Knox, Michael A. *Crime Scene Processing 2.0*. Glen St. Mary, FL: Eagle Crime Scenes, Inc., 2008. Electronic media.

NEWSPAPER & PERIODICAL ARTICLES & COLUMNS

Knox, M. A. (2013, July 19). State botched presentation of evidence in Zimmerman trial. *Orlando Sentinel.* Retrieved from http://www.orlandosentinel.com/news/opinion/os-ed-zimmerman-trial-evidence-071913-20130718,0,6303855.story

REVIEWER EXPERIENCE

Technical paper reviewer for two papers submitted for the International Mechanical Engineering Congress & Exposition, American Society of Mechanical Engineers, 2012.

PRESENTATION, LECTURE & TEACHING EXPERIENCE

Adjunct Instructor, Forensic Technology Program, Keiser University (Jacksonville, FL, 2012).

Contract Forensic Technology Instructor with the Institute of Police Technology & Management; Sirchie Fingerprint Laboratories, Inc.; Professional Business Solutions, Inc.; and Eagle Crime Scenes, Inc. (2004 – Present).

Training Coordinator for the Jacksonville Sheriff's Office Crime Scene Unit (2003 – 2007).

Advisory Board Member for the Crime Scene Technology & Forensic Investigation Programs, Keiser University. (Jacksonville, FL, 2011 – Present).

COURSES, LECTURES & PRESENTATIONS

Human Factors in Crime Scene Reconstruction, ACSR, 4 hours (Atlanta, GA, 2013)
Cartridge Case Ejection Patterns: Probability Models Using Monte Carlo Analysis, ACSR, 1 hour (Atlanta, GA, 2013)
Crime Scene Reconstruction of Shooting Incidents, IPTM, 40 hours (Jacksonville, FL, 2012)

Reconstructing Criminal Events: The Human Perspective, Fla. Assoc. of Public Defenders, 6 hours (Naples, FL, 2012).
Forensic Investigations, Kesier University, Upper Division Undergraduate Course (Jacksonville, FL, 2012)
Shots Fired!: Forensic Reconstruction of Police-Involved Shootings, Int. Mun. Lawyer's Assoc., 1 hour (Washington, DC, 2012)
Crime Scene Reconstruction of Shooting Incidents, IPTM, 40 hours (Jacksonville, FL, 2011)
Crime Scene Reconstruction: Evidence Collected v. Evidence Presented, Fla. Assoc. of Public Defenders, 6 hours (Destin, FL, 2011)
Cartridge Case Ejection Patterns: Determining a Shooter's Location, FDIAI/GDIAI Joint Educational Conference, 1 hour (Panama City Beach, FL, 2011)
Evaluating Accuracy, Precision & Uncertainty in Crime Scene Reconstruction, FDIAI/GDIAI Joint Educational Conference, 1 hour (Panama City Beach, FL, 2011)
Crime Scene Processing Workshop, IPTM, 40 hours (Jacksonville, FL, 2011)
Shooting Incidents: A Primer for Claims Professionals, Jacksonville Claims Assoc., 1 hour (Jacksonville, FL, 2011)
Photogrammetry & 3D Computer Modeling for Crime Scene Reconstruction, ASCR Annual Conf., 1 hour (Jacksonville, FL, 2011)
Crime Scene Reconstruction of Shooting Incidents, U.S. State Department/INL Under Contract with PBSI, 40 hours (Tbilisi, Republic of Georgia, 2011)
Shooting Reconstruction Involving Vehicles, IPTM, 12 hours (National CSI Camp, Lake of the Ozarks, MO, 2010)
Basic Crime Scene & Evidence Procedures, Fla. Assoc. of Public Defenders, 6 hours (Clearwater Beach, FL, 2010)
Crime Scene Processing Workshop, IPTM, 40 hours (Jacksonville, FL, 2010)
Fundamentals of Crime Scene Technology, Sirchie, 40 hours (Public Ministry, Chiclayo, Peru, 2010)
Crime Scene Technology, Sirchie, 3 hours (National Police, Lima, Peru, 2010)
Fundamentals of Crime Scene Technology, Sirchie, 40 hours (Public Ministry, Lima, Peru, 2010)
Fundamentals of Crime Scene Technology, Sirchie, 25 hours (Dubai Police, Dubai, UAE, 2010)
At-Scene Traffic Accident/Traffic Homicide Investigation, IPTM, 80 hours (Jacksonville, FL, 2010)
Bloodstain Pattern Evidence at Crime Scenes, Eagle Crime Scenes, Inc., 40 hours (Orange Park, FL, 2009)
Scenario-Based Crime Scene Processing Exercises, IPTM, 32 hours (Meriden, CT, 2009)
Crime Scene Reconstruction of Shooting Incidents, IPTM, 4 hours (Am. Crim. Just. Assoc. Nat. Conf., Jacksonville, FL, 2009)
Crime Scene Reconstruction of Shooting Incidents, Eagle Crime Scenes, Inc., 40 hours (NE Fla. Crim. Just. Trg. Ctr., Jacksonville, FL, 2007)
Bloodstain Pattern Evidence at Crime Scenes, Eagle Crime Scenes, Inc., 40 hours (NE Fla. Crim. Just. Trg. Ctr., Jacksonville, FL, 2005)
Bloodstain Pattern Evidence at Crime Scenes, Eagle Crime Scenes, Inc., 40 hours (NE Fla. Crim. Just. Trg. Ctr., Jacksonville, FL, 2005)
Crime Scene Photography, Eagle Crime Scenes, Inc., 40 hours (Valdosta, GA, 2005)
Basic Crime Scene Processing Techniques, Eagle Crime Scenes, Inc., 40 hours (NE Fla. Crim. Just. Trg. Ctr., Jacksonville, FL, 2004)
Investigation & Reconstruction of Impaired Driving Collisions, IPTM, 3 hours (Jacksonville, FL, 2000)

TELEVISION, RADIO & PRINT MEDIA APPEARANCES

First Coast News. (Local). Interviewed about offenders using social media to post about their exploits. (Jacksonville, FL, Feb. 2014)
First Coast News. (Local). Interviewed about violent sexual predators. (Jacksonville, FL, Aug. 2013)
News4Jax. (Local). Interviewed about the lack of gunshot residue on the hands of a defendant in the shooting death of a toddler in Brunswick, Georgia. (Jacksonville, FL, Jul. 2013)
First Coast News. (Local). Interviewed about social media used in criminal cases. (Jacksonville, FL, Jul. 2013)
WILS 1320 with Michael Cohen. (Local). Live telephone interview on talk radio station regarding the trial of George Zimmerman for the killing of Trayvon Martin. (Lansing, MI, Jul. 2013)
News4Jax. (Local). Interviewed about gunshot residue testing results in the killing of a toddler in Brunswick, Georgia. (Jacksonville, FL, Jul. 2013)
Nancy Grace. (National). Appeared as live guest for the trial of George Zimmerman for the killing of

Trayvon Martin. (Jul. 2013)

WPGL Local 10. (Local). Interviewed in reference to the trial of George Zimmerman for the killing of Trayvon Martin. (Miami, FL, Jul. 2013)

CBS News. (National). Interviewed in reference to the trial of George Zimmerman for the killing of Trayvon Martin. (Jul. 2013)

WKMG Local 6. (Local). Provided live guest commentary and recorded interviews during the trial of George Zimmerman for the killing of Trayvon Martin. (Orlando, FL, Jul. 2013)

News4Jax. (Local). Interviewed about the kidnapping, rape & murder of 8-year-old Cherish Perrywinkle from a Walmart store. (Jacksonville, FL, Jun. 2013)

The Morning Show. (Local). Appeared as live guest regarding murders of Texas prosecutors. (Jacksonville, FL, Apr. 2013)

Action News. (Local). Appeared in news story by reporter Ryan Smith about new technology to help prevent police from losing or destroying evidence. (Jacksonville, FL, Feb. 2013)

The Chicago Tribune. (Local). Subject of column by Eric Zorn in reference to the Trayvon Martin/George Zimmerman case. (Chicago, IL, Feb. 2013)

WKMG Local 6. (Local). Appeared in two-part feature on Trayvon Martin/George Zimmerman case by reporter Tony Pippitone. (Orlando, FL, Feb. 2013)

The Blaze. (National). Quoted in article by Erica Ritz regarding comments by Jesse Jackson that assault weapons can shoot down airplanes. (Jan. 2013)

Action News Sunday. (Local). Appeared as guest of reporter Paige Kelton for interview on gun control and school security. (Jacksonville, FL, Jan. 2013)

The Morning Show. (Local). Appeared as live guest regarding Sandy Hook Elementary School shooting and school security issues. (Jacksonville, FL, Dec. 2012)

News4Jax. (Local). Interviewed about Sandy Hook Elementary School shooting and evidence on the shooter's computer and electronic devices. (Jacksonville, FL, Dec. 2012)

Jane Velez-Mitchell. (National). Appeared on live cable news broadcast as forensic expert regarding the February 2012 shooting of teenager Trayvon Martin by neighborhood watch volunteer George Zimmerman. Commented specifically on range of fire as noted in the autopsy report and on developing a timeline of the events. (May 2012)

Jane Velez-Mitchell. (National). Appeared on live cable news broadcast as forensic expert regarding case of a woman and her three daughters that were possibly abducted. (May 2012)

News4Jax. (Jacksonville, FL). Interviewed about computer hacker case for evening news. (Jacksonville, FL, Oct. 2011)

The Morning Show. (Local). Appeared as live guest regarding computer hacker case. (Jacksonville, FL, Oct. 2011)

The Morning Show. (Local). Appeared as live guest regarding deaths of police officers. (Jacksonville, FL, Jan. 2011)

The Morning Show. (Local). Appeared as live guest regarding Ohio police-involved shooting. (Jacksonville, FL, Jan. 2011)

The Morning Show. (Local). Appeared as live guest discussing the "Grim Sleeper" serial killer case and the use of familial DNA to solve crimes. (Jacksonville, FL, Jul. 2010)

Action News. (Local). Interviewed for evening news broadcast regarding text message threats sent to high school students. (Jacksonville, FL, Jun. 2010)

PUBLIC SERVICE APPEARANCES

Sisters in Crime. (Jacksonville, FL). Presentation to crime writer's group. (Jacksonville, FL, Nov. 2012)

Keiser University. (Jacksonville, FL). Guest speaker for forensic technology program. (Jacksonville, FL, Mar. 2012)

Keiser University. Guest speaker for forensic technology program. (Jacksonville, FL, Jul. 2010)

Sisters In Crime. Presentation to crime writer's group. (Jacksonville, FL, Feb. 2010)

EXPERT TESTIMONY COURTROOM QUALIFICATIONS*

1st Judicial Circuit of Florida, Escambia County, Pensacola, Florida
4th Judicial Circuit of Florida, Duval County, Jacksonville, Florida
4th Judicial Circuit of Florida, Nassau County, Yulee, Florida
4th Judicial Circuit of Florida, Clay County, Green Cove Springs, Florida
6th Judicial Circuit of Florida, Pinellas County, Clearwater, Florida
7th Judicial Circuit of Florida, St. Johns County, St. Augustine, Florida
7th Judicial Circuit of Florida, Volusia County, Daytona Beach, Florida

9th Judicial Circuit of Florida, Osceola County, Kissimmee, Florida
10th Judicial Circuit of Florida, Polk County, Bartow, Florida
15th Judicial Circuit of Florida, Palm Beach County, West Palm Beach, Florida
U.S. District Court, Northern District of Alabama, Tuscaloosa, Alabama
U.S. District Court, Northern District of Illinois, Chicago, Illinois
27th Judicial District of Texas, Bell County, Belton, Texas
3rd Circuit Court of Mississippi, Tippah County, Ripley, Mississippi
Glynn County Superior Court, Glynn County, Georgia

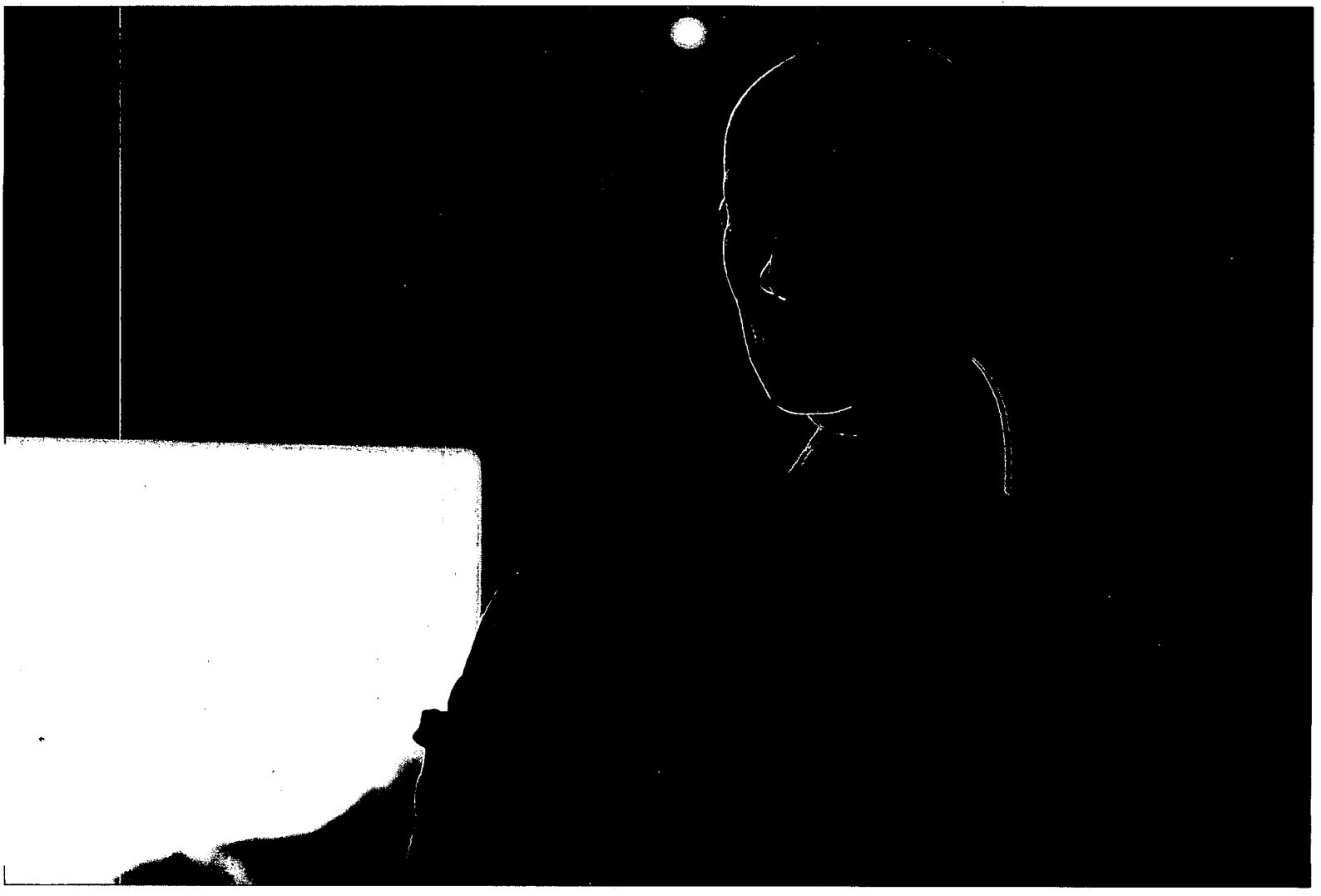
**List of jurisdictions in which expert testimony has been given. Testimony has been given multiple times in some jurisdictions. Expert testimony has been in the areas of crime scene reconstruction, traffic accident reconstruction, firearms, ballistics, shooting incidents, human factors, bloodstain pattern analysis, photogrammetry, forensic science, crime scene procedures, and crime scene behaviors of homicide offenders.*

AWARDS & RECOGNITION

Heart of MADD Award. Mothers Against Drunk Driving (Jacksonville, FL, 2008)
Heart of MADD Award. Mothers Against Drunk Driving (Jacksonville, FL, 2007)
Police Officer of the Month. Jacksonville Sheriff's Office (Jacksonville, FL, 2006)
Certificate of Commendation. Jacksonville Sheriff's Office (Jacksonville, FL, 2002)

Exhibit # 5

FRAMES 1 - 13



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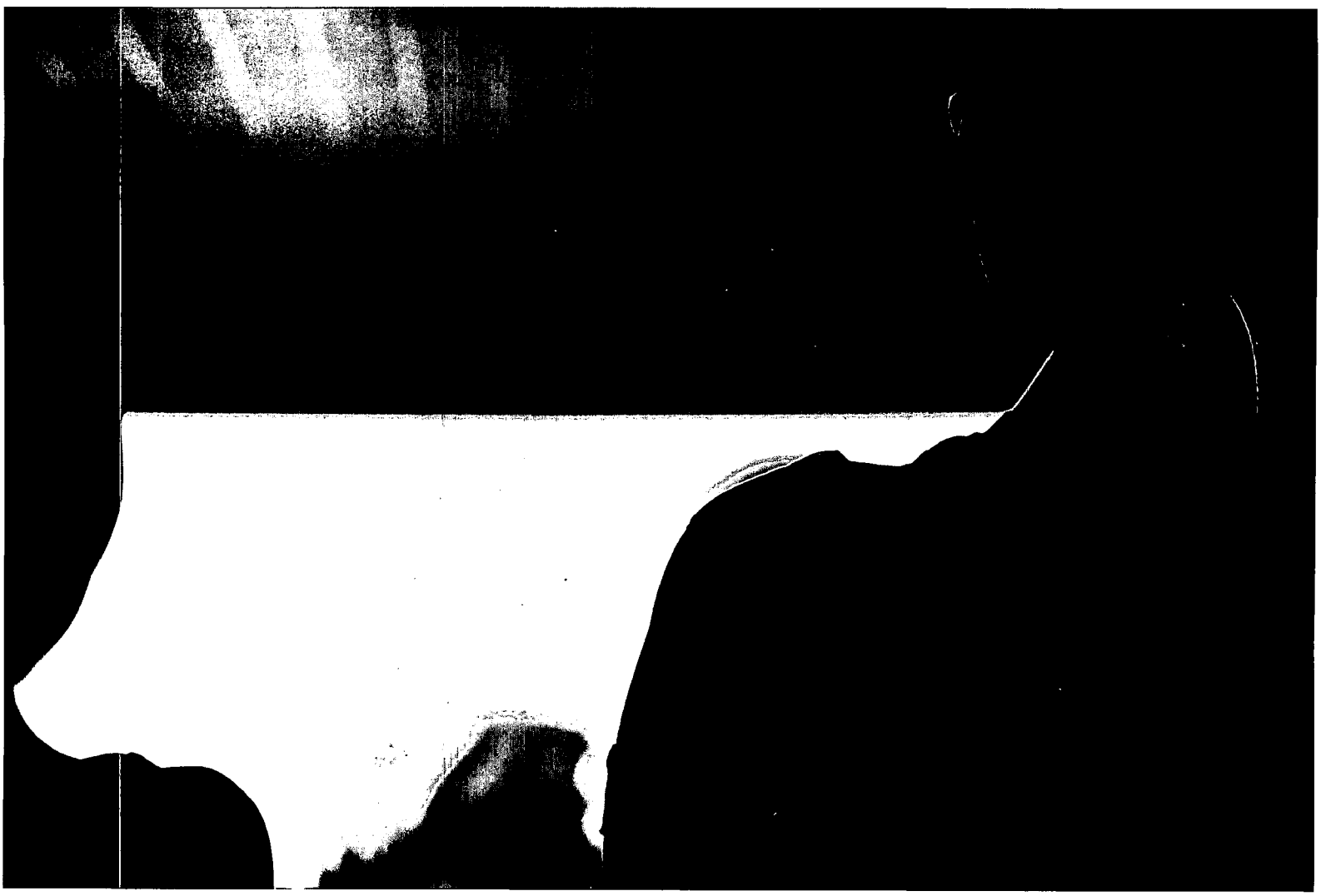
FRAMES 24 - 28

FRAMES 29 - 37



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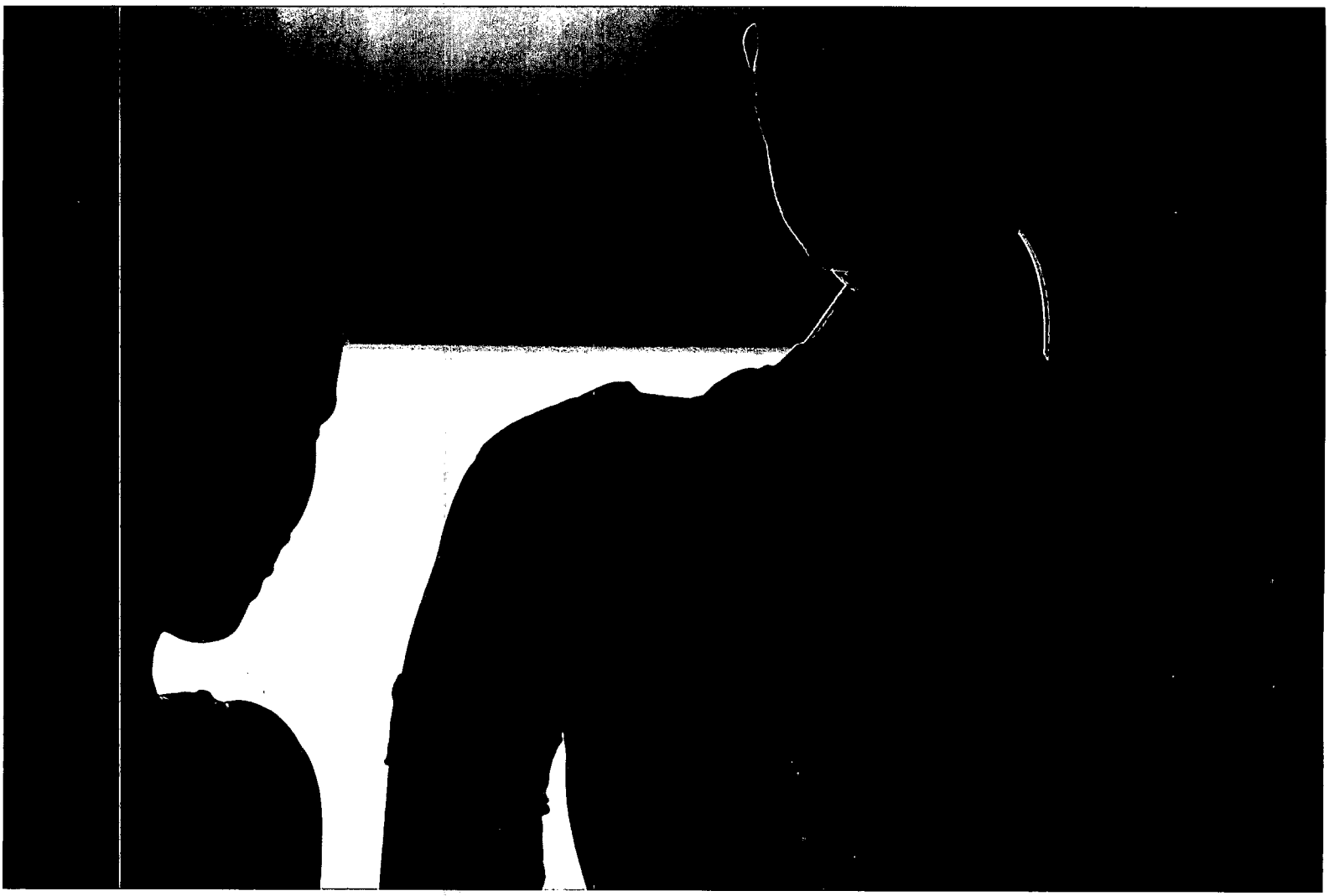

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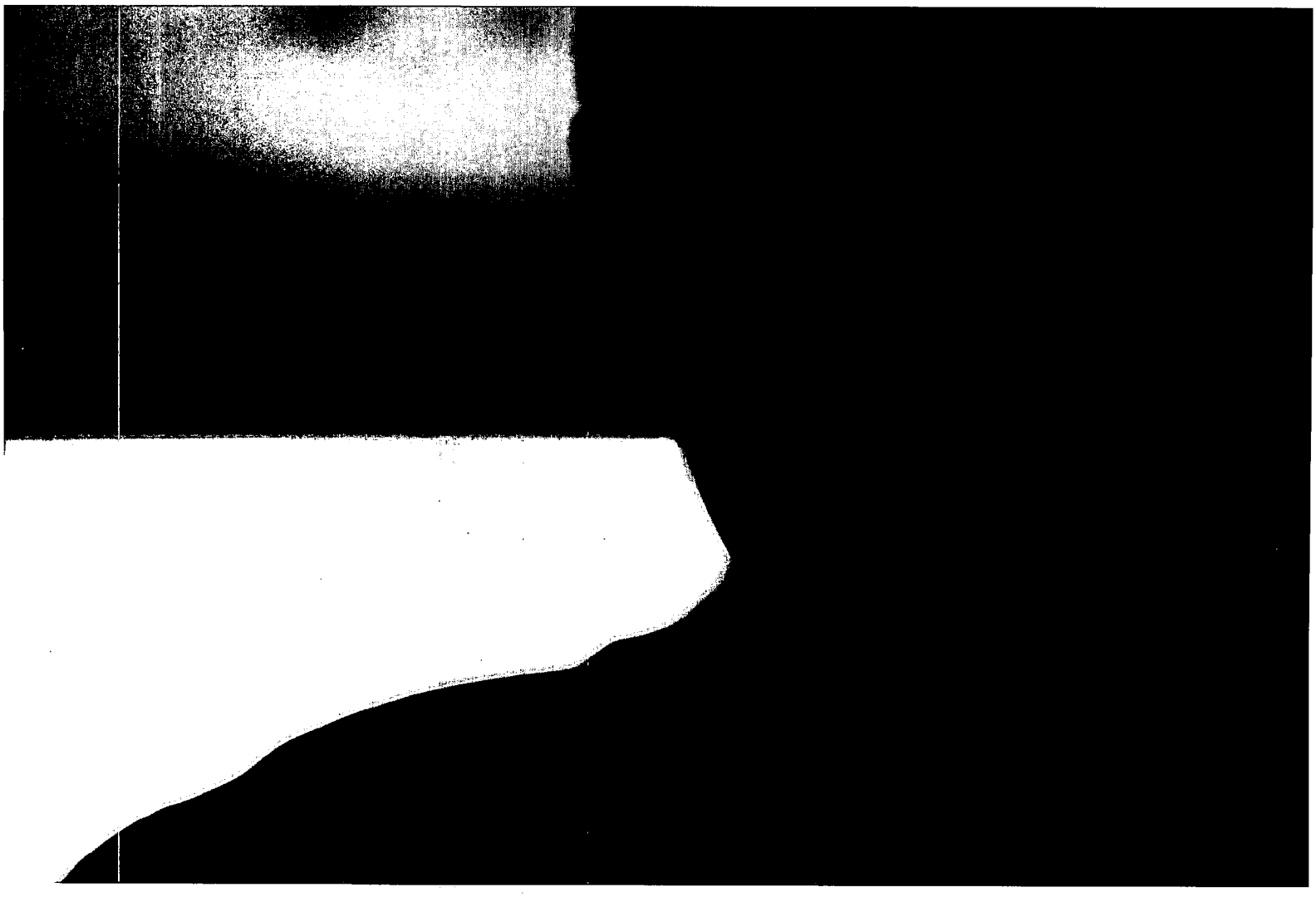
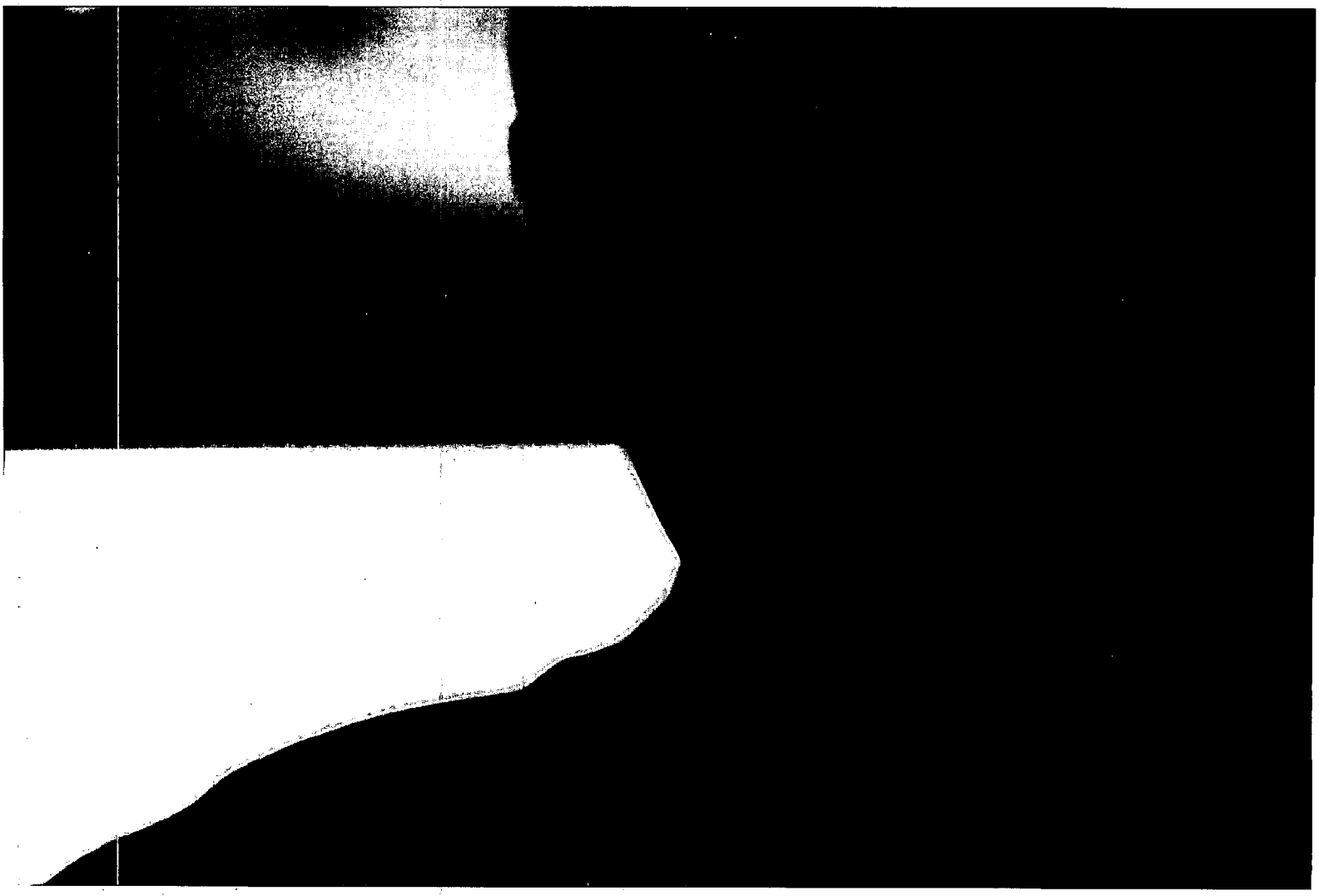
FRAMES 60 - 67





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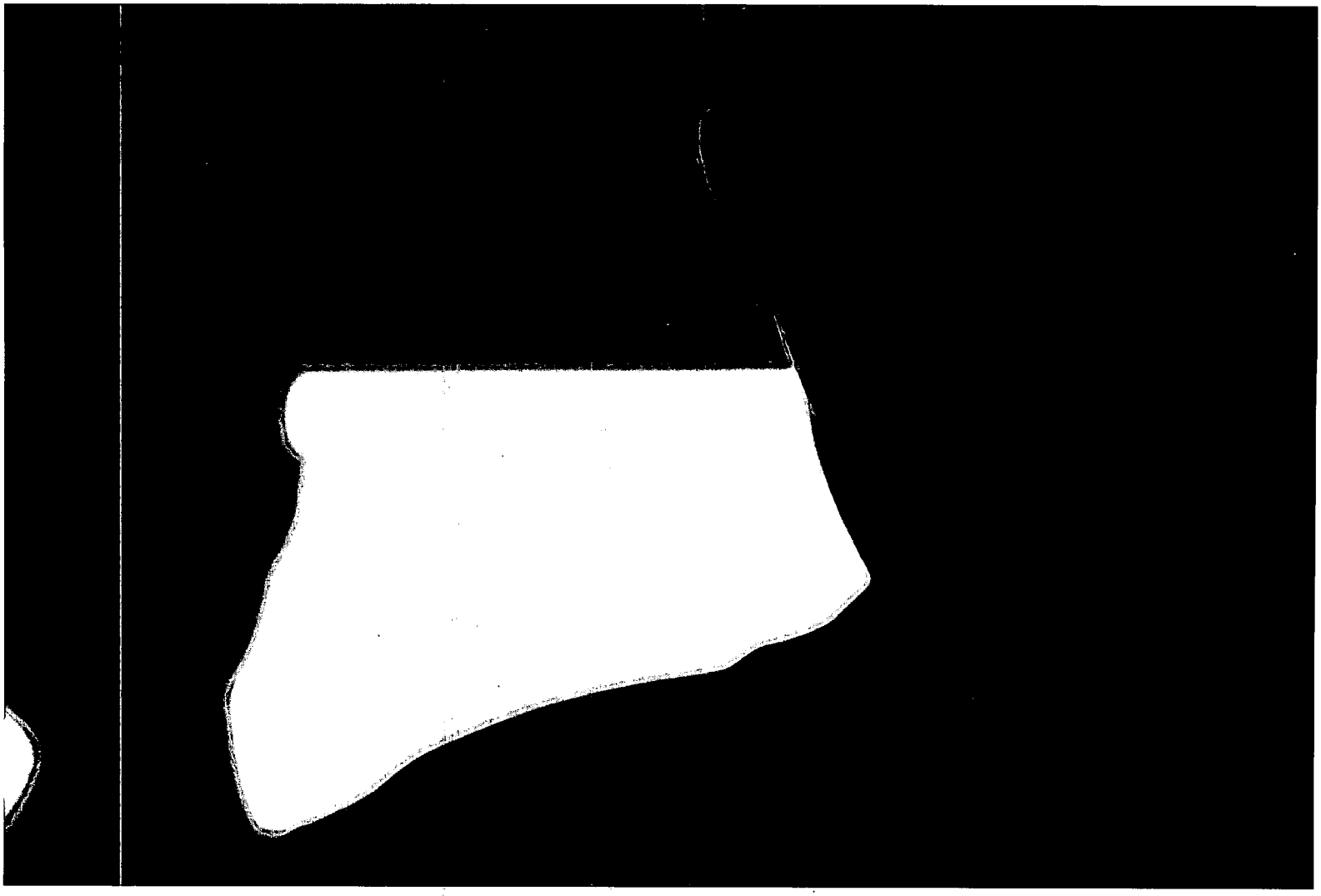

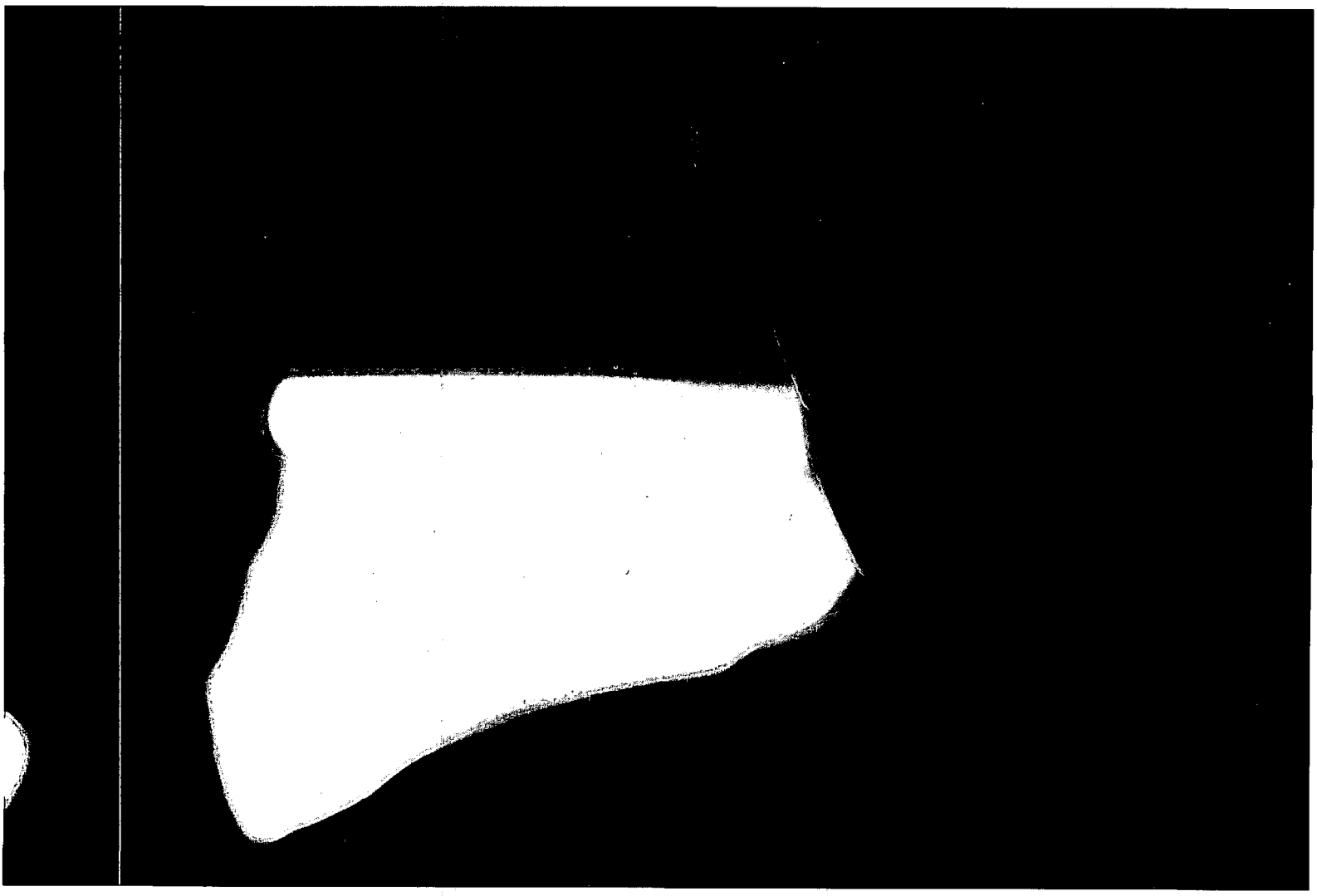

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FRAMES 84 - 88

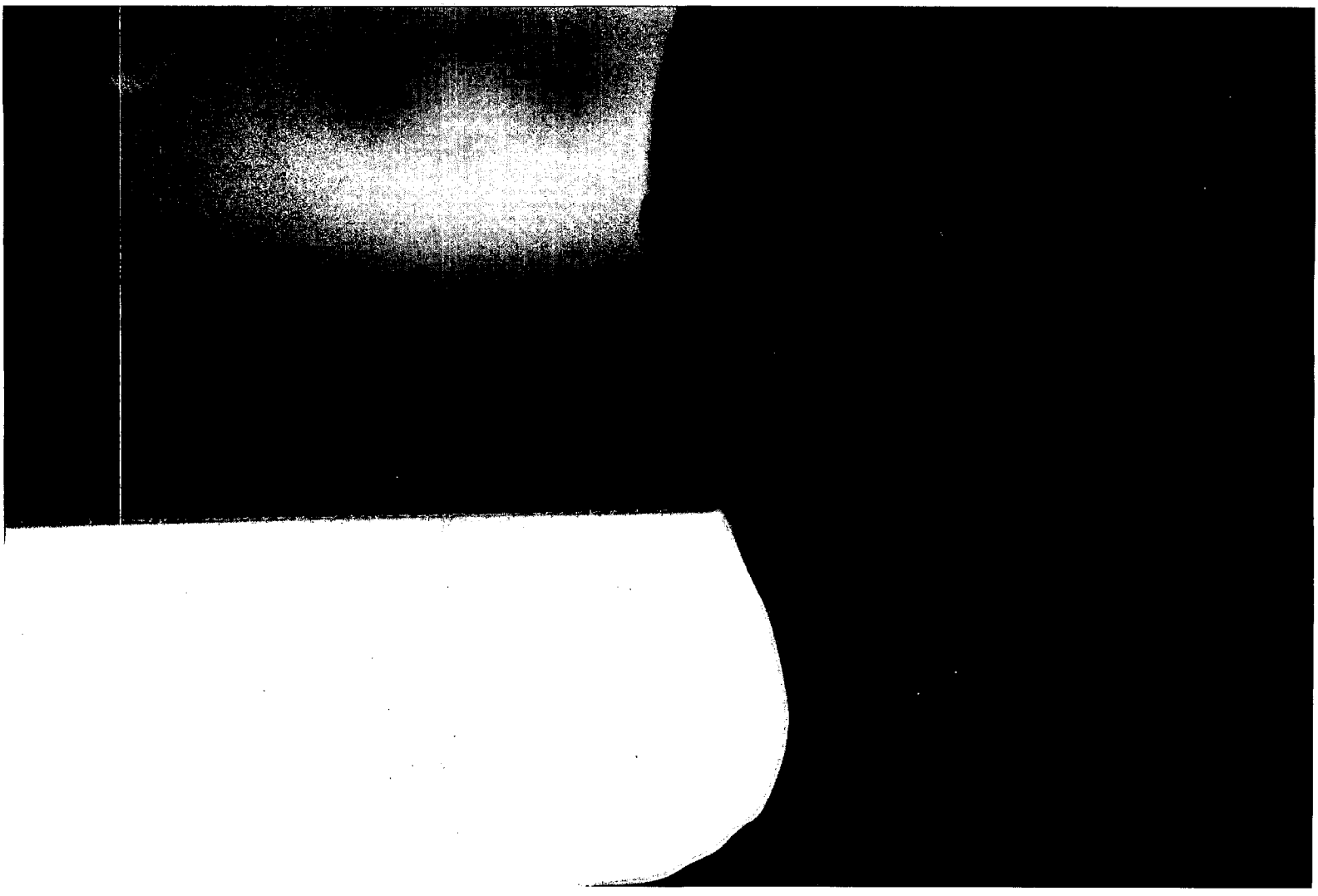

Exhibit # 6

CHAPTER 2013-107

House Bill No. 7015

An act relating to expert testimony; amending s. 90.702, F.S.; providing that a witness qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion as to the facts at issue in a case under certain circumstances; requiring the courts of this state to interpret and apply the principles of expert testimony in conformity with specified United States Supreme Court decisions; subjecting pure opinion testimony to such requirements; amending s. 90.704, F.S.; providing that facts or data that are otherwise inadmissible in evidence may not be disclosed to the jury by the proponent of the opinion or inference unless the court determines that the probative value of the facts or data in assisting the jury to evaluate the expert's opinion substantially outweighs the prejudicial effect of the facts or data; providing an effective date.

WHEREAS, the Supreme Court of the United States in Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993) replaced the standard for expert testimony in all federal courts that was first articulated in Frye v. United States, 293 F.2d 1013 (D.C. Cir 1923) with a new standard that is known as the Daubert standard, and

WHEREAS, the United States Supreme Court has subsequently reaffirmed and refined the Daubert standard in the cases of General Electric Co. v. Joiner, 522 U.S. 136 (1997) and Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999), and

WHEREAS, Florida's Evidence Code is generally patterned after the Federal Rules of Evidence,

WHEREAS, Rule 702 of the Federal Rules of Evidence, applicable to all federal courts, was amended in 2000 to reflect the holdings in Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993), General Electric Co. v. Joiner, 522 U.S. 136 (1997), and Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999), and

WHEREAS, as result of the 2000 amendment, Rule 702 of the Federal Rules of Evidence provides that:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

(a) The expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) The testimony is based on sufficient facts or data;

(c) The testimony is the product of reliable principles and methods; and

(d) The expert has reliably applied the principles and methods to the facts of the case, and

WHEREAS, by amending s. 90.702, Florida Statutes, to pattern it after Rule 702 of the Federal Rules of Evidence as amended in 2000, the Florida Legislature intends to adopt the standards for expert testimony in the courts of this state as provided in Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993), General Electric Co. v. Joiner, 522 U.S. 136 (1997), and Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999), and to no longer apply the standard in Frye v. United States, 293 F.2d 1013 (D.C. Cir 1923) in the courts of this state, and

WHEREAS, by amending s. 90.702, Florida Statutes, the Florida Legislature intends to prohibit in the courts of this state pure opinion testimony as provided in Marsh v. Valyou, 977 So.2d 543 (Fla. 2007), NOW, THEREFORE,

Be It Enacted by the Legislature of the State of Florida:

Section 1. Section 90.702, Florida Statutes, is amended to read:

90.702 Testimony by experts.—If scientific, technical, or other specialized knowledge will assist the trier of fact in understanding the evidence or in determining a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify about it in the form of an opinion or otherwise, if:

(1) The testimony is based upon sufficient facts or data;

(2) The testimony is the product of reliable principles and methods; and

(3) The witness has applied the principles and methods reliably to the facts of the case; ~~however, the opinion is admissible only if it can be applied to evidence at trial~~.

Section 2. Section 90.704, Florida Statutes, is amended to read:

90.704 Basis of opinion testimony by experts.—The facts or data upon which an expert bases an opinion or inference may be those perceived by, or made known to, the expert at or before the trial. If the facts or data are of a type reasonably relied upon by experts in the subject to support the opinion expressed, the facts or data need not be admissible in evidence. Facts or data that are otherwise inadmissible may not be disclosed to the jury by the proponent of the opinion or inference unless the court determines that their probative value in assisting the jury to evaluate the expert's opinion substantially outweighs their prejudicial effect.

Section 3. This act shall take effect July 1, 2013.

Approved by the Governor June 4, 2013.

Filed in Office Secretary of State June 4, 2013.