Use and Admissibility of High Definition Video Visibility Studies, Computer Animations and Computer Simulations[†]

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I.
Introduction

Persuasion of a jury to your client's point of view is the ultimate goal in any trial. The use of compelling, "knock-your-socks-off" exhibits can make your case on its own and persuade a jury far beyond any words you might use in closing argument. Visual presentations can be especially persuasive to show your client's version of the truth. This article will discuss the use, admissibility and considerations involved in several types of visual presentations.

High definition (HD) video visibility studies employ cutting edge technology to depict the conditions that were available to be seen by a plaintiff, driver or other witness with normal, unimpaired vision under conditions that are substantially similar to those existing at the time of an incident. HD video provides stunning realism and clarity of a scene, which can give a jury a very persuasive "you are there" perspective. With a proper scientific and foundational background, a jury can be presented with a life-like and realistic perspective of what the actual actors in an incident could or should have seen.

Computer animations and computer simulations can also be used with telling effect to present to a jury either a point of view or an expert opinion as to the events in an accident. A computer animation is usually considered to be a mere demonstration or illustration of

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what a particular expert's accident reconstruction opinions are. A computer simulation, on the other hand, utilizes a computer program employing the laws of physics and computer calculations to assist the expert in actually determining what occurred in an accident. As such, a computer simulation is part of the analytical process of generating an expert's opinion and must more rigorously adhere to considerations regarding scientific evidence than visibility studies or computer animations.

II.
Types of Visual Presentation Evidence

A. *High Definition Video Visibility Studies*

HD video has long been used to provide a very realistic viewpoint and perspective, not subject to the charge that it is simply "made up." Visibility studies have also been used to depict what a witness or plaintiff could see. With the proper foundation, an expert can testify

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that a given video, viewed at a given distance, accurately represents the actual view and perspective of a person in the plaintiff's or witness' position. Visibility studies have been used to demonstrate the perspective of drivers in automobile accidents, railroad crossing accidents, freeway accidents, premises accidents, and other situations where the claim of the plaintiff is, "I did not see it and it was not reasonable for me to perceive certain factors." Visibility studies can be very persuasive to establish that the conduct of a plaintiff was unreasonable if there was ample time to perceive a hazard and take proper precautionary actions to avoid a hazard.

Proper foundational expert testimony must be used to lay the groundwork for admissibility of a visibility study. An expert must establish that there is substantial similarity to the various details. For example, the expert must explain that the same scene was involved; the same car, bicycle or train was involved; the perspective of the camera is the correct perspective correlating to the human eye; the screen for viewing is established at the proper distance to correlate with normal human vision; and the various details and factors of the

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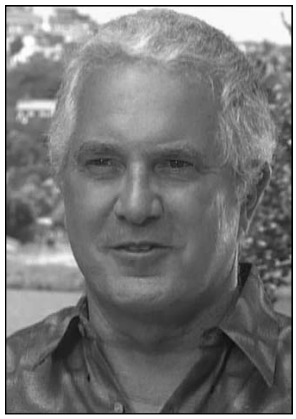
visibility study are substantially similar to the events in question or are otherwise supported by expert testimony.

The methodology for preparing a visibility study involves the coordination of testimony of experts in human factors, psychology, accident reconstruction engineering and engineering photography. The experts must determine the salient events and factors to be depicted for visibility, and then provide opinions as to what could have been seen. Such visibility studies thus focus upon the available lighting, the position of the sun at the time of the incident, the weather conditions, whether there is a night time scene and the various levels of visual acuity of the various witnesses. Calibrating night time visibility studies to control the level of detail depicted in a visibility study involves special problems in that the final video product of the study must be substantially similar to the viewing conditions at the scene. Such calibration can be done through the use of lighting measurements at the scene, color Polaroid photographs, and test shots, all designed to match appropriate visibility degradation in the video with the actual conditions as seen.

Motion picture film and still photograph film were superior to VHS video in the past. However, in recent years, HD video has been used with stunning effect. HD video has the same pixel count as 16 mm film but appears "sharper" because there is no grain. This difference is very significant in night time or low light level applications. Additionally, improved HD video systems allow better controls and calibration of brightness ranges, as well as



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adjustments to accurately depict and control the lighting conditions prevailing at an original accident scene for replication. For example, visual situations involving fog, sun glare, smoke, flames and other limiting conditions can be matched through the use of experts and other HD video techniques. Additionally, HD video's digital capabilities allow the interposition of computer generated images of an object, car or train onto the HD video presentation, which is equivalent to being able to "recreate" the scene. The use of computer generated objects in the HD video can enhance the persuasion factor of using such a technique.

Because HD video provides the realism of the actual scene, it can be far superior to computer animations, which may tend to appear cartoonish or rudimentary by comparison. Additionally, because juries have experience with video and consumer HD televisions, they may be more persuaded by an HD video as opposed to a computer animation. Computer animations can be criticized for limiting certain variables and unfairly emphasizing other variables. HD video, on the other hand, when taken at the scene under substantially similar lighting conditions, will show exactly what was available to be seen—warts and all. HD video is thus much less susceptible to a claim that the video has somehow been doctored or only certain elements have been included.

An example of the efficacy and persuasiveness of HD video can be seen in a case study done by one of us, Paul Kayfetz, that involved a catastrophic motor vehicle accident in dense fog. During daylight hours, a passenger car was proceeding in a low, dense fog that

caused the ground to become moist. The car struck the side of a tractor/trailer, which was pulling forward from a stop sign across the path of the car. Immediately after the collision, the driver of the big rig, standing at a known position on a traffic island, took a series of photographs looking down the length of his rig and a stretch of the road. The rear of his rig and various street signs disappeared in the fog at ascertainable distances. The police, who arrived within minutes, backed away from a particular sign along the path of the passenger car and measured that it disappeared in the fog at 120 feet.

In the subsequent litigation, HD video was taken with a 90 degree horizontal angle of view from the driver's position in an identical car on a sunny day following the path leading to collision. Separately, a topographic survey of the intersection and the approaching highway was used to create an accurate scale "universe" of the accident scene in the computer. A three dimensional scale model of the particular big rig involved in the accident was built in the computer and rendered photo-realistic using photographs of the accident vehicle. A three dimensional "fog program" was then used to generate the same density of fog as measured by the investigating officers and corroborated by the accident-time photographs. The driver's-eye HD video was "camera matched" frame-by-frame with the computer universe of the accident scene using a program that photogrammetrically tracks dozens of landmark features appearing in the video. The big rig was caused to accelerate in the computer from the stop sign through the point of impact as the car arrived at the collision point—consistent with both the reconstruction analysis and crash tests done by various experts involved in the case. The resulting driver's-eye visibility study showed the fog-filled scene through the entire front windshield in a manner substantially similar to the scene measured and photographed by witnesses minutes after the actual accident.

Another case study done by Mr. Kayfetz using HD video involved a wind-driven grassfire adjacent to an interstate highway. The fire was a factor in multiple collisions and deaths. The appearance of the fire and smoke to approaching drivers in different vehicles at various times over several miles was an issue in the case. Lines-of-sight over a crest on the approach were also issues. HD video was taken from several big rigs, a school bus and a witness truck approaching the fire/collision scene on the paths and at speeds consistent with witness testimony. Video was also taken from each, illustrating moderate deceleration to a stop on the shoulder after topping the last crest before reaching the fire. Finally, video was taken from numerous witnesses' positions looking at the fire area from various directions.

A three-dimensional "universe" composed of the huge fire and smoke plume as it progressed across many acres and during some ten minutes was prepared. (The size of the file was more than 100 gigabytes!) The file was based on some of the following components: high resolution aerial photomaps, aerial and ground photographs of the burned area, extensive topographic surveys, three still photos showing the smoke and flames, photogrammetry locating the flame front, smoke position and height, field sampling, fuel testing, computer modeling and a fire/smoke progress report by a fire scientist, and the integration of information from written statements and deposition transcripts of dozens of eye witnesses who viewed the fire and smoke from different directions.

The elegance of the three-dimensional computer universe of the fire/smoke is that any viewpoint can be "dialed in." The view from a witness' position can be rendered, the resulting moving video image shown to the witness, and the entire universe modified if necessary, based on the response. This process can be repeated with various witnesses until a consensus universe still consistent with the physical evidence is achieved. Once the computer universe has been conformed to the physical evidence and the best consensus of witness' testimony, the driver's eye HD videos are composited with the computer universe of the fire/smoke to show photo-realistically what it looked like to a given driver at the time he was approaching from seven miles away and driving into and through some quarter-mile of smoke and adjacent flames. Video fire/smoke composites from various witness viewpoints, along with related still "video captures" also assist in foundation testimony for admissibility.

B. *Computer Animations*

Computer animations, in the proper context, can also be extremely effective persuasion tools. Animations can be used to highlight and emphasize certain aspects of a situation. Animations can also be used to explain general principles and processes. Computer experts have developed numerous different computer programs and CAD programs to demonstrate the testimony or opinions of expert witnesses, such as accident reconstruction or human factors engineers. Some computer animation programs utilize substantial data gathering techniques by laser surveys or other three dimensional data gathering to depict a number of landmarks or other salient features of a landscape or accident scene. Computer animations can be less expensive than HD video but also have more limitations. Animations prepared by particular computer programs can be used to show different perspectives of a particular scene. For example, in one particular program, after the scene is mapped with laser survey equipment and cars and other motor vehicles are then placed into the scene, the computer program allows different perspective views from either a point trailing the cars in question, from the driver's eye view of a particular car, or even from an overhead view. Such computer animations can be more persuasive than simple still photographs, normal VHS videotapes or other consumer type videotapes.

Generally, animations are a visual medium with which many people are familiar. An animation is generally regarded as a visual display of information about events or processes—it is not a scientific presentation. An animation can be used to demonstrate both general principles as well as a wide range of angles, perspectives, speeds, and emphasis to increase the viewer's understanding of events that occurred. For example, an animation can illustrate events that occurred inside a piece of machinery while it is operating—something that could not be shown by film or video.

The most important aspect in the production of a good animation is to appropriately model the scene, objects or product to be depicted. If the model strays too far from the actual object or scene, it will not be regarded as substantially similar and may be excluded. The model must look and act as a fair and accurate representation of the objects in question. Exaggerations or out of scale proportions are generally unacceptable. Animations can utilize

different colors to highlight and affect critical elements of the presentation. It is acceptable to change colors in order to highlight or differentiate parts during an animation. However, the use of different colors that stray from the actual objects or scene in question can provide a basis for exclusion.

Lighting and perspective are also important in establishing the admissibility and validity of a particular animation. If the perspective differs from what a human eye could see, the animation will be criticized as not being fair and accurate. The amount of realism utilized in an animation is very important. Cartoon-like images should be avoided in animations because they send a secondary message that it is made up or is not important. However, utilizing too many "realistic" effects can have an unintended consequence of making a jury think that the animation is too slick or too contrived beyond what is necessary. Sometimes, an animation can have too much emotional content, such as showing blood or a purported victim evincing dismay. In general, emotion in an animation will be a ground for exclusion, especially if there is no basis for injecting emotion into a particular presentation. This can lead to a claim that the animation is more prejudicial than probative.

C. *Computer Simulations*

A computer simulation typically involves the recreation of an event or an experiment based on scientific principles and data. Computer programs such as EDSMAC, EDSCRASH and others have been developed in the last thirty years and have commonly been used by accident reconstruction experts. The central feature of computer simulations is that they receive input for certain variables, such as vehicle weight, speed, inertia, coefficient of friction, drag, skid factors, gravity and vehicle crush data. Once these factors are inputted, the computer program then runs a number of scenarios that attempt to fit the various data to a best case scenario or number of best case scenarios. The expert makes determinations as to values and the entry of data, but the computer program, in fact, comes up with an analysis and thus becomes a "witness" in determining whether a particular "fact" is an issue, is true and has independent evidentiary value. Because the program accomplishes the mathematical calculations that an expert would have to normally do, such programs are an integral part of the accident reconstruction expert's analysis. The computer program thus utilizes high speed calculating abilities to eliminate unworkable scenarios and to narrow down possibilities.

Use of a computer simulation is different from a computer animation. A computer animation program usually does not have to follow the laws of physics and is simply an illustration. Because the validity of the analysis prepared by the computer simulation depends upon scientific principles, such simulations are treated like other scientific evience and are evaluated under a *Daubert* or *Frye* test to determine admissibility. The underlying scientific or physical principles involved and the validity of the computer program to utilize such scientific principles must be validated through a witness. Beware of computer animations or illustrations that purport to be simulations, but are simply artistic renderings of a theory.

III.
Admissibility Considerations

A. *Demonstrative Evidence*

Both HD video visibility studies and computer animations are generally considered to be demonstrative evidence because they merely illustrate and present the theories and testimony of an expert witness, which could otherwise be given even without such visual presentation. Computer animations can also be admitted simply to illustrate general principles or general scientific theories that can be used for educational value. These general types of presentations—as opposed to presentations that purport to show what actually happened in an accident or situation—enjoy a relaxed standard of admissibility.

As demonstrative evidence, a computer generated animation does not depend upon the proper application of scientific principles for its validity. It is most often used and found admissible when illustrating an expert's testimony as to how an event occurred. The reliability of the animation is completely dependent upon the expert's testimony and credibility. The general foundation requirements for admissibility of a computer animation are (1) authentication; (2) relevance; (3) fairness and accuracy; and (4) whether its probative value does not exceed its prejudicial value.

The standard for admissibility of an HD video visibility study or computer animation is thus generally less than the standard for admissibility of a computer simulation. Because a computer simulation is an analysis that involves the application of scientific principles and the physical properties of objects, the courts generally apply higher scrutiny to such presentations. However, while the admissibility requirements for visibility studies and animations are generally more relaxed than those for computer simulations, the persuasive factor of such studies may be even greater because it provides a particular point of view that is unfettered by any scientific principles.

In general, the basic method for admitting HD video visibility studies and computer animations is that one must establish fairness, accuracy and substantial similarity to the event in question. There must be a proper scientific and foundational basis laid to establish that the elements in the visibility study or animation are substantially similar to the elements that occurred at the time of the incident. In general, the courts apply an abuse of discretion standard to allow admissibility. Foundational declarations or affidavits of experts are generally necessary to establish that the expert has employed an appropriate scientific methodology and has used information that is derived from the case facts, documents, depositions or photographs. Declarations of experts should also be used to establish that the expert has derived his opinion from the materials provided and that the visibility study only illustrates or demonstrates the opinion of the expert. Attacks can be made on the admissibility of such presentations on the grounds that substantial similarity does not prevail or that elements have been distorted, over-emphasized or unfairly restricted to twist or manipulate the presentation.

The admissibility of HD video and computer animations often involves an argument over whether such studies are "recreations," "reconstructions," or "reenactments." Generally,

a visibility study or animation does not purport to be such a recreation of what a particular witness or plaintiff actually saw. Instead, such studies are simply an engineering tool intended to illustrate the testimony of percipient and expert witnesses and their opinions as to what a reasonable person could have seen and what was available to be seen at the time of the incident in question.

The astute lawyer will seek to obtain all foundational and expert-generated materials from the opposing side when confronted with either HD video, computer animations or computer simulations. Requests should be made for copies of all video tapes, out takes, preliminary runs, draft simulations, draft demonstrations, computer files, background files, etc. Many times, the foundational record used to generate the final product will disclose discrepancies, manipulation, or fudge factors, which can be used to criticize or even block the opposing side's materials. If foundational computer files are produced, you and your expert can attempt to recreate the other side's presentation using the same software, and then tweak their presentation to show the accident from your point of view or the points that favor your side.

B. *Daubert Considerations*

Evidentiary challenges to visibility studies, animations and computer simulations may also invoke the application of the *Daubert* standard for admissibility of scientific evidence. It is thus advisable for the practitioner to be aware of the *Daubert* standard and prepare his or her expert to meet that standard of admissibility.

The Supreme Court of the United States has held that Rule 702 requires a trial judge to "ensure that any and all scientific testimony . . . is not only relevant, but reliable."[1] The *Daubert* court emphasized, however, that in carrying out its "basic gatekeeping obligation," the trial court must apply a "flexible" Rule 702 standard.[2] In *Kumho Tire Co. v. Carmichael*[3] the Supreme Court again emphasized that the gatekeeping function is a flexible and common sense undertaking in which the trial judge is granted "broad latitude" in deciding both how to determine reliability, as well as the ultimate decision of whether the testimony is reliable. In particular, the trial court's determination of whether the expert is sufficiently qualified is accorded great deference.

Factors identified in the *Daubert* case as indicia of reliability include whether (1) the expert's opinions have been "subjected to peer review and publication," (2) the theory or technique enjoys "general acceptance" within a "relevant scientific community," (3) a

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[1] Fed. R. Evid. 702. Daubert v. Merrell Dow Pharm., 509 U.S. 579, 589 (1993).

[2] *Id.* at 593-94.

[3] 526 U.S. 137, 141-42 (1999).

"theory or technique in question can be (and has been) tested," (4) in respect to a particular technique, there is a high "known or potential rate of error" and, (5) whether there are "standards controlling the technique's operation."[4]

Consequently, it is important for the lawyer to attempt to have the expert prepared to testify that his or her opinions have been developed pursuant to scientific principles, that the exhibits illustrate those opinions, and that the opinions and the methodology used to reach such opinions have been subject to peer review and publication. It is also important to have the expert testify that the theories and techniques used to develop the exhibits enjoy general acceptance within a relevant scientific community such as national or international engineering societies. Another critical element under the *Daubert* analysis is to have the expert testify that the methodologies used to develop the opinions have been subjected to peer review and can be tested and recreated in the field. Finally, the *Daubert* standard can be met if the expert testifies that he employs standards to control the technique's operation in order to avoid high, known, or potential rates of error. When an expert testifies that rigorous methodologies were employed, with rechecks and recalibrations of measurements, such factors can, in fact, meet the *Daubert* standard.

C. *Cautionary Jury Instructions*

Generally, the courts have imposed the use of a cautionary instruction to the jury to admonish the jury that the "demonstrative evidence" is only illustrative of the expert's testimony and can be freely accepted or rejected in whole or in part. The failure to give such an instruction can be problematic on appeal.

In *People v. Hood*,[5] the court gave a fairly typical cautionary instruction as follows:

> [Y]ou're reminded that . . . this is an animation based on a compilation of a lot of different experts' opinions. And there are what we call crime scene [substitute, accident] reconstruction experts who could, without using a computer, get on the stand and testify that based on this piece of evidence and this piece of evidence and this piece of evidence that they've concluded that the crime [accident] occurred in a certain manner. And then they can describe to you the manner in which it occurred. And they can sometimes use charts or diagrams or re-create photographs to demonstrate that. And the computer animation that we have here is nothing more than that kind of an expert opinion being demonstrated or illustrated by the computer animation, as opposed to charts and diagrams.[6]

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[4] *Daubert*, 509 U.S. at 592-94.

[5] 62 Cal. Rptr. 2d 137(Ct. App. 1997).

[6] *Id*. at 139.

IV.
Practical Considerations

There are a number of practical aspects which must be considered before utilizing these types of evidentiary presentations. First, is the case sufficiently large to justify the cost? Because of the camera work and expert analysis involved, HD video visibility studies can be very expensive, costing tens of thousands of dollars. In order to establish substantial similarity for an HD video visibility study, often times the same scene must be used along with identical or substantially similar exemplar vehicles. Computer animations and simulations, while sometimes less expensive than HD video, can also be very expensive, costing thousands of dollars. Is the case a catastrophic injury involving the potential exposure of hundreds of thousands or even millions of dollars? Small value cases do not usually justify the use of this technology.

Second, will you be able to establish the foundational requirements for admissibility of the evidence? There must be sufficient evidentiary support documentation and discovery already in the case before you can begin to prepare either a visibility study, animation or simulation. A fair and accurate representation or substantial similarity can only be obtained if you and your expert are faithful to the facts that are already in the case. Developing such evidence prior to obtaining documents or testimony of witnesses runs the risk of establishing contradictory facts to your presentation, which can then result in exclusion of the presentation.

Third, is the presentation subject to criticism for being manipulative, exaggerated, overly dramatic, or overly emotional? One of the main objections to such evidence is that it is more prejudicial than probative under Rule 403. Consequently, it is important to avoid the appearance of manipulation or exaggeration. Additionally, because juries will question whether the presentation is a "fair" perspective, care should be taken to present a scrupulously objective animation or visibility study. Are the viewpoints, perspectives or final product made to scale, or not to scale? Otherwise acceptable presentations and exhibits can be subject to criticism for being misleading, if they are not done to scale or if they seek to exaggerate or overemphasize certain aspects of the situation or point being presented. If the exaggeration or emphasis is sufficiently large, the evidence may be excluded.

Fourth, can the visual presentation evidence be used against your client? Sometimes, evidence is not always helpful to your case. Lawyers must guard against being overly enamored with toys or expensive technologies that do not advance the objectives of the case.

Fifth, can your experts provide the necessary foundational and scientific basis to withstand even a *Daubert* challenge? Even where the evidence is proffered as only demonstrative evidence, with a lesser standard of admissibility, it is important to support your evidence with the *Daubert* considerations of scientific validity, reliability and peer review.

Sixth, always be sure to prepare and disclose your visual presentation evidence in a timely fashion. Because such evidence takes substantial time and effort to generate, it cannot be done at the spur of the moment or at the last minute without taking on some risk that it will not be done properly and will therefore be excluded—after substantial dollars have

been expended. When you have discovered flaws in the opposing side's evidence, the strategic question arises of whether to raise the objections prior to trial, or whether to attack the evidence at trial. There are pluses and minuses to both approaches. Attacking the evidence early may allow the other side to fix the problem and cure the defect. However, waiting to attack the evidence at trial may then allow the jury to see and be affected by the presentation evidence. If the persuasive value of the presentation is greater than the objections to scientific validity, it may be better to try to exclude the evidence altogether.

V.
Case Law Supporting Admissibility

A. *Admissibility of Films and Videotapes*

Demonstrations by a witness while testifying are admissible to illustrate the witness' testimony if conducted under substantial similar conditions to the matter at issue. Substantial similarity does not require that the conditions be absolutely identical.

Demonstrative evidence need not be authenticated further than to establish the fairness and accuracy of its portrayal.[7] Once a knowledgeable witness testifies that the illustrative or demonstrative exhibit generated by a computer or a visibility study fairly portrays a relative subject matter, the exhibit is considered to have been authenticated and may be received, without more, subject to Rule 403 regarding prejudice and probative value.

In *Black v. U-Haul Co.*,[8] a passenger in a rented moving truck was killed in a head-on accident with a tractor trailer. The court held that the defense expert's testimony and a computer animation illustrating his testimony regarding the actions of the truck driver, as well as videotape of driving tests conducted by a truck rental company employee were both admissible. The court held that the testing video was admissible for the limited purpose of illustrating a general principle, i.e., how a moving truck would handle and brake if a supporting nut was in a particular loose position. No abuse of discretion was found.

In *Montag v. Honda Motor Co.*,[9] a products liability action was brought against the automobile manufacturer after the car collided with a train. The contention was that the auto seatbelt had malfunctioned, enhancing the injury. The manufacturer introduced a videotape depicting a collision between a train and automobile for the limited purpose of demonstrating the physical forces at play in a train-automobile accident. The court allowed the videotape with a limiting instruction that the videotape was not intended to be "recreation" of the accident. The Tenth Circuit affirmed and did not apply a *Daubert* analysis.

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[7] Gregory P. Joseph, *A Simplified Approach to Computer-Generated Evidence and Animations*, 43 N.Y.L. Sch. L. Rev. 875, 886 n.19 (2000).

[8] 204 S.W.3d 260 (Mo. Ct. App. 2006).

[9] 75 F.3d 1414 (10th Cir. 1996).

In *Edwards v. Atro SpA*,[10] a worker was injured when a pneumatic nail gun accidentally discharged. The court held that a videotape demonstration of the plaintiff's opinion witness dealing with a trigger-only activation gun versus a contact-only activation gun was relevant and admissible even though the conditions shown in the videotape were different from those involved in the accident.

In *People v. Rodrigues*,[11] the California Supreme Court allowed a crime scene reconstruction video. The videotape was offered as demonstrative evidence to show the relative locations of the victim's apartment, the stairways, and the witness' vantage point as she saw the assailants flee the scene. Because the witness confirmed that the videotape accurately depicted the area where the witness was and where she saw the assailants, the videotape was a reasonable representation of such testimony.

In *Robinson v. Missouri Pacific Railroad Co.*,[12] the court allowed into evidence a videotape prepared by the plaintiff's expert, depicting the plaintiff's theory that the automobile entered a railroad crossing and was struck by a train. The railroad objected on the grounds that it omitted particular details and was an inaccurate recreation of the accident. The court gave a limiting instruction and noted that the videotapes were not offered as substantive evidence but only to illustrate the opinions of a witness and the principles involved.

In *DiRosario v. Havens*,[13] the court admitted a filmed reconstruction of an intersection accident. The reconstruction expert produced a videotape using eyewitness statements, police reports and his own visit. The reconstruction portrayed a pedestrian walking in a crosswalk while an automobile similar to the defendant's car approached the same intersection from the direction noted in the police report. A camera was placed in the vehicle at the driver's eye level. The defendant challenged the videotape on the grounds that the lighting was different, the pedestrian was a different height, the lane markings were different, and the camera was different from the human eye. The court allowed admission on the grounds that the video showed substantially similar conditions.

In *Hasson v. Ford Motor Co.*,[14] the issue was the cause of a brake failure on a car. The plaintiff relied on braking tests administered to the same make and model car involved in the accident. Experts drove the car on the same route as the plaintiff, simulating the braking activity, which allegedly led to failure. In a different experiment, the expert preheated the brakes and then drove on a different surface and route to test another aspect of the brakes' performance. The court allowed admission of this evidence on the ground that the tests were sufficiently designed and sufficiently controlled to materially contribute to the expert's opinion as to the cause.

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[10] 891 F. Supp. 1085 (E.D.N.C. 1995).

[11] 885 P.2d 1 (Cal. 1994).

[12] 16 F.3d. 1083 (10th Cir. 1994).

[13] 242 Cal. Rptr. 423 (Ct. App. 1987).

[14] 564 P.2d 857 (Cal. 1977).

In *Culpepper v. Volkswagen of America, Inc.*,[15] the court admitted a filmed reconstruction of a vehicle rollover. The plaintiff alleged that a vehicle had an unsafe design because it tended to roll over at various speeds when the wheels were turned to a certain degree. The plaintiff used a film depicting an experiment in which the vehivle was run at various speeds without a driver, even though in the real accident there was a driver. The court held that the tests using the driverless car were properly admitted because they would be of assistance to the jury even though the absence of the driver was not substantially similar to the accident.[16]

B. *Admissibility of Computer Animations*

In *Commonwealth v. Hardy*,[17] the court held that a computer generated video of shaken baby syndrome was admissible to help a medical expert explain his testimony. As a short, nondramatic computer animation, it was consistent with the Commonwealth's theory of the case. No cautionary instruction was given, but none was needed.

In *Webb v. CSX Transportation, Inc.*,[18] the trial court admitted the plaintiff's computer animation of the accident and scene. The animation showed the car stopped for only 4.8 seconds when the victim said she stopped for ten seconds. Additionally, the vegetation was enhanced in the video. The court held there was no abuse of discretion, and the animation was admissible because it was authentic, relevant, a fair and accurate representation of the evidence, and more probative than prejudicial. Because a cautionary instruction was given, the court found no abuse of discretion.

In *Rodd v. Raritan Radiologic Assoc.*,[19] the court simply determined that admissibility of a computer animation required that there be testimony by a person with some degree of computer expertise and sufficient knowledge to be examined and crossexamined about the functioning of the computer.

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[15] 109 Cal. Rptr. 110 (Ct. App. 1973).

[16] *See also*, Datskow v. Teledyne Cont'l Motors, 826 F. Supp. 677, 686 (W.D.N.Y. 1993) (illustrative videotape admitted into evidence, with precautionary instruction, because the jury was instructed concerning the "difference between . . . believing that they are seeing a repeat of the actual event and a jury understanding that they are seeing an illustration of someone else's *opinion* of what happened. So long as that distinction is made clear to them - as it was here - there is no reason for them to credit the illustration anymore than they credit the underlying opinion."); Misener v. General Motors, 165 F.R.D. 105, 107 (D. Utah 1996) (crash test video that illustrated relevant principles was admitted because "[t]he video is helpful and probative evidence of assistance to the trier of fact in understanding applicable physics principles . . . . Of course, the video is not hearsay, as there is no assertion."); State v. Tollardo, 77 P.3d 1023, 1027-28 (N.M. Ct. App. 2003) ("When the image is used as a visual aid, the courts do not require a showing that the exhibit was produced by a scientifically or technologically valid method. Instead, the critical issue is often whether the visual aid fairly and accurately represents the evidence or some version of the evidence.").

[17] 918 A.2d 766 (Pa. Super. Ct. 2007).

[18] 615 S.E.2d 440 (S.C. 2005).

[19] 860 A.2d 1003 (N.J. Super. Ct. App. Div. 2004).

In *Verizon Directories Corp. v. Yellow Book USA, Inc.*,[20] a dispute regarding false and misleading misrepresentations in advertising was litigated. The court held that computer generated teaching devices were admissible to compliment testimony alleging false or misleading representations where the methods of proof involved complicated statistical data and expert testimony. Additionally, the court found the devices helpful to the court's understanding of complex and voluminous evidence.

In *Commonwealth v. Serge*,[21] the court held that the standards for admission of a computer animation are the same as the standards of admission of general demonstrative evidence.

In *State v. Sayles*,[22] the court affirmed the admission of a computer generated set of slides showing a case of shaken baby syndrome. The court held that whether such evidence was demonstrative and admissable was largely within the trial court's discretion.

In *State v. Stewart*,[23] it was held that the standard for admissibility of a computer animation is whether the evidence is relevant, accurate, and assists the jury in understanding the testimony of a witness.

In *People v. Cauley*,[24] it was held that computer animation is admissible as demonstrative evidence if the proponent proves that it is: (1) authentic under Colo. R. Evid. R. 901, (2) relevant under Rules 401 and 402, (3) a fair and accurate representation of the evidence to which it relates, and (4) probative and not substantially outweighed by the danger of unfair prejudice under Rule 403.

In *Commonwealth v. Serge*,[25] a case of first impression in Pennsylvania, the court held that a computer generated animation reenacting a murder was admissible as demonstrative evidence as long as the Commonwealth properly authenticated the animation and established that the probative value of the animation outweighed the danger of unfair prejudice. Since the animation did not develop any opinions or perform any scientific calculations, it was simply an illustration of the expert's opinions and was not controlled by the *Frye*/*Daubert* tests of scientific evidence.

In *Harris v. State*,[26] the court held that for a computer re-enactment to be seen by a jury as an illustrative aid to an expert's testimony, the court required: (1) that it be authenticated and the trial court should determine that it is a correct representation of the object portrayed, or that it is a fair and accurate representation of the evidence to which it relates, (2) that it is relevant, and (3) that its probative value is not substantially outweighed by the danger of unfair prejudice, confusion of the issues, misleading the jury, undue delay, needless presentation of cumulative evidence, or unfair and harmful surprise.

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[20] 331 F. Supp. 2d 136 (E.D.N.Y. 2004).

[21] 837 A.2d 1255 (Pa. Super. Ct. 2003).

[22] 662 N.W.2d 1 (Iowa 2003).

[23] 643 N.W.2d 281 (Minn. 2002).

[24] 32 P.3d 602 (Colo. Ct. App. 2001).

[25] 58 Pa. D.&C. 4th 52, 2001 WL 34058294 (Pa. Comm. Pl. 2001).

[26] 13 P.3d 489 (Okla. Crim. App. 2000).

In *Cleveland v. Bryant*,[27] it was held that a computer animation is admissible if it is a fair and accurate representation of the scene sought to be depicted, and that reenactments that are substantially different form the facts will not be admitted.

In *Pierce v. State*,[28] it was held that to admit a computer animation, one must first establish the foundational requirements necessary to introduce an expert opinion. That is, the witness must be qualified as an expert, the opinion evidence must be applied to evidence offered at trial, and the evidence must not present a substantial danger of unfair prejudice that outweighs its probative value. Finally the evidence must be a fair and accurate depiction of that which it purports to be.

In *Mintun v. State*,[29] it was stated that a computer animation is admissible as long as it does not offend the rules of evidence.

In *Hinkle v. City of Clarksburg*,[30] a computer animated videotape was introduced to show a crime scene involving shotgun use. The videotape portrayed the biomechanics of the victim's fall and the trajectory of the shot. The court held that the admission of a computer animated videotape adhered to the same "substantial similarity" standard for the admission of demonstrative evidence videotapes. A cautionary instruction was issued.

In *Hutchison v. American Family Mutual Insurance Co.*,[31] a computer animation was admissible if authenticated and the fidelity of portrayal was established.

In *Sommervold v. Grevlos*,[32] it was held that the proponent of a computer animation must describe the system and show that the program produced an accurate result. The animation must also be relevant, probative, nearly identical, and must fairly and accurately reflect the oral testimony and be an aid to the jury in understanding the issues.

In *People v. McHugh*,[33] a computer animation was held admissible in that it was relevant to a possible defense, that it fairly and accurately reflected the oral testimony offered, and that it was an aid to the jury's understanding of the issue.

C. *Admissibility of Computer Simulations*

In *State v. Sipin*,[34] the court held that a computer simulation used as substantive evidence or as the basis for expert testimony regarding matters of substantive proof must be generated from computer programs that are generally accepted by the appropriate community of scientists to be valid for the purposes at issue in the case.

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[27] 512 S.E.2d 360 (Ga. Ct. App. 1999).

[28] 744 So. 2d 1193 (Fla. Dist. Ct. App. 1999).

[29] 966 P.2d 954 (Wyo. 1998).

[30] 81 F.3d 416 (4th Cir. 1996).

[31] 514 N.W.2d 882 (Iowa 1994).

[32] 518 N.W.2d 733 (S.D. 1994).

[33] 476 N.Y.S.2d 721 (Sup. Ct. 1984).

[34] 123 P.3d 862 (Wash Ct. App. 2005).

In *State v. Tollardo*,[35] computer generated evidence was used to illustrate an expert's opinion as to the facts of a drug deal argument and shooting. The court held that when the computer animation was used by the expert witness to develop his opinion in the case, the proponent of the evidence had to show that the computer generated evidence was generated in a scientifically valid way. It then applied *Daubert* principles to analyze whether the expert's use of "off the shelf" computer assisted design programs was scientifically valid. The court held that scientific validity had been established and there was no abuse of discretion.

In *Alcorn v. Union Pacific Railroad Co.*,[36] the plaintiff presented expert testimony and a computer simulation regarding the stop distance of the train in question. The simulation was used to assist in presenting the expert's opinion. The court held that a computer simulation is similar to evidence of an experiment and the court must consider whether the experiment will aid the jury. In this case, the simulation program was widely used by the Illinois Institute of Technology and the Association of American Railroads and was reasonably relied upon by professionals in the field. Consequently, there was no error in admitting the simulation as its validity had been established.

D. *Exclusion of Videotapes*

In *Shennett v. State*,[37] the appellate court overturned the admission of an officer's videotaped experiment showing the breaking of a van's window by throwing an object. The videotaped experiment was not sufficiently similar to the defendant's actions at the scene because of the position of the officer and the object being thrown.

In *Harris v. State*,[38] the defendant was convicted of murder for striking a victim with her vehicle. The trial court excluded two videotapes offered to show the route driven by defendant prior to striking the victim on the grounds that the speed of the vehicle in the videotape was different from the facts of the accident and the perspective of the camera in the center of the backseat of the rented vehicle was not substantially similar to the accident. Additionally, the court excluded another videotape purporting to establish that the defendant's vehicle could only have run over the victim once where the videotape showed the vehicle going over a blood stain as opposed to a person or a dummy. The appellate court held that no abuse of discretion was involved.

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[35] 77 P.3d 1023 (N.M. Ct. App. 2003).

[36] 50 S.W.3d 226 (Mo. 2001).

[37] 937 So. 2d 287 (Fla. Dist. Ct. App. 2006).

[38] 152 S.W.3d 786 (Tex. Crim. App. 2005).

In *State v. Hultenschmidt*,[39] the trial court did not abuse its discretion in excluding an animated reconstruction videotape. The videotape demonstrated that the accident would not have occurred had the other driver obeyed the twenty-five miles per hour speed limit. Exclusion was due to insufficient similarity between the recreated events and the actual events.

In *Davolt v. Highland*,[40] a medical malpractice case, the trial court excluded a videotape of a shortened version of a different surgery on a different person with different anatomy presenting different symptoms. The appellate court found no prejudice from the exclusion and that there was no abuse of the trial court's discretion.

In *Grose v. Nissan North America, Inc.*,[41] an automobile passenger was seriously injured when his car went out of control and was struck by a tractor trailer. The trial court allowed the automobile manufacturer's videotape to demonstrate the impact of a tractor trailer hitting a stationary automobile and gave a cautionary instruction. On appeal, the court held that the admission of the videotape was error because it was a staged recreation of the crash and did not establish substantial similarity with the facts of the accident. Because of the lasting visual impression of the videotape, this was unfairly prejudicial to the plaintiff.

In *Guillory v. DomTar Industries, Inc.*,[42] an employee was struck in the head by a fork that fell from a forklift. The court excluded the defense expert's testimony and videotape purporting to show that it was impossible for the forks to fall. The forklift model used in the videotape was different from the forklift in the accident and was thus insufficiently similar and unreliable. Because the video format made it seem like a recreation of the accident, it was confusing and prejudicial.

E. *Exclusion of Computer Animations and Simulations*

In *Spyrka v. Cook County*,[43] a video animation that was not timely disclosed and not a demonstrative aid was admitted and that held to be error warranting a new trial in a medical malpractice suit. The appellate court found error because the animation tended to precondition the jurors to accept the plaintiff's theory, ignored evidence contrary to that theory, and presented as fact certain matters that had no support in the record.

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[39] 102 P.3d 192 (Wash. Ct. App. 2005).

[40] 119 S.W.3d 118 (Mo. Ct. App. 2003).

[41] 50 S.W.3d 825 (Mo. Ct. App. 2001).

[42] 95 F.3d 1320 (5th Cir. 1996).

[43] 851 N.E.2d 800 (Ill. App. Ct. 2006).

In *State v. Sipin*,[44] the court held that technical and users' manuals for the version of the computer program used by an expert evidenced limitations on the use of the program and demonstrated that the program was not generally accepted in the relevant scientific community for the purposed of recreating an event at trial.

In *Kane v. Triborough Bridge & Tunnel Authority*,[45] a passenger in a vehicle sued to recover for an accident that occurred on a bridge. A computer generated animation was played to the jury. The appellate court held that the animation was improperly admitted because it purported to reenact the accident and did not have a sufficient foundation because the circumstances of the animation were different from the facts of the accident. Additionally, the trial court erred in failing to give a limiting instruction and thus left open the possibility that the jury might "confuse art with reality."

In *Smith v. Kansas City Southern Railway Co.*,[46] a computer animation was held not admissible when the animation was created by an animator who relied on incorrect indormation regarding the event.

In *State v. Farner*,[47] it was held that the admission of a computer animation was an abuse of discretion when it was not a fair and accurate depiction of the facts of the case. Because the jury could be persuaded by its life-like nature, there was a high potential to mislead the jury. Thus, the court abused its discretion in admitting the animation. The animation was inconsistent with the proof and circumstances established at trial and the expert was not qualified as an accident reconstructionist.

In *Clark v. Cantrell*,[48] a speeding driver caused an accident and death. A computer generated video animation was proffered and the trial court refused the evidence. The appellate court commented that a computer animation would be considered as demonstrative evidence, which only had to adhere to a standard that it was authentic, relevant, a fair and accurate representation of the evidence, and its probative value outweighed the danger of unfair prejudice. The court noted that a computer simulation would be treated differently because that simulation would require proof of the validity of scientific principles and data used. Because the trial court had broad discretion whether to admit or exclude a computer animation, its decision was not overturned—especially when the animation did not accurately reflect the testimony of certain witnesses.

In *Van Houten Maynard v. ANR Pipeline Co.*,[49] the court held that the computer animation was not admissible because it was not timely brought into the case. It may have had undue detrimental effect on other, more trustworthy, direct evidence already before the jury.

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[44] 106 P.3d 277 (Wash. Ct. App. 2005).

[45] 778 N.Y.S.2d 52 (Sup. Ct. App. Div. 2004).

[46] 846 So. 2d 980 (La. Ct. App. 2003).

[47] 66 S.W.3d 188 (Tenn. 2001).

[48] 529 S.E.2d 528 (S.C. 2000).

[49] 1995 WL 317056 (N.D. Ill. 1995).

In *Bledsoe v. Salt River Valley Water Users' Ass'n*,[50] it was held that a proponent of a computer animation may be required to show that: (1) the computer is functioning properly, (2) the input and underlying equations are sufficiently complete, accurate, and disclosed to the opposing party so that such matters may be challenged, and (3) the program is generally accepted by the appropriate community of scientists. The court held that a reversible error occurred in admitting computer animation evidence that did not satisfy the foundational requirements. The visual nature of the video computer animation's probative value was outweighed by the prejudice it caused.

In *Racz v. R.T. Merryman Trucking, Inc.*,[51] the court excluded a computer animation because "seeing is believing" and the jury might give undue weight to an animated reconstruction of an accident.

VI.
CONCLUSION

Demonstrative evidence has always been about providing compelling perspectives, viewpoints and tools to persuade a judge or jury that your case is more meritorious or "truthful" than the opponent's case. Because research has shown that people understand, learn and retain more information when it is presented both visually and verbally, today's lawyer who does not effectively use demonstrative evidence does so at his or her peril. Juries are composed of sophisticated consumers who have come to expect high tech visual presentations such as the ones they see on television and in the movies. Because jurors are so familiar with these types of presentations, the persuasive value of this type of evidence can be very compelling. High definition video, computer animations and computer simulations allow lawyers to use the latest in technology to make their points in an attractive and entertaining way. Although expensive, in the right case these tools will more than pay for themselves, take your case presentation to the next level, and provide a "wow" factor that helps the jury see, believe and adopt your point of view.

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[50] 880 P.2d 689 (Ariz. Ct. App. 1994).

[51] 1994 WL 124857 (E.D. Pa. 1994).

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