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# Computer Generated Visual Evidence:

The Future is Now

By William M. Worden

As the Florida Court of Appeal observed in *Pierce v State*, 718 So.2d 806, 808 (Fla. Dist. Ct. App. 1998),<sup>1</sup> civil litigants have used computer animations in the courtroom for reconstructing car and truck collisions, plane crashes, construction equipment and industrial accidents, and patent litigation. In recent years, computer-animated visual evidence has been used increasingly in criminal cases throughout the United States.

Michigan criminal jurisprudence recently joined this growing trend.<sup>2</sup> In *People v Bulmer*, 256 Mich App 33; 662 NW2d 117 (2003), the Michigan Court of Appeals affirmed the defendant's conviction of second-degree murder. The *Bulmer* case involved the propriety of showing the jury a computer-animated slideshow simulation, used to demonstrate what happens to a child's brain during a shaken baby episode. The Court of Appeals concluded that the prosecutor offered the slideshow simulation solely as demonstrative evidence under MRE 702 and 703, not to show specifically what happened to the victim, but to illustrate the effect of shaking a baby, and to explain the testimony of a prosecution expert witness.

The *Bulmer* Court held that demonstrative evidence is admissible when it aids the fact-finder in reaching a conclusion on a matter that is material to the case. Demonstrative evidence must be relevant and probative. When evidence is offered not in an effort to recreate an event, but as an aid to illustrate an expert's testimony regarding issues related to the event, there need not be an exact replication of the circumstances of the event.

While there are a few cases that uphold the use of demonstrative exhibits, e.g., *People v Castillo*, 230 Mich App 442, 444; 584 NW2d 606 (1998), there was no reported Michigan decision that considered the use of computer-generated visual evidence. The *Bulmer* decision assists the bench and bar of this State because it illustrates that demonstrative evidence can include computer animations when offered for a proper purpose and with proper instructions to the jury.

After reviewing the slideshow, the *Bulmer* Court concluded that it simply demonstrated what the expert witness, a pathologist, described in her testimony. Defendant did not object to the doctor's testimony that described in detail the shaken-baby syndrome. The trial court also clearly advised the jury that the slideshow was a demonstration and not a reenactment of what happened to the victim. The brief slideshow was relevant and probative in refuting defendant's claim that he only "gently" shook the victim.

The slideshow illustrated the doctor's testimony regarding a material issue relating to the case, i.e., whether defendant gently or severely shook the victim.

Other states have allowed computer-generated visual evidence to be viewed by juries in criminal cases. In *Gosser v Commonwealth*, 31 S.W.3d 897 (Ky. 2000), the Supreme Court of Kentucky considered the admission of computer-generated visual evidence, which it abbreviated as CGVE. A *Pulaski* Circuit Court jury convicted defendant Gosser of wanton murder for firing a gun into a crowd that had gathered to watch a fight involving the defendant's acquaintance and another man who was defendant's enemy. The *Gosser* Court, at 901, wrote: "The use of computer-generated graphics and animation as evidence is a growing trend in the Commonwealth, as it is in courtrooms all across the land. Heretofore, this Court has not addressed any of the many issues concerning the admission of this type of evidence. However, there is a growing body of case law and law review articles concerning these issues."

As the Kentucky High Court in *Gosser* explained, CGVE is usually divided into two broad categories: (1) demonstrative; and (2) substantive. *Id.*, at 901-902. Demonstrative CGVE usually consists of still images or animation, which merely illustrates a witness's testimony. Substantive CGVE usually consists of computer simulations or recreations, which are prepared by experts and which are based on mathematical models in order to recreate or reconstruct an incident or event. The standard of admissibility depends on how the CGVE is categorized.

This situation is much like Kentucky's approach to the introduction of photographs. Photos are most commonly admitted into evidence as demonstrative evidence on the theory either that they are merely a graphic portrayal of oral testimony or that a qualified witness adopts the photograph as a substitute for words. When a photograph is used as demonstrative evidence, the witness need not be the photographer, nor must he have any personal knowledge of the time, method, or mechanics of the taking of the photographs. The witness is only required to state whether the photograph fairly and accurately depicts the scene about which he is testifying.

While classifying a particular type or piece of CGVE as either "demonstrative" or "real" might be helpful as a starting point, the question of admissibility is ultimately determined under the rules of evidence. The admissibility of computer-generated diagrams, like those at issue in the *Gosser* case, are analyzed the same as diagrams drawn

by hand or photographically created. The *Gosser* Court found that computer-generated diagrams have to be relevant (Rule 402); are subject to exclusion (Rule 403); are subject to the trial court's discretion over the mode and order of the presentation of evidence (Rule 611); and have to be authenticated by testimony of a witness who has personal knowledge of the diagram's subject matter and the diagram is accurate (Rule 901). Because a computer-generated diagram, like any diagram, is merely illustrative of a witness's testimony, its admission normally does not depend on testimony as to how the diagram was prepared, e.g., how the data was gathered or inputted into the computer. Where a diagram purports to contain exact measurements, to be drawn to scale, etc., then testimony as to how the data was obtained and inputted into the computer would be relevant and could be necessary to the admission of the diagram.

In *Gosser*, the computer-generated exhibits were introduced through the testimony of a detective who lacked personal knowledge of the most relevant parts of the diagrams' subject matter. The detective's testimony, as illustrated in the diagrams, concerning where persons were located at the time of the shooting was based on hearsay and should not have been admitted, but the Kentucky High Court ruled that the error was harmless because other witnesses sufficiently authenticated the diagrams. The Kentucky Supreme Court did not believe that the result in *Gosser* would have been any different had the diagrams been properly introduced through the witnesses who were present at the scene of the shooting rather than through the detective.

In *State v. Farner*, 2000 WL 872488 (Tenn. Crim. App. 2000), the Tennessee Court of Criminal Appeals held that the computer-generated videotape of a multi-vehicle, fatal crash was inadmissible. Defendant appealed his negligent homicide and reckless endangerment convictions in this case, which involved drag racing. A police officer testified as an expert in accident reconstruction. He gave a copy of his report and photographs of the scene to a college professor who created a computer-generated visualization of the crash. The professor testified as an expert in computer visualization. He said that a visualization is based upon information from an expert whereas a simulation or reconstruction uses the laws of physics to recreate exactly what happened physically. The prosecution played the visualization for the jury. The visualization showed the accident from five viewpoints: an overview; defendant's Camaro; and separate views from the other three vehicles containing the four victims.

The admissibility of a computer-generated depiction of a witness's testimony was an issue of first impression in this Tennessee Court of Criminal Appeals case. The Tennessee appellate court observed that other jurisdictions addressing the admissibility of a computer-generated videotape differed in their analysis based upon whether they viewed

the videotape to be demonstrative evidence or a scientific experiment or test. Courts and commentators make the distinction between a computer-generated animation, which illustrates a witness's testimony and is demonstrative evidence, and a computer simulation, in which one enters scientific or physical principles and data into a computer program, which analyzes the data and draws a conclusion from it. *Farner, supra*.

The Tennessee appellate court further observed that jurisdictions viewing the computer-generated videotape as merely illustrating the expert witness's testimony require only that the animation meet the rules of admissibility for demonstrative evidence and do not delve into the reliability of the underlying computer program. In *Farner*, the college professor used the computer to illustrate the officer's reconstruction of the crash and not to reconstruct the crash itself. The Tennessee Court believed that the videotape was demonstrative evidence illustrating the officer's testimony. But, the trial court erred in admitting the visualization because it failed to meet the foundational requirement that it be a true and accurate portrayal of the accident it sought to depict under Rule 901(a).

The visualization's depiction of the defendant's Camaro was speculative; the officer testified he could not calculate the Camaro's speed because it left no yaw marks or skid marks at the scene. The college professor testified that the crash could have occurred either behind the undamaged Camaro, as depicted in the visualization, or in front of the defendant's car. The fact that these two possibilities exist coupled with a lack of physical evidence from the Camaro at the scene and witnesses to the accident itself made the visualization's portrayal of the Camaro's actions speculative. The trial court erred in admitting the visualization because no evidence existed that its portrayal of the actions of the Camaro were a true and accurate depiction of the events in question, although it showed the Camaro going at a particular rate of speed. Nevertheless, the Tennessee appellate court believed that the admission of the videotape was harmless because, considering the record as a whole, the judges could not conclude that the error more probably than not affected the judgment.

In *State v. Bauer*, 598 NW2d 352 (Minn. 1999), Dr. Dan Davis, M.D., testified and his expert opinion was illustrated by a graphic poster showing the defendant's leg brace matched to scale with a mark on the murder victim's leg. Dr. Davis, the Hennepin County Medical Examiner in Minneapolis, Minnesota, produced "Mechanism of Shaken Baby Syndrome," which was the demonstrative evidence involved in Michigan's *Bulmer* decision. In *Bauer*, the Minnesota Supreme Court held that such a graphic demonstration was admissible because it simply illustrated the expert's opinion, which was supported by sufficient evidence in the case.

Authorities found defendant's estranged wife on the living room sofa bed with a telephone cord and a metal coat hanger wrapped tightly around her neck. In addition to the injuries caused by these ligatures, investigators observed multiple soft tissue injuries on the victim's face, neck, chest, and hands, and an L-shaped abrasion on her left calf. In the course of their investigation, police also seized leg braces that belonged to defendant, who had polio as a child and needed the braces to walk.

During the autopsy, the coroner observed and photographed an L-shaped abrasion on the victim's left calf that had been inflicted near the time of her death. After the autopsy, the coroner compared the scaled photograph of this abrasion to the hinges of the right leg braces seized from defendant. From this comparison, the coroner concluded that either defendant's brace or one of similar configuration and manufacture caused the L-shaped abrasion.

The state offered the testimony of Dr. Davis, who like the coroner, compared the hinges on the defendant's right leg braces to the autopsy photograph of the L-shaped abrasion on the victim's left calf. In connection with Dr. Davis' testimony, the state sought to introduce a computer-generated 26 inch by 36 inch "poster" made by Dr. Davis that showed a scaled comparison of the hinge on defendant's leg brace and the L-shaped abrasion on the victim's calf. Claiming that the state had failed to lay sufficient foundation to establish the poster's credibility and validity, the defense objected to the use or admission of this poster.

Dr. Davis' poster was not admitted as substantive evidence that defendant's brace caused the abrasion on the victim's leg. Rather, the poster was used only as illustrative evidence to assist Dr. Davis in explaining his independent comparison of the actual brace hinge to the autopsy photograph of the L-shaped abrasion.

Dr. Davis actually placed defendant's brace on the autopsy photograph. Both he and the coroner testified that such comparisons are a common practice among medical examiners seeking to determine the cause of an injury. In subsequently creating the poster, Dr. Davis used rulers and scales to ensure that size and proportion were depicted accurately. Dr. Davis verified, from first-hand knowledge, that the image depicted on the poster was a substantially accurate representation of the important elements of his independent comparison of the brace hinge and the autopsy photograph. The Minnesota Supreme Court held that Dr. Davis, a competent and knowledgeable witness, laid the proper foundation to use the poster to illustrate his testimony concerning that independent comparison. Because the trial court did not receive the poster as substantive evidence of a scientific or medical fact, the Court found that it need not decide whether the proper foundation was laid to admit the poster for such purposes.

Defendant argued that the poster should have been

excluded under Rule 403 because its probative value was substantially outweighed by the danger of unfair prejudice. Specifically, defendant argued that the jury may have been misled into believing that the poster was actually a photograph of the brace hinge placed on the victim's leg. The trial court could have helped clarify the issue by instructing the jury on the illustrative nature of the poster. But, on direct examination, Dr. Davis testified at length as to how the poster was created and what it depicted. With extensive cross-examination and in closing argument, the defense had ample opportunity to, and did, point out the relative weaknesses of the image depicted on the poster. The trial court's ruling excluding the poster from the jury deliberation room largely alleviated any danger that the poster would be used in a context other than to illustrate Dr. Davis' testimony. The Minnesota Supreme Court held that the probative value of the poster was not outweighed by the danger of unfair prejudice.

*State v Harvey*, 649 So. 2d 783 (La. Ct. App. 1995), a Louisiana Second Circuit Court of Appeals case, involved a police officer accused of shooting his wife in their home. The couple's two young sons were watching television in another room and did not witness the shooting. The central issue of this case was whether the defendant shot his wife in self-defense.

Defendant, *inter alia*, contended that the Caddo Parish trial court erred in admitting into evidence computer-generated, still animations depicting the shooting incident and the placement of the victim's body. The Caddo Parish coroner testified that three of the four animations accurately depicted his conclusions as to the sequence of the three shots fired at the victim. The fourth animation depicted the position of the victim's body in relation to the clothes dryer and freezer in the laundry room. This animation also accurately showed where a .22 caliber revolver was found, under the victim's right armpit. Defendant shot his wife with a 9 mm Glock handgun issued by the Shreveport Police Department.

Defendant objected that the animations could be inflammatory. He argued that by admitting these exhibits, the state was introducing into evidence the coroner's conclusion of how the incident occurred. The state argued that the animations illustrated the positions of the victim and the defendant and the path of the bullets. There was no blood depicted. After determining that the animations were demonstrative of the coroner's testimony, the trial court overruled the defendant's objection and admitted the animations.

The appellate court found that the trial judge did not err in admitting the animations into evidence. The coroner conducted the autopsy on the victim. Qualified as an expert witness in forensic pathology, the coroner concluded that the first shot went through the victim's elbow as she

turned, which twisted her to the side. That first bullet then re-entered the right side of her abdomen and exited her right lower back. The second shot entered her left breast and again turned her to the side. The third shot was fired at extremely close range (within inches) and grazed her right hand before striking her in the middle of the chest. The downward angle of the last two bullets indicated that the victim was either bent over or on her knees when they were fired. The coroner offered his expert opinion that the victim was not holding anything in her right hand when she was shot and that it was impossible for her to have been reaching for a gun at that time.

The animations had strong probative value, providing a visual demonstration of the shooting as described by the coroner. The jury was aware that the coroner did not witness the shooting and that his testimony was based upon the autopsy and tests he performed. The jury could weigh this factor when considering the animations, which illustrated the coroner's version of how the shooting most likely occurred. Thus, they enhanced the jury's understanding of the autopsy report and pictures as to the direction of the bullets and the position of the shooter.

In *Mintun v State*, 966 P.2d 954 (Wyo. 1998), the Wyoming Supreme Court considered whether the trial court properly admitted a computer animation of the automobile crash that killed the victim. The defendant was charged with aggravated homicide by vehicle. Both the victim and defendant were ejected from the vehicle during the crash. Seriously injured, the victim had no recollection of the crash or prior events leading up to the crash. The only issue at trial was who was driving the car when it crashed. The jury determined the defendant was driving, and found him guilty.

A police sergeant investigated the accident. None of those who stopped to assist witnessed the crash. At trial, the sergeant testified about his investigation and crash reconstruction. The State used a computer-generated video animation of the accident as a demonstrative exhibit during the sergeant's testimony. The animation showed the accident from three different vantage points: a top, or helicopter view; a side view; and what was termed the witness view.

The animator responsible for creating this exhibit testified that he used measurements and other information provided by the sergeant, and the animation was intended to present the sergeant's reconstruction of the crash from the three different vantage points.

The "witness view" was intended to present what the sergeant believed an eyewitness would have seen from Nathaniel Huff's vantage point. Huff, an eyewitness to the crash who did not come forward until shortly before trial, testified that he saw defendant ejected from the passenger side of the car, and that he saw the victim gripping the steering wheel while the crash was in progress.

The "witness view" was inconsistent with Huff's testimony, showing the car spinning before Mintun was ejected. The sergeant explained his theory that, although Huff accurately placed the point and time of ejection, Mintun was actually ejected from the driver's side after the car had spun around.

The Wyoming Supreme Court had not previously considered the admissibility of a computer-generated animation. However, the Court saw no reason to depart from long-standing rules of evidence in determining whether such an exhibit was admissible. Evidence is admissible when it is authenticated, relevant, and not subject to an exclusionary rule. Under Rule 901(a), authentication is accomplished by showing that the evidence in question is what its proponent claims. The State offered the computer animation to show the sergeant's reconstruction of the crash from three vantage points, including the point at which Huff watched it occur. The animator's testimony as to how the animation was created, combined with the sergeant's testimony on the methods used in reconstructing the accident and his intent to show only his reconstruction, not Huff's version, were sufficient to authenticate this exhibit. The Wyoming Supreme Court wrote: "Joining those jurisdictions which hold that an animated reconstruction of an accident is admissible so long as it does not offend the rules of evidence, we find no abuse of discretion in the admission of such evidence here." *Id.*, at 959.

In *People v Hood*, 53 Cal App 4th 965; 62 Cal Rptr 2d 137 (1997), the California Court of Appeal reviewed a first-degree murder conviction based, in part, upon a computer animated re-enactment of the crime. The California appellate court held there was no abuse of discretion by the trial court, which determined that the probative value of the prosecution's computer animation outweighed the animation's prejudicial impact. The animation was clinical and emotionless and the trial court gave an instruction that the animation was only an aid based on particular interpretations of the evidence.

The defense contended that the victim had threatened Hood beforehand and was in the process of pulling out a gun when Hood shot him in self-defense. The prosecution based its computer animation of the shooting upon information supplied by Hood's secretary and the detective who did measurements at the scene, and on reports and opinions of the pathologist who performed the victim's autopsy, prosecution ballistics and gunshot residue experts. The trial court ruled that the animation was illustrative, similar to an expert who draws on a board, and was not being introduced as evidence in and of itself, but only to illustrate the testimony of various prosecution experts. The defense introduced its own computer animations of the shooting at both of defendant's trials. Hood's first trial resulted in a hung jury.

Before the prosecution's computer animation was played at defendant's second trial, the judge instructed the jury that the computer animation was nothing more than an expert opinion being demonstrated or illustrated by the computer animation, as opposed to charts and diagrams. The trial judge further instructed jurors that all of the animated video re-enactments or re-creations were only designed to be an aid to testimony or reconstruction, the same as if an expert testified and drew certain diagrams on the board. They were not intended to be a film of what actually occurred or an exact re-creation.

The California Court of Appeals agreed with the trial court's ruling. The prosecution and defense computer animations were tantamount to drawings by the experts from both sides to illustrate their testimony. Given the nature of the testimony at trial as to how the prosecution's animation had been prepared, the introduction of the defense's contradictory animation and the instructions given the jury concerning both animations, there was no danger that the jury was swept away by the presentation of a new scientific technique, which it could not understand and, therefore, would not challenge. Addressing defendant's contention that the trial court abused its discretion in determining that the probative value of the prosecution's computer animation outweighed its prejudicial impact, the California Court found that the animation was clinical and emotionless. This fact, combined with the instruction given jurors about how they were to utilize both animations, persuaded the appellate court that the trial court did not abuse its discretion.

This cursory survey of American criminal jurisprudence reveals that Michigan practice and procedure mirrors other states regarding the admission of computer-generated visual evidence. American humorist Mark Twain once expounded on the importance of evidence to forming an opinion: "I think there is no sense in forming an opinion when there is no evidence to form it on. If you build a person without any bones in him he may look fair enough to the eye, but he will be limber and cannot stand up; and I consider that evidence is the bones of an opinion." So it goes with CGVE. If computer-generated visual evidence illustrates your expert witness' testimony, it will make your argument stand up, even under the closest appellate scrutiny.

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#### Endnotes

- <sup>1</sup> In *Pierce v State*, *supra*, defendant's pickup truck hit three children, killing one, while they were walking through a residential neighborhood. Without stopping, defendant fled in his pickup. Convicted, *inter alia*, of vehicular homicide, defendant objected to the admission of a computer-generated animation that illustrated the lead investigator's reconstruction of the accident and was published to the jury as a demonstrative exhibit. The Florida Court of Appeal, Fourth District, found the animation was properly admitted as a demonstrative exhibit because a proper foundation was established, the facts or data on which the expert relied in forming the opinion expressed by the computer animation was of a type reasonably relied upon by experts in the subject area, and the computer animation was a fair and accurate depiction.
- <sup>2</sup> For an excellent discussion of how the Michigan Rules of Evidence work in conjunction with computer data, cf. Norman C. Ankers & Ronald S. Longhofer, *Computer-Based Evidence Under the Michigan Evidence Rules*, 78 Mich. B.J. 678, July 1999 at 685.