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SEEING IS BELIEVING:[1] A PRACTITIONER'S GUIDE TO THE ADMISSIBILITY OF DEMONSTRATIVE COMPUTER EVIDENCE

"If we leap off the technological cliff without looking, we shouldn't be surprised by an occasional splat."[2]

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I. INTRODUCTION

The expert raised his right hand, affirmed his oath to tell the truth and nothing but the truth, and took his place in the witness box.[4] Sitting, he took a deep breath,

[1]Racz v. R.T. Merryman Trucking, Inc., Civ. A. No. 92-3404, 1994 WL 124857, *5 (E.D. Pa. Apr. 4, 1994). The court recited this adage in concluding that the jury might give undue weight to a computer simulation.

[2]Fredric Lederer, *Is Technology Changing Civil Justice?,* TRIAL, March 1998, at 40, 42. Professor Lederer is Chancellor Professor of Law at William and Mary Law School in Williamsburg, Virginia. *Id.* at 40. He is also the director of the Courtroom 21 Project, which provides both a demonstration center for state-of-the art courtroom technology and a research center that examines the impact of technology on the justice system. *Id.*

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knowing the questions were about to begin. The prosecutor began questioning the expert regarding the disaster. The expert answered the questions patiently, methodically, calmly. Yes, the boat was at sea. Yes, the night was dark. Yes, lookout was made, but the lookout failed to perceive the danger. Yes, the boat ran into the unidentified object, and sustained damage. Yes, due to the complex laws of both physics and physiology, the normal human eye would have been unable to spot the danger in time to avoid it. Yes, many people died in the aftermath. No, based upon my knowledge, skill, experience, training, and education, my opinion to a reasonable degree of scientific certainty is that the accident was caused by the forces of nature coupled with simple carelessness.

The expert looked at the jury box. It had been a long, drawn-out trial, as criminal trials of this type usually are. The jury looked tired, dazed and sleepy. The expert knew his testimony was important to this case, and wondered what he could do to convey to the nodding jury the impact of the events as they actually occurred.

This may be fiction, but the above scenario may be probable today in a trial to determine criminal liability for a Titanic-type disaster.[5] Ah, yes, the Titanic . . . the name alone imparts to the reader the scale and depth of the victims' misery and death.[6] Yet, the words this expert may have spoken, even though quite factual, barely convey to the reader and the fictitious jury the depth and extent of the actual events. Imagine in this same fictional trial if the expert could have used computer simulations to demonstrate his testimony. The reasonableness and coincidental nature of the actual events would have been visualized within the minds of the jury.[7]

With the invention of television and the development of computerization our society and our juries have become much more visually oriented.[8] As computer equipment itself becomes more financially accessible, more experts are using computer simulations as demonstrative evidence during their trial testimony. However, this use of computer simulations presents several novel, complex issues. Which evidence rules are applicable during expert testimony accompanied by demonstrative computer simulation? Are our experts, attorneys and/or judges sufficiently knowledgeable to effectively handle this demonstrative evidence? Is the use of demonstrative computer simulations unduly influential to the jury and

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[4]The story of the trial is fictional, and used for illustrative purposes only.

[5]The Titanic was the largest and most expensive passenger ship built during its time. Jim Sadur, *Titanic: Facts & Figures*, (March 27, 1998) <http://www.intercall.net/~jsadur/titanic/facts.html>. It was built to be unsinkable. *Id.* However, on her maiden voyage two days out of port, the liner hit an iceberg and within a few hours completely sank. *Id.*

[6]The Titanic held 2,228 people on board, but only had lifeboat capacity for 1,178 people. *Id.* It sank in 12,500 feet of water, approximately 375 miles southeast of Newfoundland. Approximately 1,523 perished in the tragedy, most from exposure. *Id.*

[7]Adam T. Berkoff, *Computer Simulations in Litigation: Are Television Generation Jurors Being Misled?,* 77 MARQ. L. REV. 829, 829 (1994). Once the jurors see the simulation, "the images will be graven on their minds." *Id.*

[8]*Id. See also* THOMAS A. MAUET, TRIAL TECHNIQUES 139 (4th ed. 1996). "A whole generation of Americans has been raised and educated primarily by seeing. Children learn by watching TV . . . ." *Id.* For a practical discussion of the use of computer technology to prepare for trial, see William S. Bailey, *Using Computer Technology to Prepare For Trial*, TRIAL, Apr. 1998, at 44.

prejudicial to the opposing party? Is there a backlash against the over-use of technology by segments of our society?

These and many other issues are considered, resulting in this practical tool to be used in admitting demonstrative computer evidence. Part II will explore the backgrounds of demonstrative evidence, computerization, and the use of computer simulation for demonstrative evidence.[9] Part III will discuss and analyze several relevant issues, including attorney training, expert knowledge, judicial confusion, additional evidentiary issues, and the possible prejudicial influence of demonstrative computer simulations.[10] This discussion concludes with some general thoughts regarding the use of demonstrative computer simulation to illustrate expert testimony.[11]

II. BACKGROUND

A. General Background of Demonstrative Evidence

Information which is presented to us is absorbed by us primarily through sight.[12] Research shows that the use of visual aids to assist with an oral presentation can facilitate comprehension, increase understanding and retention levels by as much as sixty-five percent.[13] Additionally, information which is perceived by the individual from a variety of methods (aural, visual, and written) is retained and understood at a substantially higher level.[14]

Demonstrative evidence uses models, charts, diagrams or actual demonstrations to clarify or explain other relevant, substantive evidence introduced at trial.[15] Demonstrative evidence has been included in the American trial process for well

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[9]*See infra* Part II.A-B.

[10]*See infra* Part III.A-E.

[11]*See infra* Part IV.

[12]Fred H. Cate & Newton N. Minow, *Communicating with Juries*, 68 IND. L.J. 1101, 1114 (1993).

[13]*Id.* "[A] witness's oral testimony can be absolutely boring and by this time a juror has stopped paying full attention. It should come as no surprise that as much as ninety percent of verbal testimony is misunderstood or forgotten completely." *Id.*, quoting Theodore D. Ciccone, President of Litigation Communications, Inc.

[14]*See also* MAUET, *supra* note 8, at 139. "A study entitled the 'Weiss-McGrath Report' found a 100 percent increase in juror retention of visual over oral presentations and a 650 percent increase in juror retention of combined visual and oral presentations over oral presentations alone." Mary C. Kelly & Jack N. Bernstein, *Virtual Reality: The Reality of Getting It Admitted*, 13 J. MARSHALL J. COMPUTER & INFO. L. 145, n.39 (1994), quoting Roy Krieger, *Now Showing at a Courtroom Near You . . .; Sophisticated Computer Graphics Come of Age - and Evidence Will Never Be the Same*, ABA J., Dec. 1992, at 93.

[15]Robert D. Brain & Daniel J. Broderick, *The Derivative Relevance of Demonstrative Evidence: Charting its Proper Evidentiary Status*, 25 U.C. DAVIS L. REV. 957, 959 (1992). Mueller and Kirkpatrick have determined three different definitions for demonstrative evidence: 1) anything that appeals to the senses, 2) firsthand sense impression, and 3) illustrative evidence. CHRISTOPHER B. MUELLER & LAIRD C. KIRKPATRICK, EVIDENCE 1179-80 (1995).

over 100 years.[16] However, it was during the 1950's, that trial attorneys like Melvin Belli "championed vivid, dramatic models or charts to persuade jurors."[17] Since that time, an increasing number of both civil and criminal trials have contained the use of demonstrative evidence.[18]

Unlike substantive evidence, demonstrative evidence can only illustrate or explain other testimonial, documentary or real evidence.[19] It cannot independently prove a fact and is usually prepared uniquely for litigation.[20] Demonstrative evidence may be formally admitted[21] and included in the record on appeal.[22] During deliberations, the jury is usually permitted access only to exhibits formally admitted into evidence.[23]

The foundational requirements for admissibility of evidence differ based upon jurisdictions. The focus of this discussion is based upon the application of the Federal Rules of Evidence. However, many states, including Ohio, have based their own state rules upon the Federal Rules, and many of the considerations and arguments found in this practical guide can be adopted for use in other jurisdictions. Additionally, as demonstrative computer evidence is an emerging issue for trial practitioners, all practitioners, regardless of jurisdictional rules, can glean insight from discussions contained in this guide.

The foundational requirements for admissibility of demonstrative evidence are different from those requirements for substantive evidence.[24] The foundational requirements focus on whether the demonstrative evidence can accurately and helpfully explain the other related evidence.[25] To establish a foundation for admission of demonstrative evidence, the following requirements must be met:

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[16]Brain & Broderick, *supra* note 15, at 959.

[17]Robert D. Brain & Daniel J. Broderick, *Demonstrative Evidence: The Next Generation*, 17 No. 4 LITIGATION 21 (1991). Belli threw a prosthetic leg at a jury in 1946, and told each juror to "feel the warm blood coursing through the veins." Brain & Broderick, *supra* note 15, at 998. *See also* Melvin Belli, *Demonstrative Evidence: Seeing is Believing*, TRIAL, July 1980, at 70.

[18]Brain & Broderick, *supra* note 17, at 21.

[19]*Id.*

[20]Brain & Broderick, *supra* note 15, at 971.

[21]MUELLER & KIRKPATRICK, *supra* note 15, at 1183.

[22]Brain & Broderick, *supra* note 17, at 23.

[23]United States v. Abbas, 504 F.2d 123, 125 (9th Cir. 1974); United States v. Cox, 633 F.2d 871, 874 n.9 (9th Cir. 1980); Pierce v. Ramsey Winch Co., 753 F.2d 416, 430-32 (5th Cir. 1985). *But see* United States v. Lewis, 759 F.2d 1316,1329 n.6 (8th Cir. 1985); United States v. Downen, 496 F.2d 314, 320-21 (10th Cir. 1974).

[24]Brain & Broderick, *supra* note 17, at 23. Substantive evidence may be admitted if it tends to prove the apparent existence or nonexistence of a relevant fact, therefore being primary relevance. FED. R. EVID. 401. *See generally*, George F. James, *Relevancy, Probability and the Law*, 29 CALIF. L. REV. 689 (1941).

[25]Brain & Broderick, *supra* note 17, at 23.

1. The demonstrative exhibit relates to other relevant, competent, and material testimonial, documentary, or real evidence;[26]
2. The witness whose testimony the demonstrative exhibit illustrates is familiar with the exhibit;[27]
3. The demonstrative evidence fairly and accurately reflects the other evidence to which it relates;[28] and
4. The demonstrative evidence will aid the trier of fact in understanding or evaluating the other related evidence.[29]

Additionally, demonstrative evidence must still meet the general evidentiary rules which apply to all evidence.[30]

B. General Background of Demonstrative Computer Simulation

The federal government lead the way into the computer age.[31] During World War II, the Army funded development of a computer to calculate artillery trajectories.[32] Following the Army's construction of ENIAC, advances and use of computerization began to rapidly evolve, with several new machines being built.[33]

In 1947, physicists at Bell Laboratories invented transistors, which performed the functions of vacuum tubes.[34] The transistors were smaller, reliable and consumed much less power than vacuum tubes.[35] In the late 1960's and 1970's, the next advances in computer technology arrived.[36] Silicon computer chips replaced

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[26]FED. R. EVID. 401; MUELLER & KIRKPATRICK, *supra* note 15, at 1181. *See generally* Elwyn L. Cady, Jr., *Objections to Demonstrative Evidence*, 32 MO. L. REV. 333 (1967); Craig Spangenberg, *The Use of Demonstrative Evidence*, 21 OHIO ST. L.J. 178 (1960).

[27]FED. R. EVID. 602, 703; Brain & Broderick, *supra* note 17, at 24.

[28]FED. R. EVID. 401; MUELLER & KIRKPATRICK, *supra* note 15, at 1182. James McElhaney describes the phrase "fair and accurate" as "magic words" in the introduction of demonstrative evidence. JAMES W. MCELHANEY, MCELHANEY'S TRIAL NOTEBOOK 561 (3d ed., 1994).

[29]FED. R. EVID. 401 & 403; MUELLER & KIRKPATRICK, *supra* note 15, at 1183; Harvey by Harvey v. General Motors Corp, 873 F.2d 1343, 1355 (10th Cir. 1989); Campbell v. Pitt County Memorial Hosp., Inc., 352 S.E.2d 902, 905-06 (N.C. App. 1987).

[30]*See infra* Part III.A-E.

[31]Sandra Sanders, *Arizona's Public Records Laws and the Technology Age: Applying "Paper" Laws to Computer Records*, 37 ARIZ. L. REV. 931, 932 (1995).

[32]*Id.* That computer was called ENIAC (Electronic Numerical Integrator and Calculator). Lee Loevinger, *The Invention and Future of the Computer*, 15 J. MARSHALL J. COMPUTER & INFO. L. 21, 26 (1996). It had to be manually wired to execute each program as it had no storage memory. *Id.* The computer was 15,000 square feet in size, weighed thirty tons, contained 6,000 switches and 17,468 vacuum tubes. *Id.*

[33]*Id.* at 29.

[34]*Id.*

[35]*Id.* Transistors took ten years of experimentation and development before they were ready for commercial use. *Id.*

[36]*Id.*

transistors as the heart of the computer equipment.[37] In the 1980's, very large scale integration (VLSI) increased the density of computer chips.[38] By 1995, a single computer chip replaced more than five million transistors.[39]

The rapid acceleration in the advancement of computer chip technology is the heart of the advancement in the use of technology in our modern age.[40] Our modern use of technology has greatly increased, as the computer chips become faster, lighter, smaller, more reliable, less power consuming, and more efficient.[41] Where ENIAC was used to compute trajectories, computer chips now talk to us in our cars and in our pockets.[42]

When individuals think of the word "computer," many envision an electronic marvel with magical powers.[43] In reality, the capabilities of the computer are quite limited, as a computer has no independent intelligence.[44] Computers derive most of their amazing power from three features: speed, accuracy, and memory.[45] The accuracy of computers is due partially to the inherent reliability of the electronic circuits that make up a computer system.[46] The consistency of the computer-generated results is known as the accuracy of the system.[47]

However, computer accuracy only relates to the internal processing of the system. If either the computer instructions or the information fed into the computer are inaccurate, the end result of the computer processing will be incorrect.[48] This phenomenon, known as "Garbage in - Garbage out" (GIGO), is fundamental to understanding computer accuracy.[49]

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[37]Loevinger, *supra* note 32, at 29.

[38]*Id*.

[39]*Id*.

[40]*Id.* at 30.

[41]*Id.* Nicolas Negroponte, Professor of Media Technology at MIT wrote: "[c]omputing is not about computers any more. It is about living . . . We have seen computers move out of giant airconditioned rooms into closets, then onto desktops, and now into our laps and pockets. But this is not the end." NICHOLAS NEGROPONTE, BEING DIGITAL 229, 231 (1995), as quoted in Lee Loevinger, *The Invention and Future of the Computer*, 15 J. MARSHALL J. COMPUTER & INFO. L. 21, 30 (1996).

[42]The microprocessor is the foundation of the current American economy, and American industry spends more now on computers and related equipment than on all other capital equipment combined. Loevinger, *supra* note 32, at 33.

[43]STEVEN L. MANDELL, COMPUTERS AND DATA PROCESSING: CONCEPTS AND APPLICATIONS 6 (1979).

[44]*Id*.

[45]*Id.* at 6. Computer speeds are measured in nanoseconds, or one-billionth of a second. *Id.*

[46]*Id.* at 7.

[47]*Id.* at 7. MANDELL, *supra* note 43, at 7.

[48]*Id.*

[49]*Id*.

Computer simulation can take several forms. The first form is known as computer animation. Computer animation is very similar to commercial animation, in that an artistic image is altered frame by frame in order to show actual movement.[50] The artistic computer rendering is then recorded in rapid succession onto a videotape to create the illusion of movement.[51] Computer animation is produced by collecting all information possible, loading it into the computer system, deciding on the animation features of the presentation, rendering the still frames, and finally recording the still frames onto videotape.[52] It is important to note that computer animations are strictly artists' renditions, and are not limited by any physical laws.[53]

By contrast, computer reconstructions, also known as computer simulations,[54] are computer animations grounded in the laws of physics and science.[55] To produce a reconstruction, the initial step begins with the inputting of the three-dimensional coordinates of the objects that were present at the scene.[56] Then the motions of each object involved in the incident are calculated.[57] The laws of science provide the rules by which the objects move, and this movement is compared with the testimony and observances of eyewitnesses.[58] The computerized results can then be recorded on videotape for production during the trial.[59]

There are several situations in which the use of computer simulations can be very valuable. First, the computer simulation can be valuable if the visualization of the event or an object is complicated by the dynamics of the situation.[60] Second, if "real-

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[50]Berkoff, *supra* note 7, at 830.

[51]Jennifer Robinson Boyle, *State v. Pierce: Will Florida Courts Ride the Wave of the Future and Allow Computer Animations in Criminal Trials*, 9 NOVA L. REV. 371, 375 (1994). This is similar to how Saturday morning cartoon favorites are produced. *Using Computer Animation in the Courtroom*, PROSECUTOR, October 1995, at 19.

[52]Boyle, *supra* note 51, at 375-76.

[53]*Using Computer Animation, supra* note 51, at 20.

[54]It is important to note that commentators and courts use some terms interchangeably. Therefore, when faced with computer produced evidence, it is important to ascertain the true basis for the computer production. *See infra* Part III.A and D.

[55]*Using Computer Animation, supra* note 51, at 20.

[56]Berkoff, *supra* note 7, at 831.

[57]*Id.*

[58]*Id.*

[59]Id. In some jurisdictions, the attorneys can now take the computers into the courtroom and using an overhead projector, "play" the computer reconstruction for the jury.

Virtual reality could be considered another type of computer simulation. It is similar to computer reconstructions; however, the viewer (juror) wears a helmet and possibly other items, and can individually "see," "sense," and investigate the incident scene. Due to the special evidentiary issues which arise with active juror participation, virtual reality will not be included in the scope of this comment. *See generally* Mary C. Kelly & Jack N. Bernstein, *Virtual Reality: The Reality of Getting It Admitted*, 13 J. MARSHALL J. COMPUTER & INFO. L. 145 (1994).

[60]Berkoff, *supra* note 7, at 832.

time" of the incident is a crucial factor, the computer simulation can be most helpful.[61] Third, the computer simulation can recreate an event where physical recreation would be impracticable due to expense or danger.[62] A computer simulation can be very valuable to explain or clarify a complex situation being explained by an expert to the jury.[63] Finally, computer simulation is able to show multiple, three-dimensional views of the incident.[64]

One of the most significant cases laying the groundwork for the admissibility of computer simulations is *Perma Research and Development v. Singer Co*.[65] Here, Perma had assigned a patent to Singer to perfect, manufacture, and market an anti-skid braking device for automobiles.[66] Perma brought action against Singer for a breach of a contractual obligation to use its best efforts in fulfillment of the contract.[67] Singer defended on the grounds that the device was not perfectible.[68] Perma was permitted to present expert testimony with computer simulations indicating that the anti-skid device was perfectible.[69] The end result was an award of nearly seven million dollars in damages for Perma.[70]

Another famous civil action using demonstrative computer simulation was a massive hexane explosion in the Louisville, Kentucky sewer system.[71] A chemical engineer had determined that liability ran to the Ralston Purina plant; the problem was that it took the engineer "days to explain his theory."[72] The expert's conclusions were reduced to a 12-minute segment of computer animation.[73] Immediately after viewing the videotape, Ralston Purina settled for more than $65 million.[74]

Other types of civil cases have jumped onto the computer simulation bandwagon. Those types of cases include medical malpractice,[75] fraud,[76] auto accident,[77] product

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[61]*Id*.

[62]*Id*.

[63]*Id*.

[64]*Id*.

[65]542 F.2d 111 (2d Cir. 1976). *See also* Elaine M. Chaney, *Computer Simulations: How They Can Be Used At Trial and The Arguments for Admissibility*, 19 IND. L. REV. 735, 736 (1986).

[66]*Perma,* 542 F.2d at 113.

[67]*Id*.

[68]*Id*.

[69]*Id*.

[70]*Id*.

[71]Mark Barrish, *Disclosure of Computer Re-Enactments During Pretrial Discovery*, 16 HASTINGS COMM. & ENT. L. J. 691, 697 (1994).

[72]*Id*.

[73]*Id*.

[74]*Id*.

[75]For detailed discussion, *see* Andre M. Thapedi, *A.D.A.M. - The Computer Generated Cadaver: A New Development in Medical Malpractice and Personal Injury Litigation,* 13 J.

liability,[78] and nuclear plant accidents.[79] Additionally, quasi-civil actions have also involved the use of computer simulation.[80]

Due to constitutional considerations, demonstrative computer simulations used during criminal trials developed at a slower, more cautious rate. In 1984, a New York court became the first court to allow the introductions of a computer animation in a criminal trial.[81] Courts across the country were slow to allow for the introduction of the demonstrative computer evidence. In 1992, California permitted a computer simulation to be used in a murder prosecution.[82] In 1995, an Ohio court

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MARSHALL J. COMPUTER & INFO. 313 (1995). A.D.A.M. is a "computer generated cadaver that permits the user to peel away several layers of the human body." *Id.*

[76]In *Delzer v. United Bank of Bismarck*, 559 N.W.2d 531 (N.D. 1997), the Delzers brought action against the bank for deceit and breach of contract to loan money. *Id.* at 532. Plaintiff's experts used a computer model to explain their theory of what would have happened if the Bank had loaned the money it had promised. *Id.* at 537.

[77]Sallis v. Lamansky, 420 N.W.2d 795 (Iowa 1988).

[78]Arnold v. Riddell, Inc., 882 F. Supp. 979 (D. Kansas 1995). The Arnolds are the parents of a high school football player who suffered a severe neck injury. *Id.* at 986. They brought suit against the defendant manufacturer of the football helmet. *Id.*

[79]Arising out of the infamous incident known as Three Mile Island, *In re TMI Litigation Consolidated Proceedings*, 927 F. Supp. 834 (M.D. Pa. 1996).

[80]State v. Louis Trauth Dairy, Inc., 925 F. Supp. 1247 (S.D. Ohio 1996) (antitrust). *See also* Robert J. Gross, *Ten Practice Tips for Dealing with the U.S. Government in Aviation Tort Litigation*, 12 FALL AIR & SPACE LAW 1 (1997); Dwight H. Merriam, *Dealing with Citizen Opposition: A Dozen Do's and Don'ts for Development Denizens*, SC10 ALI-ABA 517 (1997) (land use planning, regulation, and litigation); Robert H. Lande, *From the Surrogates to Stories, The Evolution of Federal Merger Policy*, 11 SPG ANTITRUST (1997); Mark W. Frankena & John R. Morris, *Why Applicants Should Use Computer Simulation Models to Comply with the FERC'S New Merger Policy*, 135 No. 3 PUB. UTIL. FORT 22 (1997).

[81]People v. McHugh, 476 N.Y.S.2d 721 (N.Y. 1984). McHugh involved a vehicular homicide, and the animation depicted the motion of a car, not of a person. *Id*. The defendant was charged with both intoxication and speeding. However, the defendant denied both, claiming that the accident occurred when bad weather forced his car to swerve off the road and hit a road hazard. *Id*. The defendant attempted to demonstrate his theory by computer animation. *Id*. After discussion, the court concluded that the computer animation was admissible, that it was not scientific evidence, but analogous to a simple chart or diagram. *Id*. at 722. In an oft-quoted remark, the court stated:

> A computer is not a gimmick and the court should not be shy about its use, when proper. Computers are simply mechanical tools - receiving information and acting on instructions at lightning speed. When the results are useful, they should be accepted, when confusing, they should be rejected. What is important is that the presentation be relevant to a possible defense, that it fairly and accurately reflect the oral testimony offered and that it be an aid to the jury's understanding of the issue.

McHugh, 476 N.Y.S. 2d at 722-23.

[82]People v. Mitchell, Marin County Superior Court No. SC-12462-A (Cal. App. First Dist. Div. 2 1994). James Mitchell claimed he shot his brother Artie in self-defense. The prosecution used animated reconstruction of the events based on physical evidence gathered at the crime scene. *Id.* at 11.

permitted the use of computer reconstruction to disprove the defendant's theory of the murder case.[83]

A most recent use of computer reconstruction occurred in the case of *Pierce v. State*.[84] Using computer reconstruction, Pierce was convicted of vehicular homicide and sentenced to sixty years.[85] Defense counsel objected to the prosecution's use of a three-minute computer reconstruction of the accident, and appealed.[86] The appellate court, quoting *McHugh*, permitted the use of the computer simulation, as long as counsel "established proper ground work and qualified the expert."[87]

III. ISSUES: ANALYSIS AND RECOMMENDATIONS

A. The Attorneys

As with the growth and advancement of technology, computer simulations to demonstrate expert testimony will continue to be an increasingly common sight in courtrooms. In the mid-1980's, a typical computer reconstruction cost $100,000 or more.[88] In 1989, the same simulation cost about $30,000 to $60,000 to produce.[89] In 1993, the cost for the same simulation was $4,000 to $8,000.[90]

As with any critical part of the litigation process, the attorney would be well advised to consider the local jurisdictional nuances and rules regarding the use of computer simulation.[91] Time investment prior to the trial is preferable to the "risk of incurring the [c]ourt's wrath and having one's carefully planned high tech show derailed."[92]

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[83]State v. Clark, 655 N.E.2d 795 (Ohio Ct. App. 1995). Clark claimed that the death was an accident, but the computer reconstruction showed differently. *Id.* at 810. *See* Kristin L. Fulcher, *The Jury as Witness: Forensic Computer Animation Transports Jurors to the Scene of the Crime or Automobile Accident,* 22 U. DAYTON L. REV. 55 (1996). *But see* Cornell v. State, 463 S.E.2d 702 (Ga. 1995) (defendant not permitted to introduce a reconstruction of a crime scene as evidence, as lacking adequate foundation).

[84]Pierce v. State, 671 So.2d 186 (Fla. App. 4th Dist. 1996).

[85]*Id*. at 187. Pierce hit three children with his truck, killing one of them. *Id.*

[86]*Id*.

[87]*Id*. at 190. For a detailed discussion of Pierce, *see* Jennifer Robinson Boyle, *State v. Pierce: Will Florida Courts Ride the Wave of the Future and Allow Computer Animations in Criminal Trials?*, 19 NOVA L. REV. 371 (1994).

[88]Daniel Tynan, *Evidence in Motion*, 13-Oct CAL LAW 85, 85 (1993).

[89]*Id*.

[90]*Id.* A review of any litigation based publication will include advertisements for computer software which will produce computer simulations for the attorney.

[91]MAUET, *supra* note 8, at 167.

[92]David Siegel & Brian Pass, *High Technology at Trial: Use It or Lose It*, 444 PLI/LIT 605, 624 (1992). The contra is also possible . . . not preparing a computer simulation upon the false assumption that the court would exclude it.

An effective attorney will have an understanding of data processing and computer modeling concepts.[93] This will allow the attorney to make an initial investigation and develop an understanding of the true materiality of the computer simulation.[94] "Where the computer is involved, the advocate's ability to effectively detect and present facts and to control the uncertainty associated with those facts will depend . . . on his understanding of the data processing environment."[95]

Only a knowledgeable advocate will be able to make effective use of "the oldest and most venerable tradition available to the attorney, the art of cross-examining the expert."[96] The modeling expert must be made to "defend the procedures used in all steps of the modeling process."[97] Using effective cross-examination, the knowledgeable advocate can convey to both the judge and jury the unreliability of a poorly executed demonstrative computer simulation.[98] If the model is speculative, the effective and knowledgeable advocate can reveal this substantial defect to the factfinder.[99] If the computer simulation's underpinnings are weak, the advocate can reveal this to the jury by thoroughly questioning the expert, stripping him of his expert "jargon" and requiring him to answer the cross-examination in explicit terms.[100]

In criminal trials, the U.S. Constitution guarantees the criminal defendant the right to effective assistance of counsel.[101] In *Strickland v. Washington*,[102] the Supreme Court adopted a two-prong test[103] which evaluates counsel's performance against the actions of an objective reasonably competent lawyer under the circumstances based upon the prevailing professional norms and circumstances.[104] Although this standard applies both during discovery and at trial, currently no case

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[93]Craig Murphy, *Computer Simulations and Video Re-Enactments: Fact, Fantasy and Admission Standards,* 17 OHIO N.U. L. REV. 145, 158 (1990). This is especially significant considering that many advocates have a non-scientific or technical background. One commentator predicts that we may well be headed towards a stratified society—one class of sophisticated technological aristocrats, who are able to use and command the complex technologies, and a "much larger class of plebeians who still have trouble programming their VCRs." Loevinger, *supra* note 32, at 35-36.

[94]*Id.*

[95]*Id.*

[96]Itzchak E. Kornfeld, *A Postscript on Groundwater Modelling: Daubert, "Good Grounds," and the Central Role of Cross-Examination*, 29 TORT. & INS. L. J. 646, 648 (1994).

[97]*Id.*

[98]*Id.*

[99]*Id.* at 648-49.

[100]*Id.*

[101]U.S. CONST. amend. VI.

[102]466 U.S. 668 (1984).

[103]The defendant must show that counsel's performance was deficient, and that the deficient performance was so serious as to deprive the defendant of a fair trial that reached a reliable result. *Id.*

[104]*Id.*

has found that that defense counsel's failure to seek discovery of computerized information resulted in a constitutional violation.[105] However, as defense attorneys and the judiciary become more technically literate and request this information during discovery and/or trial, the prevailing norms considered under a *Strickland* test will shift to include computer simulation information.[106] Thus, even the minimally competent attorney will be required to consider and evaluate demonstrative computer simulations.[107]

B. The Experts Themselves

Prior to evaluating the admissibility of the demonstrative computer simulation, the court evaluates the admissibility of the expert's testimony.[108] If the expert testimony is inadmissible, then the computer simulation which would demonstrate the expert's opinion would also be inadmissible.[109] However, even if the expert testimony is admissible, prior to its viewing by the jury the demonstrative computer simulation must receive independent scrutiny.[110]

In addition to the substantive expert, the demonstrative computer simulation may require the testimony of the expert who actually produced the simulation.[111] The computer expert would still have to be qualified concerning his expertise in the subject matter of his testimony. The testimony of the computer expert should cover: 1) the expert's knowledge, skill, experience, training, or education in programming and operating computers;[112] 2) the instructions the expert received for creating the program;[113] 3) the data the expert entered into the computer, the source for such data, and validation performed on the information;[114] 4) the steps taken to ensure that the

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[105]Robert Garcia, *"Garbage In, Gospel Out": Criminal Discovery, Computer Reliability, and The Constitution*, 38 UCLA L. REV. 1043, 1141 (1991).

[106]*Id.* at 1142.

[107]*Id.*

[108]FED. R. EVID. 104(a).

[109]Edward A. Hannon, *Computer-Generated Evidence: Testing the Envelope*, 63 DEF. COUNS. J. 353, 359-60 (1996). Therefore, qualification of the expert is a critical step, and would be performed according to FED. R. EVID. 702. Depending on the type of testimony the expert is expected to produce and the jurisdictional rules that apply, either the *Frye, Daubert*, or combination (*Williams/Downing*) test would be used.

[110]Hannon, *supra* note 109, at 259-60. *See infra* Part III.D for a detailed discussion regarding the foundational requirements for admissibility of the demonstrative computer simulation.

[111]Robert M. Pozin, *Sophisticated Models and In-Court Demonstrations*, 15 SPG BRIEF 43, 45 (1986). If the substantive expert relied on commercially available and tested software, in some jurisdictions the computer expert's testimony may be partially replaced by judicial notice. *Id.* Some courts may also considering appointing their own expert under FED. R. EVID. 706 to independently evaluate the demonstrative computer simulation.

[112]*Id.*

[113]*Id.*

[114]*Id. See infra* Part III.C.

programs were reliable and performed calculations accurately;[115] 5) the "chain of custody" of all parts of the demonstrative computer simulation;[116] 6) the reliability of the software and hardware;[117] and 7) emphasis that the computer is simply making quick and speedy mathematical calculations based on the information relayed by other parties.[118]

Finally, even though the substantive expert may not have personally prepared the simulation, the substantive expert must still be familiar with the workings, concepts and information used in the demonstrative computer simulation, and be prepared to explain them in understandable terms to both the bench and jury.[119] If the substantive expert has not been properly prepared on these concepts, the advocate risks the inadmissibility of the demonstrative computer simulation.[120] The substantive expert would be unable to testify if the demonstrative computer simulation would "fairly and accurately" represent his testimony, and if the computer simulation would "assist the expert is testifying."[121]

C. GIGO - Garbage in, Garbage Out

Computer systems do not think on their own; they simply respond to the instruction and information given by humans.[122] If this information and/or instruction is faulty, the end result of any computer process would be inaccurate.[123] For example, on January 15, 1990, the AT&T long-distance network collapsed for a nine hour period, due to a faulty instruction given to the computer by a person.[124] If an incorrect computer instruction can create this type of chaos, how much damage can an undetected incorrect computer instruction do in the criminal courtroom?

Reliability of the demonstrative computer simulation is required for admissibility.[125] Several factors determine the reliability of the simulation: 1) the

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[115]*Id.* James T. Wentzel, the crime scene reconstructionist for the Cuyahoga County Coroner's Office in *Clark,* now calibrates his hardware and software as a validation of reliability. Public Interview with James T. Wentzel (Feb. 4, 1998).

[116]Brain & Broderick, *supra* note 17, at 54-55. Testimony would be proper regarding who has had access to either the source data, computer software or hardware, and results of the simulation.

[117]*Id.*

[118]*Id.* Therefore, the computer simulation is simply demonstrating the testimony of the substantive expert witness.

[119]David Weinberg, *Animation in the Court: Scientific Evidence or Mickey Mouse?*, 34 No. 2 JUDGES' J. 11, 13 (1995).

[120]*In re* Chartiers Valley School District, 447 A.2d 317 (Pa. 1982).

[121]*See supra*, note 28, for discussion on the "magic words."

[122]*See supra*, notes 48-49 and accompanying text for discussion regarding GIGO.

[123]Mario Borelli, *The Computer as Advocate: An Approach to Computer-Generated Display in the Courtroom*, 71 IND. L. J. 439, 450-51 (1996).

[124]Garcia, *supra* note 105, at 1077.

[125]*See* United States v. Scheffer, 523 U.S. 303 (1998) for the Supreme Court's most recent discussion regarding reliability of evidence.

hardware (equipment);[126] 2) the software (instructions);[127] 3) the manner in which the information was entered into the computer;[128] 4) the presence or absence of quality control over the process;[129] and 5) the presence or absence of a security system within the computer.[130]

Based on the GIGO principle, a knowledgeable attorney could challenge the reliability of the demonstrative computer simulation. Even commercial software is subject to inaccuracies, so all portions of the production of the computer simulation should be considered.[131] However, the qualification of the input data is both the most important and the most vulnerable.[132] An effective attorney will be wise to double-check each piece of information input into the simulation software.[133] Spot-checks should be performed on the output of the process to verify and validate the entire process.[134]

Additionally, the theories used to process and formulate the computer simulation require close scrutiny.[135] The computer programs require large amounts of source information to produce an accurate simulation.[136] If inadequate information is available, extrapolation or speculation of the information may be performed to produce the data necessary to run the program.[137] However, such information is not factual; rather, it is an educated guess, and will distort the actual event.[138]

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[126]Dennis A. Estis et al., *Admissibility of Computer-Generated Evidence*, CONSTRUCTION LAW, August 1994, at 42.

[127]*Id.*

[128]*Id.* For example, in an accident reconstruction scenario, information would need to be gathered, entered, and verified from eyewitnesses, photographs, scene visits, highway maps, and topographical surveys. Kristin L. Fulcher, *The Jury As Witness: Forensic Computer Animation Transports Jurors to the Scene of a Crime or Automobile Accident*, 22 U. DAYTON L. REV. 55, 74 (1996). If just one piece of this information is inaccurate, it can skew the entire results of the demonstrative computer simulation . . . resulting in an inaccurate video display of the incident to the jury. *Id.*

[129]Estis et al., *supra* note 126, at 42.

[130]*Id.*

[131]*Id.*

[132]David W. Muir, *Debunking the Myths About Computer Animation*, 444 PLI/LIT591, 602 (1992).

[133]*Id.* The dissent in *Clark* noted that the crime scene reconstructionist did not validate the information given to him, that "he neither visited this crime scene nor personally took any of the measurements used in the analysis." State v. Clark, 655 N.E.2d 795, 818 (Ohio Ct. App. 1995).

[134]Muir, *supra* note 132, at 602. This source contains a good, detailed explanation of validating the input data.

[135]I. Neel Chatterjee, *Admitting Computer Animations: More Caution and New Approach are Needed*, 62 DEF. COUNS. J. 36, 41 (1995).

[136]*Id.*

[137]*Id.*

[138]*Id.* at 41-42.

D. Admissibility

The admissibility of computer simulations continues to provide confusion for both the bench and bar.[139] Some view the computer simulation as substantive evidence, and subject the simulation to rigorous substantive admissibility requirements.[140] Others view the computer simulation as demonstrative evidence, and subject the evidence to the more relaxed admissibility requirements for demonstrative evidence.[141]

First, to admit demonstrative computer simulation to illustrate expert testimony, the experts themselves must be qualified to testify.[142] Under Federal Rules of

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[139]MAUET, *supra* note 8, at 165-67. A review of the current literature also shows continuing confusion over the true role of computer simulation. Due to this confusion, the wise litigator will be aware of the issues and arguments concerning both substantive and demonstrative computer simulations.

[140]As substantive evidence, the computer simulation is admitted as an exhibit, the attorneys can use it during closing arguments, and the jury can use it during deliberations. *Id.* For substantive evidence, the computer simulation itself must have independent probative value, add new facts to the case, and meet substantive evidentiary standards. Chatterjee, *supra* note 135, at 38. As such, the computer simulation itself is subjected to the requirements of FED. R. EVID. 702, and would come under the jurisdictional scrutiny of the *Frye/Daubert* type evaluation. *Id.* In one case, the computer simulation was offered for substantive evidence, but failed a *Daubert* evaluation. Robinson v. Missouri Pacific Railroad Co., 16 F.3d 1083 (10th Cir. 1994). However, the court still permitted the simulation to be introduced as illustrative evidence. *Id.* at 1086-91. For additional information regarding the use of computer simulations as substantive evidence, *see* I. Neel Chatterjee, *Admitting Computer Animations: More Caution and New Approach are Needed*, 62 DEF. COUNS. J. 36 (1995); Edward A. Hannon, *Computer-Generated Evidence: Testing the Envelope,* 63 DEF. COUNS. J. 353 (1996); John Selbak, *Digital Litigation: The Prejudicial Effects of Computer-Generated Animation in the Courtroom,* 9 HIGH TECH. L. J. 337 (1994).

[141]As computers have no independent thought process and totally reflect the thought of humans, it is more proper to use the computer simulation as demonstrative evidence. Demonstrative evidence is not admitted into evidence, and is usually not permitted in the deliberation room. *See supra*, Part II.A. However, by illustrating the expert's testimony with computer simulation, the visual conceptualization of the expert's testimony is shown to the jury, and carried mentally by the jury themselves back into the deliberation room.

[142]*See supra*, Part III.B. As previously mentioned, the Federal Rules of Evidence are used throughout this practitioner's guide. However, even for those jurisdictions which have not adopted the Federal Rules, the discussions contained here are valuable in handling demonstrative computer evidence.

The Federal Rules of Evidence echo the *Daubert* standard, based upon *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), which concluded that the judge serves as gatekeeper for the admissibility of scientific testimony, relevancy being based upon not whether or not the judge favored or disfavored the scientific conclusion, but rather if there are good grounds for the scientific conclusion, the testimony is admissible, and the jury is to determine the weight and credibility of the scientific testimony. *Id.* at 592, 597. *Daubert* contains the "four horsemen," that is, four factors which judges can consider in determining the reliability and hence the admissibility of the proffered scientific evidence: 1) whether the theory employed by the expert is generally accepted in the scientific community; 2) whether the theory has been subjected to peer review activities and publication; 3) whether the theory can be and has been tested; and 4) whether the known or potential error rate of the tests is acceptable. The expert's bare conclusions, without more, are not enough; rather, the expert's

Evidence 702, the expert's opinions may be scrutinized for reliability and relevancy, using a *Daubert* test for scientific testimony. The Federal Rules of Evidence 401/403 relevancy/balancing tests work together with the *Daubert* test contained in 702 to insure the quality of the evidence placed before the jury.

The purpose of demonstrative computer simulation is simply to make an expert's testimony more understandable, or to provide background material to accomplish the same effect.[143] Therefore, to admit the demonstrative simulation, the only required foundation is the expert's testimony that the animation fairly and accurately illustrates the expert's opinion and is helpful for the expert to explain the testimony to the jury.[144]

To authenticate the demonstrative simulation, both the source information and the computer process used to create the simulation are subject to scrutiny for reliability.[145] As discussed earlier, both the substantive expert and the computer expert will need to demonstrate the reliability of the underlying data, formulae or theories, etc.[146] Additionally, the system should be authenticated to show accurate results, and reliability of the processes.[147] Once this foundational requirement is met, the demonstrative computer simulation can be considered to illustrate the expert's testimony.

The importance of establishing the reliability of both the underlying data and theories, as well as the operation of the computer system, can not be taken lightly. For evidence to be placed before the jury, reliability of the evidence is required. A criminal defendant may counter that his constitutionally protected Fifth Amendment[148] due process right to mount his own defense will permit the use of evidence which may seem reliable in the lay setting, but has not been deemed reliable *de jure*. However, in a recent Supreme Court decision,[149] the Court held that

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conclusions must be founded on sound science, requiring objective, independent evaluation of the expert's work. *Id*. at 593-97.

Prior to the *Daubert* standard, the Federal Rules were based on the *Frye* standard, named aptly for *Frye v. United States*, 293 Fed. 1013 (D.C.Cir. 1923). Some state jurisdictions still utilize the *Frye* standard, which held that evidence which was not based on generally accepted principles in the scientific community was inadmissible, therefore not permitting the admission of new or novel scientific theories. *Id*. at 1014.

[143]Hannan, *supra* note 109, at 360.

[144]MAUET, *supra* note 8, at 166. In *People v. McHugh*, 476 N.Y.S.2d 721 (N.Y. 1984), (discussed *supra,* note 80), the court articulated that the demonstrative computer simulation was admittable upon qualification of the expert if the computer simulation: 1) was relevant, 2) fairly and accurately reflected the oral testimony, and 3) could aid the jury in understanding the testimony. *Id.* at 722.

[145]Weinberg, *supra* note 119, at 12.

[146]*See supra*, Part III.B.

[147]Weinberg, *supra* note 119, at 13. FED. R. EVID. 901 will permit authentication by showing the computer produces accurate results, by demonstrating that commercially available equipment and software was used, or by judicial notice. *Id.* For sample foundational questions specifically developed for computer simulations, *see* Gail Donoghue, *Computer Generated Exhibits*, 553 PLI/LIT 509, 524-25 (1996).

[148]U.S. CONST. amend V.

[149]United States v. Scheffer, 523 U.S. 303 (1998) .

the criminal defendant must establish reliability of his defense evidence, and that unreliable evidence has no place before a jury in the criminal courtroom.[150] Therefore, the establishment of the reliability of demonstrative computer simulation to illustrate expert testimony is a crucial phase, and should be give full and proper weight in preparation for trial.

E. Additional Evidentiary Issues

1. Discovery

An expert's testimony illustrated by computer simulation will contain many complex data, theories, and calculations, and take considerable time by the opposition to study and prepare.[151] However, all that is required under criminal discovery rules is the pre-trial disclosure of a summary of the expert's intended testimony.[152] The civil discovery rules are more liberal, requiring the disclosure of "data or other information considered by the witness"[153] and notification of any "exhibits to be used as a summary."[154] Neither rule explicitly requires advance notification and production of the computer simulation, or its chief components.

In the civil context, early case law did not require opposing counsel to supply the underlying data and theorems of the computer simulation in advance of trial.[155] However, subsequent cases have required the timely pre-trial disclosure of information regarding the use of demonstrative computer simulation to illustrate expert testimony, and have excluded the expert's testimony when timely pre-trial disclosure was not given.[156]

Beyond the Federal Rules of Civil Procedure protection of Rule 26, civil litigants may also be able to obtain access to the computer simulation information through

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[150]*Id.*

[151]Barrish, *supra* note 71, at 712.

[152]FED. R. CRIM. P. 16 (a) (1) (E). The rule requires the defendant to comply with a reciprocal request by the government after the government has provided the defense with the defendant's discovery request. FED. R. CRIM. P. 16 (b) (1).

[153]FED. R. CIV. P. 26 (a) (2) (B).

[154]*Id.*

[155]Perma Research v. Singer Company, 542 F.2d 111 (2d Cir. 1976). Although Perma refused to disclose the details to Singer, the trial judge still allowed the expert to testify. The appellate court did not find an abuse of discretion by the trial judge, as "Singer has not shown that it did not have an adequate basis on which to cross-examine the plaintiff's experts." *Id.* at 115.

[156]*See* Mississippi PSC v. Mississippi Valley Gas Co., 358 So. 2d 418 (Miss. 1978); Richardson v. State Highway & Transportation Commission, 863 S.W.2d 876 (Mo. 1993); Ladeburg v. Ray, 508 N.W.2d 694 (Iowa 1993). In *City of Cleveland v. Cleveland Electric Illuminating Co*., 538 F. Supp. 1257 (N.D. Ohio 1980), the court concluded that a "discovering party not only must be given access to the data that represents the computer's 'work product,' but he also must see the data put into the computer, the programs used to manipulate the data and produce the conclusions, and the theory or logic employed by those who planned and executed the experiment." *Id.* at 1266-67 (citing 8 WRIGHT & MILLER, FEDERAL PRACTICE AND PROCEDURE, § 2218).

other avenues. The issuance of a *subpoena duces tecum* and request for production will facilitate the obtainment of this information.[157] Very specific interrogatories may also lead to additional information.

The attorney can also use the protective order provided by Federal Rules of Civil Procedure 26(c) to require enough advance notice and information to adequately prepare,[158] to require that the opposing party's obligation to supplement discovery include any demonstrative computer simulation,[159] and to limit disclosure in order to protect any proprietary information of the expert.[160] Using a *motion in limine* for a pre-trial hearing may be useful in determining the jurisdictional boundaries of this disclosure.[161]

However, the criminal defendant does not have at his disposal the discovery tools available to the civil litigant. Federal Rules of Civil Procedure 16 allows for limited discovery, but it does not allow depositions or interrogatories of the experts who will be testifying with the computer simulation.[162] The criminal defendant must look to the court's interpretations of the Constitution for his protection. Under the Due Process clause, the government must disclose any information in its possession that is favorable to the defense and material to guilt or punishment, including information that is exculpatory or that can be used to impeach a witness.[163] This would apply equally to information regarding a computer simulation.[164]

The criminal defendant also has a protected constitutional right to confront his accusers.[165] Inherent in the right of confrontation is the right to cross-examine the witness.[166] However, improper pre-trial discovery of the expert's testimony and the accompanying complex computer simulation information would render the cross-examination of the expert incomplete at best.[167] Yet, to date there is no clear, brightline rule allowing for the pre-trial discovery of demonstrative computer simulations.[168]

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[157]FED. R. CIV. P. 26 (b) (1); FED. R. CIV. P. 33; Brain & Broderick, *supra* note 17, at 54.

[158]Brain & Broderick, *supra* note 17, at 54.

[159]*Id.*

[160]Pozin, *supra* note 111, at 44.

[161]Edward V. Filardi & Dimitrios T. Drivas, *The Presentation of Demonstrative and Visual Evidence At Trial*, 299 PLI/PAT 245, 250 (1990). The attorney may also start with the voir dire challenge of the opposing expert . . . remember, no expert, no demonstrative computer simulation. *Id.*

[162]Edward J. Bardelli, *The Use of Computer Simulations in Criminal Prosecutions*, 40 WAYNE L. REV. 1357, 1374-75 (1994).

[163]Brady v. Maryland, 373 U.S. 83 (1963).

[164]Garcia, *supra* note 105, at 1132.

[165]U.S. CONST. amend. VI.

[166]Pennsylvania v. Ritchie, 480 U.S. 39, 66 (1987) (Brennan, J. dissenting).

[167]Garcia, *supra* note 105, at 1137-38.

[168]The issue in *Ritchie* was: Does the Sixth Amendment right to cross-examine entail the right to obtain discovery before trial of any and all information in a confidential file that might be useful to contradict or to impeach unfavorable testimony at trial, or to prepare for trial?

2. Hearsay

Upon introduction of demonstrative computer simulation to illustrate expert testimony, opposing counsel is likely to stand and welcome the simulation with that aggravating phrase: "Objection, hearsay." However, a demonstrative computer simulation is not hearsay, it is not an out of court statement offered for the truth of the matter asserted.[169] Rather, demonstrative computer simulation is offered to illustrate the expert's testimony; to assist the expert in the explanation and clarification of his testimony to the jury.[170] Since the computer simulation demonstrates the expert's testimony, the expert's in-court statements are those statements which are evaluated against the hearsay rules.[171]

In those jurisdictions which may still classify demonstrative computer simulation as substantive evidence, Federal Rules of Evidence 803 (24) and 804 (b) (5) may provide relief to the hearsay objection. These hearsay "catchall exceptions" give courts discretionary authority to admit hearsay evidence, providing the court determines that the evidence is reliable and trustworthy.[172] However, the caveat is that these exceptions require pre-trial notification to the opposing party.[173]

3. The 403 Balancing Test: Unfairly Prejudicial or Technology Backlash?

As this discussion is entitled "Seeing is Believing,"[174] this old adage gains extra weight when considering computer simulations that are produced for the jury.[175] Computerization carries with it a public perception of precision and infallibility.[176] The fear by opposing counsel is that the jury will think "I saw it on TV, so it must be true," without examining the validity of the expert's own underlying testimony.[177]

Under Federal Rules of Evidence 403, the court can exclude evidence, regardless of its authentication and relevance, "if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury."[178] Generally courts will admit demonstrative computer simulation if the simulation is

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Ritchie, 480 U.S. at 42-43. The plurality decision held that the Sixth Amendment does not guarantee the right of pre-trial discovery. *Id.* at 61.

[169]FED. R. EVID. 801.

[170]Borelli, *supra* note 123, at 448.

[171]Additionally, FED. R. EVID. 703 allows an expert to rely upon information not in evidence in forming his testimonial opinion.

[172]Marc A. Ellenbrogen, *Lights, Camera, Action: Computer-Animated Evidence Gets Its Day in Court*, 34 B.C. L. REV. 1087, 1110-11 (1993).

[173]*See supra*, Part III.E(1) for discussion on pre-trial discovery.

[174]Racz v. R.T Merryman Trucking, Inc., Civ. A. No. 92-3404, 1994 WL 124857, *5 (E.D. Pa. Apr. 4, 1994).

[175] Borelli, *supra* note 123, at 455.

[176]*Id.*

[177]Murphy, *supra* note 93, at 158. The expert in *Pierce* described the effect as this: "All eyes were glued to the" computer simulation. Fulcher, *supra* note 128, at 72.

[178]FED. R. EVID. 403. To preserve the record for appeal, the simulation needs to be included in the record.

true to the expert's testimony,[179] is not unnecessarily inflammatory,[180] and proper pretrial notice has been forewarned to the opposition. The court places great faith in the jury and their ability to adhere to the court's instructions.[181]

However, there have been instances where courts have disallowed the use of demonstrative computer simulation, citing the prejudicial effect foreseen by Federal Rules of Evidence 403. It would be possible to boast the credibility of an expert's not-quite-firmly-grounded testimony by the mere method of using a demonstrative computer simulation. Coupled with less knowledgeable opposing counsel, the prejudicial effect can quickly outweigh the probative value of the expert's testimony. In one instance, the simulation was so effective that it made the judge uncomfortable, and he was convinced that the simulation would remove from the jury the factfinding role.[182] In another case, the court determined that the computer simulation was not sufficiently similar to the expert's testimony to permit the simulation to be shown to the jury.[183] However, another court disapprovingly found that even though the computer simulation was an adequate representation of the expert's testimony, counsel gave opposing counsel inadequate notice and time to prepare for examination of the simulation.[184] In each of these instances, Federal Rules of Evidence 403 was cited as the authority to exclude the proposed demonstrative computer simulation to illustrate the expert's testimony.

The backlash in our society against over computerization can also lurk as a potentially damaging prejudice on the contra side of the demonstrative computer simulation.[185] The use of the demonstrative computer simulation is supposed to aid the jury in clarifying the expert's complex testimony. However, in some instances, other types of demonstrative evidence would be much more helpful to the jury in

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[179]In *Robinson v. Missiori Pacific Railroad Co*., 16 F.3d 1083 (10th Cir. 1984), the Tenth Circuit ruled that in this matter with the limited illustrative use of computer simulation, there is no resulting prejudice; provided that there is a cautionary instruction to the jury and an opportunity for cross-examination of the expert. *Evidence - Videotaped Animation - Illustration of Expert's Theory*, 95 No. 5 FED. LITIGATOR 43 (1994).

[180]In *Pierce v. State*, 671 So.2d 186 (Fla. App. 4th Dist. 1996), even though the evidence indicated a bloody scene with screaming children, the "computer animation videotape demonstrated no blood and replicated no sound. Further, the mannequins used in the computer animation . . . depicted no facial expressions." *Florida Appeals Court OK's Use of Computer Animation As Demonstrative Evidence in Criminal Trials*, 1996 WL 259109. In *Clark*, the demonstrative computer simulation indicated the defendant and victim by the use of stick figures. State v. Clark, 655 N.E.2d 795, 801 (Ohio Ct. App. 1995).

[181] Hannon, *supra* note 109, at 358. One commentator concurs with the dissenting judge in *Perma*, that most people have had enough experience with computer glitches and errors as to be skeptical when presented with computer produced information. Borelli, *supra* note 123, at 455.

[182]*Computer Simulation May Be Considered Real Evidence*, 29 Dec. PROSECUTOR 17, 21 (1995).

[183]Sommervold v. Grevlos, 518 N.W.2d 733, 738 (S.D. 1994).

[184]Richardson v. State Highway & Transp. Comm'n, 863 S.W.2d 876 (Mo. 1993).

[185]James W. McElhaney, *Gizmos in the Courtroom: Don't Use Technology at Trial Just Because You Can*, A.B.A. J. Nov. 1997, 74, 75.

understanding the expert's testimony.[186] Where more simplified demonstrative evidence is required, the excess use of computer simulation just for the sake of the new technology[187] can dilute the jury's understanding of the expert testimony.[188]

Even when the technology is the proper media for the demonstrative illustration, the jury can negatively react to the computer simulation. Jurors can be skeptical as to lawyer-created evidence[189] and may view a computer simulation in a skewed light.[190] One instance revealed that a jury recognized an intentional effort of an emotional appeal[191] and became angry with counsel for this intentional effort to bias their verdict.[192]

4. Jury Instructions

The court can address the concerns of the parties by giving specific limiting instructions.[193] For effectiveness, the judge should instruct the jury when the simulation is shown that the it is being used to illustrate the expert testimony.[194] Additional clarification by the judge related to scale, size, and other similarities will be helpful to proper use by the jury of the demonstrative computer simulation.[195]

IV. CONCLUSION

With the rapid growth of technology, an increased use of demonstrative computer simulation to illustrate expert testimony in the courtroom is expected. The expert's testimony is required for introduction of the demonstrative computer simulation before the jury.[196]

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[186]In one example, an attorney was cross-examining a doctor regarding lung cancer metastasization. *Id.* Rather than use the whiz-bang technology, the attorney had the doctor hold up a grapefruit (representing the tumor) right next to his chest. *Id*. The grapefruit was covered with Post-It notes, which represented the migrating cancer cells. *Id.* During the cross-examination, the attorney pulled the Post-It notes off of the grapefruit, and stuck them all over the doctor . . . demonstrating the migration of the cancer. *Id.*

[187]In the technology world, this overuse of technology just for the sake of the technology is known as "latest and greatest" or "bleeding edge;" the point being that the mere use of the brand-new, hot-out-of-the-development-lab technology is more important than the intended result itself.

[188]McElhaney, *supra* note 185, at 75.

[189]*Id.* Criminal defense attorney Gerald Messerman worries that the high costs of the technology will make litigation increasingly undemocratic. *Id.*

[190]*Id*.

[191]Fredrick Lederer, *supra* note 2, at 42-44. The graphics in the simulation were encased in tombstones. *Id.*

[192]*Id.* What really could be more damaging to your case than to anger the jury against you?

[193]Fulcher, *supra* note 128, at 75.

[194]*Id.*

[195]*Id*.

[196]*See supra*, Part III.B.

The prepared and tenacious litigator will become knowledgeable regarding the terms, concepts, and processes involved in creating the computer simulation,[197] as demonstrative computer simulation carries additional evidentiary reliability concerns. The "Garbage In, Garbage Out" principle of computing requires that the underlying information and process used to produce the computer simulation be critically reviewed and evaluated for accuracy and reliability.[198] Effective counsel should analyze and plan for (and against) the use of demonstrative computer simulations, and assist the court in understanding these same technical terms, concepts and processes. Failure of counsel to familiarize themselves with the technology which results in the admission of unreliable computer simulations may arise to the level of ineffective assistance of counsel and ethical concerns.

Seeing may be believing.[199] Effective counsel will ensure that only fair and accurate illustrations of the expert's testimony via demonstrative computer simulations reach the jury. It is the responsibility of the court and counsel to ensure the computer simulations which illustrate the expert's testimony assist the jury in their understanding, and do not unfairly prejudice their decision.

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[197] *See supra*, Part III.A.

[198] *See supra*, Part III.C.

[199] Racz v. R.T. Merryman Trucking, Inc., Civ. A. No. 92-3404, 1994 WL 124857, *5 (E.D. Pa. Apr. 4, 1994).