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**FEATURE:** COURTROOM COMPUTER ANIMATION AND SIMULATION: SELLING YOUR CASE WITH HIGH-TECH PERSUASION

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**TEXT:**

[\*5] Bullets and fragments of eight shots fired, angles of the bullet holes in doors and walls, trajectories of the shots, multiple wounds in the victim's body who moved through the house as the shots were fired, sounds recorded over the telephone line during a 911 call on which five shots could be heard. n1

n1 People v. Mitchell, Marin County, Ca no. 12464 (1992). A 3-D animation produced by A. Jason with the assistance of shooting incident reconstruction expert Luke Haag, was the first of its kind to be introduced in California.

You are in court and you need to convey to the jury the story this physical evidence tells. It needs to be accurate, sequential, persuasive. A detailed verbal description of the events, even under a non-adversarial setting, would be lengthy, confusing, and most likely boring.

In an age where the average attention span is reduced to a sound bite, the goal of any persuader should be "less is more." But how? Well, if a picture is worth a thousand words, then a 3-D computer animation can be worth a thousand paragraphs or even a thousand pages. Though nothing more than a high-tech blackboard, computer animation is a very effective communication tool because it visually illustrates testimony. The images can be manipulated to show the scene or events from different angles, and it is often impressive and crowd (jury) pleasing.

Computer animation is actually a series of still images (drawings) which are displayed sequentially on a computer screen or via video tape, creating natural looking motion -- very much like a cartoon. In designing the animation, the computer animator, with the input of the expert whose testimony will be illustrated, creates the animation's essential scenes. A series of frames are connected to give a free-flowing and natural quality. Presenting the series of frames/charts in rapid sequence creates motion. And, of course, the *coup* of using computer generated animation is that it can present the scene from every conceivable angle, even an aerial view. You can slow-motion, you can freeze-frame, you can display separately and/or simultaneously the opinions/results of [\*6] different witnesses's accounts, assumptions, tests, etc. This sort of impact is simply not possible with still photos and two-dimensional diagrams.

Still images -- *i.e.*, charts, maps, photographs, X-rays, etc. -- have long been accepted in trials. Motion pictures and videos have also been equally admissible at trial for many years. n2 The use of a computer to create and display still images is not different from any other graphic presentation. If a witness is allowed to use a blackboard to illustrate his or her opinion, then there is no substantial difference, other than the level of persuasiveness, in allowing the image to be shown with the slide or movie projector, or on a computer screen. However, computer animations and simulations are not free of controversy or objections to admissibility. The underlying fear is that the animations or simulations may be "too powerful, too persuasive, unfairly prejudicial, (and) overvalued by the jury." Despite the concern about the impact of forensic computer animation, if properly presented, it should not be any more difficult to get it admitted than any other demonstrative exhibit. The key is to be aware of the various admissibility issues before you even set out to have an animation designed so that at the preproduction stage you can avoid all the pitfalls and anticipate any arguments that may arise at trial.

n2 *People v. Dabb* 32 Ca 2nd 491 (1948). The defense reenacted a robbery of a cab driver and the shooting of police on film including sound.

### **Animation v. Recreation/Simulation n3**

n3 For an cogent discussion by a criminalist on the differences between reconstruction, reenactment and "virtual reality" or VR computer simulations *see* D.H. Garrison Jr., *Shooting Reconstruction Vs Shooting Reenactment*, AFTE JOURNAL (volume 2) April 1993.

It is important to understand the distinction between computer animation and computer simulation. Computer animation is nothing more than a drawing tool used to explain, illustrate and highlight a witness's testimony/opinion. In a computer simulation, the computer is actually used to "figure out" what might have happened.

The computer is fed data which it uses to recreate an event, for instance, a simulation of an airplane crash. The computer will take factors such as speed, altitude, weight, the aircraft's plotted path, information from the black box, etc., and it will process this data through formulas provided by the software.

In an automobile accident reconstruction, a computer can show two vehicles moving, colliding and sliding to their final resting points. In a simulation, the computer will use the input data to "create" these movements.

The final outcome is dependent on the software. A simulation is as impressive as an animation in that the events can be shown from various angles, the motion can be real, slow or frozen, voices/sounds can be added (in an airplane crash, the voice recorder from the black box can be added relevant to the events in time and place, etc.), and alternative theories can be compared separately or on a split screen.

Keep in mind the distinction between animation and simulation because there are additional foundational issues one needs to worry about with a computer generated simulation: primarily, the validation of the computer program and,

perhaps, the computer itself.

### **Creating Animation**

Creation of computer animation is a very labor intensive, highly technical, very tedious process. Your first step as the defense attorney is to become thoroughly familiar with the details of the incident through meticulous witness interviews, study of the available discovery, examination of the physical evidence, any photographs and diagrams of the crime scene. Next, you must consult your expert to see whether any additional information should be gathered, such as reenacting a sound relevant to the event being portrayed, videotaping scenery or a reenactment that will be incorporated into the animation, taking additional measurements and photos, etc. Even if you are familiar with crime scene investigation, consult with your expert. At this preproduction stage it is always useful to include the computer animator in any meeting that specifically deals with the design, purpose and vision of the final cut. Make sure that the computer animator is thoroughly familiar with all the details of the incident/events being depicted.

Knowing all this information, the animator is ready to recreate the relevant objects and environment (*e.g.* crime scene) in the computer. After the scene is scaled accurately, the movements of people and objects are key-framed into the scene. There are several other lengthy technical steps required before the animation or simulation can be presented in final form -- usually on video tape. For technical reasons, once completed, any changes to the animation/simulation will require hours or days to complete. Since time is money, the more time spent at the planning stage, the fewer the production errors and adjustments.

### **Hurdling Foundation Obstacles**

Unlike real evidence (such as the bloody glove from the crime scene or a video tape of the police beating an alleged perpetrator) which has a direct or indirect significance to the case, demonstrative evidence has no independent significance. On its own it has no probative value -- it proves nothing. Demonstrative evidence is used purely as a visual/illustrative aid to assist the jury (not the expert), in understanding testimony on substantive evidence being offered by the witness. It is presumed, therefore, that the substantive evidence meets the threshold requirement of establishing the existence or non-existence of a "relevant" fact. n4

n4 *Fed. R. Evid. 401*

*Fed. R. Evid. 901(a)* requires that the proponent of evidence authenticate or identify "as a condition precedent" that the evidence [\*8] "is what its proponent claims." The requirement of authentication or identification is a component of relevancy under *Fed. R. Evid. 401* -- *i.e.*, unless it is shown that the proponent of the evidence is sufficiently familiar to authenticate or identify the data contained in the demonstrative exhibit, it is without relevance. So, where an animation or simulation has data that was gathered by the expert, investigator or others, and it is not within the provided discovery by the prosecution, the animation or simulation is not relevant -- does not have any tendency to make the existence of any fact that is of consequence more or less probable -- until it is established that the data is indeed accurate. n5 Since this can only be shown through personal knowledge, all those who are responsible for gathering this data must be available to lay the foundation. n6

n5 *Fed. R. Evid. 104(b)*, similar to R. 901(a), requires as a condition precedent that sufficient evidence be introduced to fulfill the condition of fact -- fair and accurate -- before relevant evidence can be introduced.

n6 *Fed. R. Evid. 901(b)(1)*

The substantive evidence being proffered or included in the animation must meet any *Fed. R. Evid. 401, 403* objections before it can be admitted. Where an expert is providing opinion testimony which the animation is illustrating, the condition precedent is covered by *Fed. R. Evid. 702*. The fundamental question seems to be whether the demonstrative evidence fairly and accurately illustrates/explains/depicts previously admitted relevant evidence. Any remaining attacks on the issue of admissibility of the exhibit would come under *Fed. R. Evid. 403*, with the court being asked to use its discretionary authority under *Fed. R. Evid. 611* to limit or exclude the exhibit.

### **Foundation Requirements for Animations**

An animation is nothing more than a series of high-tech drawings. The foundation requirements for an animation then should be the same as with any drawing, chart, slide presentation, etc. There is, of course, the additional concern that a foundation must be laid for any expert testimony if the animation is going to be used by an expert in explaining his/her testimony. The foundation requirements for an animation are:

1. the substantive testimony of the expert is admissible under *Fed. R. Evid. 701*;
2. the expert witness is familiar with the animation;
3. the animation fairly and accurately reflects the expert's testimony for which it is being used;
4. the animation will be of assistance to the jury in understanding/evaluating the expert's testimony.

There is no need to have the creator testify as to the creative process/software used in producing the animation. n7 The expert need only be familiar with the information, data and substantive evidence relied on in creating the animation. An animation will run into foundation problems if it does not accurately and fairly reflect the expert's opinion. It is irrelevant whether the images in the animation are to scale so long as the displayed images are not misleading, unfairly prejudicial or not helpful to the jury's understanding of the expert's testimony. n8

n7 Clearly, E., MCCORMICK ON EVIDENCE, Sec 212 p 668 (3rd ed 84)

n8 *Id.* at Sec 214 p 670 (3rd ed 84)

### **Foundation Requirements for Simulations**

A computer generated simulation of an airplane crash or automobile accident is demonstrative evidence, not substantive evidence. The foundation requirements are somewhat more detailed than with an animation. The primary difference is that you must establish the reliability of the data and of the software used. You have to anticipate the often used objection to computer generated findings: "junk in -- junk out." Since the output or result is only as good as the input, the quality of the data and software is an issue that must not be ignored. To overcome any objections at trial, go over the following with the expert and the computer animator at the design stage:

1. data collected by the expert;
2. means by which data was collected;
3. data that might be available but ignored/excluded;

4. the methodology by which this data was used;
5. other available alternatives in computing data;
6. software chosen by computer expert/ animator;
7. the scientific principles used by the software, *i.e.*, does the software apply accepted laws of science and if so, are these applications by the software acceptable within the scientific community;
8. the knowledge and expertise of the computer animator;
9. to what extent will the simulation advance the expert's opinion while remaining true to the existing data;
10. to what extent is the software used determinative of the expert's opinion (chicken and egg query).

Anticipate all the dilemmas you will have in laying a foundation with the data to the exclusion of other data available. Be aware of any inherent problems in the software used to depict the expert's opinion.

The expected foundation requirements for a computer simulation are:

1. the data collected was accurate and complete;
2. the computer animator depicted the data accurately;
3. testimony from the software designer about the formulas and scientific principles used are acceptable within the scientific community;
4. the scientific principles as applied by the software in the simulation are accepted by the computer and scientific communities;
5. testimony by the reconstruction/simulation expert that any adjustments or manipulations of the data contributing to the design are valid;
6. the expert relying on the simulation to explain or illustrate his/her opinion, is familiar with the exhibit;
7. the simulation will assist the jury in understanding the expert's presentation.

## Objections

Simply because you are able to hurdle all the foundation obstacles, you do not have *carte blanche* in getting your animation or simulation admitted. There are other objections that are likely to be raised by an opponent bent on excluding your highly persuasive [\*10] exhibit (of course, you may be the one objecting to the introduction of such evidence):

1. A *Frye* hearing is necessary to determine whether the program used is generally accepted within the scientific community. Though *Daubert* n9 is the applicable authority in the federal system, many states continue to follow the *Frye* standard. n10 Any objection relating to *Frye* with respect to an animation is bogus since this is only an issue regarding the expert's field and methodology by which his/her opinion was reached, *i.e.*, whether recognized and accepted by the scientific community.

n9 *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 113 S. Ct. 2786 (1993). The "general acceptance" presentation under *Frye* is no longer essential. Rather, under *Fed. R. of Evid. 702*, the trial judge is entrusted with the task of determining whether the expert's testimony is based on a reliable foundation and relevant.

n10 *Frye v. U.S.*, 54 App DC 46; 293 F 1013 (DC Cir 19 23)

Illustrative charts are not subject to scrutiny under *Frye*, since they are not being proffered as independent substantive facts. As for the program that created the animation, this is also not an issue, since the software that created the animation is not being proffered. Rather, the animation is the issue and as long as it fairly and accurately reflects the expert's opinion, is not misleading and it is helpful to the jury's understanding of the expert's testimony, then with a proper foundation it must be admitted. n11

n11 *See Fed. R. Evid. 403.*

A *Frye* objection may have merit when dealing with a simulation if the software was used to "figure out" the result/opinion being offered by the expert. Where the software is designed to analyze, compute or synthesize data in creating an outcome, the software must pass muster by showing that its functions are generally accepted and relied on by the computer community. Computer generated recreations/simulations have been widely used by the automobile and aviation industries, so it is unlikely that a *Frye* objection is going to exclude such exhibits. n12 Again, even if such high-tech exhibits are found to be accepted within the scientific community, be prepared to meet the requisite foundation requirements of qualifying the expert who designed the software, establishing that the data used is accurate and complete and the scientific principles as applied are recognized and accepted within the field.

n12 *See Dombroff, Innovative Developments in Demonstrative Evidence Techniques and Associated Problems of Admissibility*, 45 J AIR L & COMMERCE 139 (1980).

2. One side or the other may object claiming that the animation or simulation is "overvalued" and given undue weight by the jury. This objection falls under the category of "too persuasive." It may also arise under a § 403 objection -- unfairly prejudicial . . . more prejudicial than probative. No doubt, animations can be persuasive. That's the whole purpose behind using demonstrative evidence. However, it is the expert's testimony that is really at issue and not the illustrative means by which the testimony is explained. So long as you meet the foundation requirement of "fairly and accurately," this objection is groundless.

If you are trying to exclude an animation or simulation, then you must argue that the jury is likely to give undue weight to what is questionable or weak opinion testimony. If a jury is more likely to find the expert's flimsy opinion more believable because of a computer generated animation, then the demonstrative evidence is not being used to illustrate but to bolster the expert's credibility.

If the prosecution is attempting to introduce an animation or simulation that does not include the defense version or the exculpatory evidence, then the best objection is that it does not "fairly and accurately" present both sides. Though you may not prevail in excluding the exhibit, you may be successful in convincing the judge to force the prosecution to either downsize the exhibit or to make it less prejudicial (persuasive) or, in the alternative, to have the prosecution add a defense version at no cost to the defense. Since the prosecution has the burden, it is unfairly prejudicial to have the jury view only one side -- particularly when it is cost prohibitive for attorneys representing indigent clients to counter such exhibits.

3. The exhibit cannot be cross-examined. An animation or simulation does not "prove" anything. It is used to illustrate or demonstrate. Thus, the need to cross-examine the demonstrative evidence is a red herring

The witnesses who gathered the data and put it in the computer will be testifying as to the illustrative basis of the exhibit and therefore will be open to cross-examination. When dealing with a simulation, there is the added opportunity to cross-examine the designer of the software. In short, while laying a foundation, there is ample opportunity to cross-examine the cast of characters involved in the creation of the animation or simulation. There is also the added opportunity to cross-examine the expert who is relying on the exhibit in advancing his or her opinion.

4. Another mindless objection is that the exhibit does not contain all the details. It is simply cost-prohibitive to include every minor detail in an animation. Moreover, detail, or the lack thereof, is irrelevant so long as the animation or simulation fairly and accurately depicts the intended incident or event. For instance, in a shooting recreation, the lack of furniture in the animation is not important if the shooter had a clear shot or the eyewitness had an unobstructed view. If all you are doing is plotting the bullets' trajectory given the available evidence and measurements, it is more persuasive and less costly to simply display the incident without distracting details. Detail only becomes of issue in an animation or simulation if it is necessary to fairly and accurately assist the fact-finder in understanding the expert testimony being illustrated.

In addressing this objection, it is important to point out the difference in costs for including senseless and unimportant detail, particularly when the prosecutor is likely to make a stink in the jury's presence of the high costs for the exhibit . . . *i.e.*, flash for cash, but of no substance. By keeping the animation simple and poignant, you defeat this common objection.

### **Practical Advice**

At every stage of the creation of the animation or simulation, from the brainstorming sessions to the post-production phase, always be thinking about authentication and foundation. Here are some suggestions on how to get through the foundation bramblebush virtually unscathed:

1. Make a checklist on every piece of fact that will be in your exhibit and that needs to be authenticated.
2. List the relevance to each item in the exhibit and how it relates to the overall purpose.
3. Keep track of all the discovery and data provided to the expert and computer animator.
4. Make sure that the witnesses that will be using the exhibit understand the significance to everything that is in the animation or simulation.
5. Keep track of the amount of time spent in thinking through the design and creating it.
6. If changes were done in post-production, have that information available -- it may come in handy in showing the court that the final version has addressed all of the evidentiary concerns being raised. You may wish to bring to court the various drafts to show how the final version emerged.
- [\*11] 7. Have the expert bring to court all of the discovery and data made available to him/her.
8. In qualifying the animator or expert whose opinion is being illustrated, it is impressive to have them list both at the foundation stage and before the jury, all the input available to them.
9. Anticipating the argument that the animation is unfairly prejudicial, have the animator/expert explain the reasons why certain items were included and others excluded. Since you want to be fair, your animation/simulation should include alternative versions, juxtaposing the prosecutor's would-be version and that of the defenses.

10. Spend time with the witnesses who will be using the animation/simulation. Don't just prep the witness for the substantive use of the exhibit. Anticipate all the potential questions and objections at the foundation stage and thoroughly go over them with the witnesses. Keep in mind that even if the prosecution loses the battle to exclude the animation or simulation they can still attack the exhibit and perhaps even diminish its value through an effective *voir dire* in the presence of the jury.

Put simply, in laying the foundation before the jury, do an in-depth showing of everything that was considered and the reasons why. Leave nothing to which the prosecution can object. You may even wish to steal the thunder from the court by having the expert hint about the coming attraction. The jury is going to hear a limiting instruction from the judge anyway, so why not beat the judge to the punch and gain a little credibility to boot. Here is one suggested approach:

**Q.** Mr. W, do you have an opinion in this case?

**A.** Yes, I do.

**Q.** Could you briefly tell us what it is?

**A.** (expert gives a short, quick and dirty one-liner)

**Q.** Now before you tell us how it is that you have reached this opinion, could you please list all of the material data, evidence you examined and every thing else you have done in this case to enable you to form your opinion?

**A.** (expert goes through the list, just itemizing. An explanation will follow as the expert goes through the evidence in detail, but only after the jury has been informed that an animation has been prepared for their benefit).

**Q.** Now before we go through all this information and how it is you reached your opinion of...have you had anything prepared

[\*66] to assist the jury in following your presentation?

**A.** Yes, a computer animated diagram. (You have already had your hearing and the court is allowing it to come in).

**Q.** What is a computer animated diagram?

**A.** Well, it is not evidence; it does not prove anything. Rather, it is an illustrative tool, prepared for the jury's benefit in following the presentation of my testimony.

### **Cost of Going High Tech**

Accurately estimating costs for an animation is particularly difficult without a complete understanding of the key point(s) to be demonstrated. The current range of costs for a forensic animation is from \$ 3000 to \$ 20,000+, although some big-time engineering companies will charge three or four times those amounts. As a general guideline, there are five factors which help to estimate cost:

. The time period involved

- . The number of people, objects, scenery, etc.
- . The amount and type of motion
- . The variations (angles, speed, alternative viewpoints)
- . The degree of precision required.

Naturally, when designing a simulation you can expect the costs to be significantly higher than with an animation. It may even be possible to do animations in-house. The technology, expertise and costs of the equipment make in-house production of simulations cost prohibitive. Moreover, given all the evidentiary hoops of laying a foundation and the precision required to make a simulation effective, it is best to leave it to the experts

### **Future Of Computer Animations**

In the last few years, courts have admitted animations to accompany testimony of the defendant and to illustrate aspects of expert opinion.

In *People v. Hood*, a 1993 San Bernadino, California case, both the prosecution and defense had computer animation admitted into the trial. While the prosecution's animation depicted certain physical evidence items, the defense's animation was based only on the recollection of the defendant -- it was a depiction of his version of the incident. The foundational argument made was that while the jury can make a determination as to the credibility of the defendant, it should not be denied an opportunity to clearly understand the defendant's version of the incident.

In a federal civil trial (*Wilson v. City of Clarksburg, WV, 1993*), the jury was shown a computer animation of a fatal police shooting. This animation had several segments: one showed the events based on the testimony of the police officers; one graphically depicted the bullet's trajectory from where it was fired to where the bullet was recovered and its relationship to the wound path through the decedent; and one in which crime scene and autopsy photos were overlaid over a human figure to demonstrate how the wounds corresponded to the bullet trajectory.

In *State of Alaska v. Jeffrey DeGrasse*, a graphic depiction of sound wave patterns was used to show how someone being shot at could easily be confused as to the source of the gunshots.

There are two important factors which will affect the future use of animation in the courtroom: First is the understanding by attorneys and judges that animation is a legitimate form of demonstrative, supporting evidence. Second, advancing technology is driving down the cost of computer generated animations and, to a lesser extent, simulations. Computer animations and simulations will soon lose their novelty and join audio and video tapes as common courtroom elements. The arguments surrounding the admissibility issues must remain so that these highly persuasive demonstrative aids are used properly.

### **Legal Topics:**

For related research and practice materials, see the following legal topics:

Computer & Internet Law  
Criminal Offenses  
Copyright Infringement Actions  
Evidence  
Demonstrative Evidence  
General Overview  
Evidence  
Testimony  
Experts  
General Overview

### **GRAPHIC:**

Illustration 1, A computer animation of a shooting shows the events based on police testimony. First panel depicts the bullet's trajectory from where it was fired to where it was recovered. Second panel shows the relationship between the bullet's trajectory and the wound path through the decedent. To demonstrate how the wound corresponds to the bullet's trajectory, the last panel uses a human figure with overlaid crime scene and autopsy photos. *Wilson v. City of*

Clarksburg, WV., *infra*; Illustration 2, This graphic depiction of sound wave patterns was used to show how a would-be target could easily be mistaken for the shooter. *State of Alaska v. Jeffrey DeGrasse*, *infra*.