A Class of Their Own: Model Procedural Rules and Evidentiary Evaluation of Computer-Generated "Animations"

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I. INTRODUCTION

Over twenty years ago, one New York court recognized that:

> 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.[1]

The simple logic of this statement cannot be denied. As time has progressed, however, the highly persuasive nature of computer-generated "animations,"[2] coupled with the ease with which they can be manipulated, has manifested a panoply of procedural and evidentiary concerns incident to their use in the courtroom. This Article explores those procedural and evidentiary issues.

As explained in the following sections, computer-generated "animations" are in a class of their own, apart from all other forms of demonstrative aids and substantive evidence. No other courtroom tool is so persuasive, while at the same time allowing unprecedented control over the courtroom presentation. Real-life recreations and out-of-court experiments are subject to the limitations innate in the physical world. "Animations," on the other hand, can recreate the effects of an automobile or plane crash not once, but multiple times, under any conceivable condition and with views from every conceivable angle. Any attempt to replicate such effects under "real" conditions would clearly be unrealistic, both in terms of time and cost.

Computer-generated "animations" can themselves be divided into two separate categories: demonstrative and substantive. When most people envision a demonstrative aid, some form of static picture comes to mind, such as a blowup of a photograph, an overhead projection of a chart, or, in the case of medical testimony, a plastic mannequin depicting some part of the human anatomy. This perception is not unfounded. Demonstrative aids are generally static; they can depict only a single

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1. People v. McHugh, 476 N.Y.S.2d 721, 722-23 (N.Y. Sup. Ct. 1984).

2. In the following section, a more precise definition of "animation" is developed and used throughout the Article. Where the term "animation" is in quotations, the reference is simply to "the technique by means of which movement is given, on film, to a series of drawings" generally. 1 OXFORD ENGLISH DICTIONARY 477 (2d ed. 1989).

snapshot of information at a time. Because demonstrative "animations" have the ability to portray a series of images over time, a single thirty-second animation can effectively perform the function of hundreds of these static aids. Demonstrative "animations" more than match regular static aids in function, and they surpass static aids in persuasiveness. A complex presentation need not be interrupted by the clumsy exchange of one chart for the next – an "animation" portrays any series of images seamlessly. Demonstrative "animations" have evolved so far past their static counterparts that the current guidelines governing their use do not adequately account for the potential problems they can generate.

Where demonstrative computer-generated "animations" have evolved past static demonstrative aids, substantive "animations" are an entirely new species of evidence. Using computer-generated "animations" as substantive evidence, while a relatively novel concept itself, is very different from using simple "animations." For example, computer-generated tests can serve as the basis for an expert opinion. A simple computer-generated "animation," on the other hand, is merely a demonstration to the jury of substantive evidence in the form of moving pictures. Although an expert will likely take the stand to introduce and explain the substantive "animation," apart from anything the expert says, the substantive "animation" is itself evidence for the jury.

The following sections lay the groundwork for what "animations" are, how they are created, and how they make their way in front of the jury. Part II then discusses the need for a model set of procedural guidelines governing the use of computer-generated "animations" at trial, as well as addresses the evidentiary issues attendant to using "animations" at trial. Part III includes a review of the structure of the model rules, a proposed set of model rules of admissibility, and a detailed evaluation of the procedural requirements involved in seeking to admit a computer-generated "animation" at trial. Part IV evaluates the preexisting evidentiary requirements that computer-generated "animations" implicate at trial, including: hearsay, authentication, relevance, unfair prejudice, jury instructions, special admissibility requirements for scientific evidence, and viewing "animations" during jury deliberations, opening statements, and closing arguments. Part V concludes with some practical guidance regarding the decision to employ an animation or a simulation.

A. *Using Computer-Generated "Animations":*
Substantive Versus Demonstrative

As previously mentioned, not only do computer-generated "animations" differ from other forms of evidence, there are important distinctions among "animations" themselves. In particular, an "animation" can

be used either demonstratively or substantively. An "animation" used for demonstrative purposes is often referred to simply as an animation, while an "animation" used as substantive evidence is often referred to as a simulation.[3] The remainder of this Article will take on that convention. Of course, there is also the possibility that a single computer-generated exhibit can be used as both an animation and a simulation.[4]

A computer animation is purely demonstrative when used to illustrate a witness's testimony. Consequently, in this context, the animation must be utilized in conjunction with material testimony.[5] In other words, as with a diagram or any other demonstrative aid, the testifying witness refers to the animation in explaining his or her testimony to the jury.[6] One commentator has described computer-generated animations as

> simply computer-generated drawings assembled frame by frame which, when viewed sequentially, produce the image of motion. The still frames are viewed in rapid succession, usually at a speed of 24 or 30 frames per second. The image is merely a graphic representation – a series of pictures "drawn" by a computer operator with a computer – depicting a witness's testimony.[7]

A simulation, rather than mirroring a witness's testimony, forms a conclusion based on raw data and is substantive evidence in and of itself. "In a simulation, data is entered into a computer which is programmed to analyze the information and perform calculations by applying mathematical models, laws of physics and other scientific principles in order to draw conclusions and recreate an incident."[8] Com-

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3. *See, e.g.,* Commonwealth v. Serge, 896 A.2d 1170, 1175 (Pa. 2006) (using the animation/simulation distinction); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 68 (C.P. Ct. Lackawanna County 2001); State v. Farner, 66 S.W.3d 188, 208 (Tenn. 2001); *see also* Robert B. Bennett, Jr. et al., *Seeing Is Believing; Or Is It? An Empirical Study of Computer Simulations as Evidence,* 34 WAKE FOREST L. REV. 257, 260 (1999); Mario Borelli, Note, *The Computer as Advocate: An Approach to Computer-Generated Displays in the Courtroom,* 71 IND. L.J. 439, 450-52 (1996).

4. *See* Clark v. Cantrell, 529 S.E.2d 528, 535 (S.C. 2000). Though not dealing with a computer-generated animation or simulation, the court gave an example of how a piece of evidence can be both substantive and demonstrative: "[A] bank surveillance photograph of a robbery suspect may be classified as demonstrative evidence because it illustrates the crime scene; however, it also may be classified as substantive evidence of the identity of the perpetrator." *Id.* Another example would be an animation used demonstratively during an opening statement (where no evidence is entered), then used as a substantive simulation during the introduction of expert testimony.

5. *See id.*

6. Of course, demonstrative and substantive aids also help the judge in understanding the testimony. However, although persuasive in bench trials as well, computer animations and simulations are more focused on impacting the jury.

7. Fred Galves, *Where the Not-So-Wild Things Are: Computers in the Courtroom, the Federal Rules of Evidence, and the Need for Institutional Reform and More Judicial Acceptance,* 13 HARV. J.L. & TECH. 161, 180-81 (2000).

8. *Serge,* 58 Pa. D. & C.4th at 68.

puter simulations may use any number of scientific principles to recreate an event, including acceleration, gravity, friction, atmospheric pressure, or water flow.[9] The critical distinction is that, unlike an animation, which merely reflects testimony, a simulation *is* the evidence presented to the jury.[10] During an accident recreation "simulation[,] the computer functions in a sense as an expert itself, rendering its own opinion based on internal calculations of how the accident would have occurred."[11] In an airplane disaster case, one could use the data from the onboard flight recorder to create a simulation of the accident for the jury.[12] As one commentator reported, in such a situation "[t]he computer itself was the expert. It told the jury, 'given the information contained in the onboard flight recorder, this is how the crash must have happened.'"[13] Because the simulation itself draws scientific conclusions, the computer simulation will have to pass the relevant jurisdiction's scientific evidence admissibility standards,[14] i.e., some formulation of the *Frye*[15] or *Daubert* tests.[16]

Apart from their ability to stand alone as substantive evidence, computer-generated simulations may also provide the basis for expert opinions.[17] The expert will render his or her opinion based on the simulation, which represents the result of any number of calculations run by a computer program.[18]

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9. *Id.* at 68-69.

10. *See, e.g.*, Constans v. Choctaw Transp., Inc., 97-0863, p. 47-49 (La. App. 4 Cir. 12/23/97); 712 So. 2d 885, 901.

11. *Id.*

12. *See* James E. Carbine & Lynn McLain, *Proposed Model Rules Governing the Admissibility of Computer-Generated Evidence*, 15 SANTA CLARA COMPUTER & HIGH TECH. L.J. 1, 3-4 (1999) (describing the computer-generated simulation of an airplane crash); Paul Marcotte, *Animated Evidence: Delta 191 Crash Re-Created Through Computer Simulations at Trial*, A.B.A. J., Dec. 1989, at 52, 54.

13. Carbine & McLain, *supra* note 12, at 4.

14. *See* Alice B. Lustre, Annotation, *Post-*Daubert *Standards for Admissibility of Scientific and Other Expert Evidence in State Courts*, 90 A.L.R.5th 453 (2001) (reviewing the various standards for the admissibility of scientific evidence in state courts). For ease of reference, the various standards applicable to the introduction of scientific evidence will be referred to as the "*Frye/Daubert*" standard for the remainder of the Article. See *infra* Parts III.B.4 and IV for a more thorough discussion of the *Frye/Daubert* issue as it relates to substantive simulations.

15. Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923).

16. Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 597 (1993).

17. *See* Galves, *supra* note 7, at 185 ("[In creating a simulation,] an expert enters a compilation of mathematical formulae or other scientific principles into the computer so that the computer can generate a model – based on the data and scientific assumptions -- that the expert will use to form an opinion as to what must have or could have actually happened.").

18. *See, e.g.*, Livingston v. Isuzu Motors, Ltd., 910 F. Supp. 1473, 1492 (D. Mont. 1995) (discussing expert testifying about results of accident reconstruction simulation); Commercial Union Ins. Co. v. Boston Edison Co., 591 N.E.2d 165, 167-71 (Mass. 1992) (much-cited case allowing expert to testify to results of simulation); Schaeffer v. General Motors Corp., 360 N.E.2d 1062, 1066-67 (Mass. 1977) (finding that, for expert to testify about results of a simulation,

The distinction between an animation and a simulation has more to do with its respective use and application, rather than with what it actually looks like on screen. That is to say, although an animation and a simulation appear different only in name to a jury, the moniker of animation versus simulation entails not only differing admissibility standards, but also differing evidentiary functions.

B. *Overview of Computer Animations and Simulations and the Influence They Bring*

Courts have long struggled with the admissibility of computer-generated models and the appropriateness of their use as either a purely demonstrative exhibit or as substantive evidence.[19] According to one commentator, animations first appeared in the courtroom in a 1979 trial involving an airplane crash.[20] Since that time, "[c]omputer animations have been used in the courtroom by civil litigators for reconstructing accidents, including automobile and truck accidents, aircraft collisions, construction equipment accidents, and industrial accidents, as well as in patent litigation."[21] Computer-generated animations have also been used by both the prosecution and defense in criminal trials involving vehicular homicide,[22] criminally negligent child abuse,[23] and murder,[24] to name just a few.[25]

In their early history, animations and simulations were limited in use because even a "[s]imple graphic animation could only be generated by multi-million dollar computer systems."[26] As a result, the admissibility question did not call for an immediate comprehensive response. Over the years, technology has evolved to the point where animation and simulation creation is both fast and relatively inexpensive, thereby pav-

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reliability standards must be met); Deffinbaugh v. Ohio Tpk. Comm'n, 588 N.E.2d 189, 194 (Ohio Ct. App. 1990) (finding expert properly allowed to testify as to results of simulation).

19. *See* Perma Research & Dev. v. Singer Co., 542 F.2d 111, 115 (2d Cir. 1976); *see also* Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 63 (C.P. Ct. Lackawanna County 2001) (commenting on *Perma Research & Dev. v. Singer Co.*).

20. Rorie Sherman, *Moving Graphics: Computer Animation Enters Criminal Cases*, NAT'L L.J., Apr. 6, 1992, at 32 (recounting information as relayed by a representative of a computer animation company).

21. Pierce v. State, 718 So. 2d 806, 808 (Fla. 4th Dist. Ct. App. 1997) (citing 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, 374 (1994)).

22. *See, e.g., Pierce*, 718 So. 2d at 806.

23. *See, e.g.*, People v. Cauley, 32 P.3d 602, 606 (Colo. Ct. App. 2001).

24. *See, e.g.*, People v. Hood, 62 Cal. Rptr. 2d 137, 139 (Cal. Ct. App. 1997).

25. *See* Edward J. Bardelli, *The Use of Computer Simulations in Criminal Prosecutions*, 40 WAYNE L. REV. 1357, 1357 (1994).

26. Carlo D'Angelo, *The Snoop Doggy Dogg Trial: A Look at How Computer Animation Will Impact Litigation in the Next Century*, 32 U.S.F. L. REV. 561, 562 (1998).

ing the way for their use on a greater scale.[27] Although not common courtroom practice for most litigators, the use of animations and simulations is becoming increasingly apparent.[28] Litigators have begun to tap into this invaluable resource by working with companies who exist solely to create computer-generated animations and simulations.[29] As production costs continue to decline, animations and simulations will become even more prevalent,[30] forcing courts to deal with the issues attendant to their use.

The persuasive impact animations and simulations have on the jury has driven their increased application.[31] Both animations and simulations "can be highly influential upon a jury, well beyond [their] reliability and materiality, due to [their] documentary-type format presented in

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27. *See* Boyle, *supra* note 21, at 372.

28. *See* Clark v. Cantrell, 529 S.E.2d 528, 536 (S.C. 2000) ("Attempts to use computer-generated video animations at trial, although not an everyday occurrence, are increasing."); *see also* D'Angelo, *supra* note 26, at 562.

29. *See, e.g.*, Jones v. Kearfott Guidance & Navigation Corp., No. CIV. 93-64(DRD), 1998 WL 1184107, at *1 (D.N.J. Nov. 17, 1998) (animation created by Vigani Technical Systems, Inc. using computer animation software called Lightwave DataLabs); Racz v. R.T. Merryman Trucking, Inc., Civ. A. No. 92-3404, 1994 WL 124857, at *1 (E.D. Pa. Apr. 4, 1994) (animation created by A.R.S. Associates); Rockwell Graphic Sys., Inc. v. DEV Indus., Inc., No. 84 C 6746, 1992 WL 330356, at *1 (N.D. Ill. Nov. 4, 1992) (animation created by Rockwell Graphic Systems); Hutchison v. Am. Family Mut. Ins. Co., 514 N.W.2d 882, 890 (Iowa 1994) (animation created by Technical Medical Animation Corporation); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 57 (C.P. Ct. Lackawanna County 2001) (animation created by 21st Century Forensic Animations); Galves, *supra* note 7, at n.aa1 (recognizing Engineering Animation, Inc. as providing the litigation community with computer animations since 1988); Marcotte, *supra* note 12 (mentioning Graphic Evidence, a division of Litigation Sciences, Forensic Technologies International, and Schirmer Engineering Corp.).

30. *Clark*, 529 S.E.2d at 536 ("Computer animation is likely to become more prevalent, especially as the price of preparing such animations falls."); *see also* D'Angelo, *supra* note 26, at 562-63.

31. *See Racz*, 1994 WL 124857, at *5 (stating that "[b]ecause the expert's conclusion would be graphically depicted in a moving and animated form, the viewing of the computer simulation might more readily lead the jury to accept the data and premises underlying the defendant's expert's opinion, and, therefore, to give more weight to such opinion than it might if the jury were forced to evaluate the expert's conclusions in the light of the testimony of all of the witnesses, as generally occurs in such cases"); *see also* Lopez v. Foremost Paving, Inc., 796 S.W.2d 473, 479 (Tex. App. 1990) ("The powerful effect of videotape on jurors has been recognized."); THOMAS A. MAUET, TRIAL TECHNIQUES 194-95 (6th ed. 2002) (referring to animations and simulations as "powerful, persuasive tools"); 2 McCORMICK ON EVIDENCE § 212 (John W. Strong ed., 5th ed. 1999) ("Since 'seeing is believing,' and demonstrative evidence appeals directly to the senses of the trier of fact, it is today universally felt that this kind of evidence [demonstrative evidence generally] possess an immediacy and reality which endow it with particularly persuasive effect."); Carbine & McLain, *supra* note 12, at 5 ("Computer simulations and animations are exceptionally persuasive. Judges and jurors absorb information presented in a visual format much more readily than information presented only by the spoken word. They more easily give credibility to televised information. If Peter Jennings says it happened, it happened.") (citations omitted)).

a 'television' like medium."[32] While "photographs can . . . transmit a message far better than any human witness,"[33] bringing those photographs to life in the form of an animation has even higher communicative value. Techniques such as using animations and simulations to improve juror comprehension and retention equate to greater persuasiveness in less time.[34] The average person learns more effectively by seeing rather than hearing,[35] hence a computer-generated animation "makes a more lasting and intense impression on jurors than other forms of proof."[36] Indeed, Americans receive most of their information through visual media, the television being the most prevalent format.[37] The television-like appearance of animations and simulations caters to this reality.[38] Moreover, animations and simulations break up the monotony of a dry trial, grabbing the jury's attention for those issues the litigator feels are important.[39]

Continuing with this effective communication theme, computer-generated animations can also be used as a tool to make potentially complex and confusing expert testimony understandable to the average juror.[40] In fact, although often used to illustrate lay witness testimony,[41] the majority of computer animations are used as demonstrative aids accompanying expert testimony.[42] Animations can make otherwise

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32. Van Houten-Mayhard v. ANR Pipeline Co., No. 89 C 0377, 1995 WL 317056, at *12 (N.D. Ill. May 23, 1995).

33. Hannewacker v. City of Jacksonville Beach, 419 So. 2d 308, 311 (Fla. 1982).

34. *See* Gerald J. Flintoft & Bryan Butler, *Maximizing the Impact of Visual Evidence in Patent Litigation*, *in* 349 PATENTS, COPYRIGHTS, TRADEMARKS, AND LITERARY PROPERTY COURSE HANDBOOK 429, 434-35 (1992).

35. *See* David W. White-Lief, *Effective Demonstrative Evidence: It's Your Most Persuasive Tool*, MASS. L. WKLY., Jan. 17, 1994, at B37 (noting that "[e]ighty-five percent of all learning is visual, compared to 10 percent for hearing, and 5 percent for the other senses combined").

36. *Lopez*, 796 S.W.2d at 479 (referring to videotaped evidence generally); *see also* White-Lief, *supra* note 35, at B37 ("One study reported that jurors who received combined visual and oral presentations retained 650 percent more information compared to jurors who received only oral presentations."). *But see* Bennett et al., *supra* note 3, at 285 ("[T]he extraordinary possibilities inherent in computer animations and computer simulations raised hopes – and fears – that juries would find computer-generated displays more persuasive or convincing than other forms of evidence. These hopes and fears seem to be unwarranted, at least within the context of the empirical results of this study.").

37. Bruce G. Vanyo, *Communicating with "Post-Literate" Jury: Advanced Graphic Exhibits in Patent Trials*, *in* 349 PATENTS, COPYRIGHTS, TRADEMARKS, & LITERARY PROPERTY COURSE HANDBOOK, *supra* note 34, at 409, 411-12.

38. *Id.*

39. *See* Boyle, *supra* note 21, at 380.

40. *See id.*

41. *See, e.g.*, Jones v. Kearfott Guidance & Navigation Corp., No. CIV. 93-64(DRD), 1998 WL 1184107, at *1 (D.N.J. Nov. 17, 1998); Commonwealth v. Chipman, 635 N.E.2d 1204, 1210 (Mass. 1994); Commonwealth v. Shea, 644 N.E.2d 244, 244 (Mass. App. Ct. 1995).

42. *See, e.g.*, Pierce v. State, 718 So. 2d 806, 807 (Fla. 4th Dist. Ct. App. 1997); Hutchison v. Am. Family Mut. Ins. Co., 514 N.W.2d 882, 890 (Iowa 1994); State v. Clark, 655 N.E.2d 795,

complex, technical information understandable.[43] Using programs like AutoCAD, animations can depict a scene from any vantage point imaginable.[44] A computer-generated animation "can place the jury in the driver's seat of automobile involved in a collision, in the cockpit of an airplane about to crash, or in the position of an eyewitness to a crime."[45] In medical malpractice and personal injury cases, litigators are using animations to illustrate how complex internal injuries occur.[46] No other medium can bring this perspective, and the accompanying empathy and understanding, to a jury as effectively as a computer animation or simulation.[47]

C.   The Process of Creating a Computer-Generated Animation or Simulation

Preparing a computer-generated animation or simulation involves several stages. First, the litigator must decide what the animation or simulation is to accomplish. In other words, the attorney, the forensic animator, and any relevant witnesses (be they expert or lay) must meet and determine the parameters of the animation or simulation.[48] The next, and perhaps most critical, step involves gathering the animation or simulation data.[49] This compilation should incorporate all relevant

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801 (Ohio Ct. App. 1995); Commonwealth v. Serge, 896 A.2d 1170, 1174-75 (Pa. 2006); Clark v. Cantrell, 529 S.E.2d 528, 535 (S.C. 2000);.

43. *See* Boyle, *supra* note 21, at 380-81.

44. *See, e.g., Clark*, 655 N.E.2d at 801-02 (reconstructing possible trajectory of bullets using AutoCAD).

45. Kathleen M. O'Connor, *Computer Animations in the Courtroom: Get with the Program*, 67 FLA. B.J. 20, 20 (1993) (citing Kathlynn G. Fadely, *Use of Computer-Generated Visual Evidence in Aviation Litigation: Interactive Video Comes to Court*, 55 J. AIR L. & COM. 839, 849 (1990)); *see also Clark*, 529 S.E.2d at 536 ("'Computer animation allows attorneys to convert witnesses' verbal testimony into dynamic, visual demonstrations capable of mentally transporting jurors to the scene.'") (quoting G. Ross Anderson, Jr., *Computer Animation: Admissibility and Uses*, S.C. TRIAL LAW. BULL., Fall 1995, at 9)).

46. *See, e.g.*, Hutchison v. Am. Family Mut. Ins. Co., 514 N.W.2d 882, 890 (Iowa 1994) (excluding an animation depicting a closed-head injury for authentication reasons); *see also* Andre M. Thapedi, *A.D.A.M. – The Computer Generated Cadaver: A New Development in Medical Malpractice and Personal Injury Litigation*, 13 J. MARSHALL J. COMPUTER & INFO. L. 313, 313 (1995).

47. *But see* Datskow v. Teledyne Cont'l Motors Aircraft Prods., 826 F. Supp. 677, 685 (W.D.N.Y. 1993) ("The mere fact that this was an animated video with moving images does not mean that the jury would have been likely to give it more weight than it would otherwise have deserved. As one commentator has observed, '[i]f audio or visual presentation is calculated to assist the jury, the court should not discourage the use of it. . . . Jurors, exposed as they are to television, the movies, and picture magazines, are fairly sophisticated. With proper instruction, the danger of their overvaluing such proof is slight.'") (quoting 1 JACK. B. WEINSTEIN & MARGARET A. BERGER, WEINSTEIN'S EVIDENCE ¶ 403[5], at 403-88 (1992))).

48. *See* D'Angelo, *supra* note 26, at 563.

49. *See* Smith v. Kansas City S. Ry. Co., 01-1505, p. 5 (La. App. 3 Cir. 5/28/03); 846 So. 2d 980, 983 (finding exclusion of animation proper where "information . . . relied upon to create the

information (including such elements as object size, surfaces, lighting, distances, etc.) as extracted from police and accident reports, eyewitness testimony, expert calculations, photographs, and drawings.[50] As will be discussed in later sections, much of the concern surrounding the admissibility of computer animations is based on the accuracy of the data the animation purports to reflect. Third, the forensic animator incorporates the data into the computer program to create a model. This includes incorporating the data to render a model consistent with the relevant time period. In other words, this step "controls the portrayal of how and where an object will move throughout the animation."[51] The computer will analyze this data and generate still image frames, which are recorded in succession on a particular medium (e.g., a DVD) to create what appears to be a moving image.[52] The fourth and final step involves the litigator, through expert witnesses and any other appropriate witnesses, proofing the animation to ensure it fairly and accurately reflects the scene it purports to represent.[53] As with gathering data, the importance of this step cannot be overstated because if an animation conflicts with other material evidence, the court may not admit the animation.[54] Furthermore, courts have excluded animations where certain critical variables are unverifiable.[55] Note, however, that creating an animation or simulation is only the first step on the path to the jury.[56]

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animation was inaccurate"); Cox v. State, 2001-KA-01427-SCT (¶ 57) (Miss. 2003), 849 So. 2d 1257, 1273-74 (excluding computer animation because the animation was not "based on scientific, identifiable, and objective facts"); *see also* D'Angelo, *supra* note 26, at 563-64 ("Collecting data is one of the most important steps in producing computer animation exhibits."). Technically, in the litigation process this set of inquires should have already been complete in terms of creating a theory of the case. However, for the purpose of creating a computer animation, understanding the evidence generally and understanding the evidence as it relates to what the animation will portray are separate inquires.

50. *See* Boyle, *supra* note 21, at 375.

51. *Id.* at 376.

52. *See id.* (generally referring to this author's step three as four separate steps).

53. *See* D'Angelo, *supra* note 26, at 563.

54. *See, e.g.*, Campoamor v. Brandon Pest Control, Inc., 721 So. 2d 333, 334 (Fla. 2d Dist. Ct. App. 1998) (finding error in the trial court admitting videotape interspersed with "computer-produced animations" because "the videotape . . . [is] patently deceptive and prejudicial in light of the entirety of the conflicting evidence"); State v. Farner, 66 S.W.3d 188, 210 (Tenn. 2001) (concluding that the trial court erred in admitting computer animation of drag race where the animation failed "to fairly and accurately illustrate and explain the [expert's] testimony").

55. *See, e.g.*, State v. Basten, No. 97-0918-CR, 1998 WL 61129, at *18-19 (Wis. Ct. App. Feb. 17, 1998) ("[T]he most important factor in the computer generation . . . was actually a variable based on [witness] testimony. [With that,] [t]he [trial] court believed the video would add little to the evidence, and was concerned that it would mislead the jury.").

56. See *infra* Parts III and IV for an analysis of the procedural and evidentiary concerns attendant to using animations and simulations.

D. Vehicles for the Introduction of Computer-Generated Animations and Simulations

There are five basic methods a litigator may use to bring a computer-generated animation or simulation in front of the jury: (1) as an illustration of expert testimony;[57] (2) as an illustration of lay witness testimony;[58] (3) as a simulation on which the expert has based his opinion;[59] (4) as a stand alone recreation introduced through the testimony of experts involved in creating the simulation;[60] and (5) as any of the preceding methods or a separate illustration of the theory of the case in opening statements or closing arguments.[61] Using animations to illustrate an expert's testimony is the most commonly used method.[62] This makes sense considering that expert testimony is often complex. Combining the expert's oral testimony with a computer animation illustrating that testimony makes for more effective communication and better retention.[63] Using animations to illustrate lay witness testimony is also a powerful tool. An animation can put the jury in the witness's shoes by allowing the jurors to see the events as they unfolded through the eyes of the witness. For example, litigators have used computer animations to illustrate an eye witness's depiction of a helicopter's flight path just before it crashed.[64]

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57. *See, e.g.*, Hinkle v. City of Clarksburg, 81 F.3d 416, 424 (4th Cir. 1996); Jones v. Kearfott Guidance & Navigation Corp., No. CIV. 93-64(DRD), 1998 WL 1184107, at *1 (D.N.J. Nov. 17, 1998); People v. Hood, 62 Cal. Rptr. 2d 137, 139 (Cal. Ct. App. 1997); People v. Cauley, 32 P.3d 602, 607 (Colo. Ct. App. 2001); Pierce v. State, 718 So. 2d 806, 807 (Fla. 4th Dist. Ct. App. 1997); Cleveland v. Bryant, 512 S.E.2d 360, 361 (Ga. Ct. App. 1999); State v. Sayles, 662 N.W.2d 1, 7 (Iowa 2003); Constans v. Choctaw Transp., Inc., 97-0863, p. 31 (La. App. 4 Cir. 12/23/97); 712 So. 2d 885, 900; State v. Harvey, 26613-KA, p. 5 (La. App. 2 Cir. 1/25/95); 649 So. 2d 783, 788; Commonwealth v. Serge, 896 A.2d 1170 (Pa. 2006).

58. *See, e.g., Jones*, 1998 WL 1184107, at *1 (illustrating eyewitness testimony regarding helicopter crash); *see also* Commonwealth v. Shea, 644 N.E.2d 244, 247-48 (Mass. App. Ct. 1995) (using regular videotaped illustration of victims' view as they were stranded in the ocean).

59. *See, e.g.*, Livingston v. Isuzu Motors, Ltd., 910 F. Supp 1473, 1494-95 (D. Mont. 1995) (allowing the introduction of a computer simulation upon which the accident reconstruction expert based his opinion); Starr v. Campos, 655 P.2d 794, 796-97 (Ariz. Ct. App. 1982) (discussing whether expert should be permitted to testify based on results of a non-visual computer simulation); Schaeffer v. General Motors Corp., 360 N.E.2d 1062, 1066-67 (Mass. 1977) (discussing the admissibility of results of non-visual computer simulation of auto accident). Note also that rules of evidence such as Federal Rule of Evidence 703 must be satisfied under this scenario. *See infra* Part V.

60. *See, e.g.*, Carbine & McLain, *supra* note 12, at 5 ("Expert 'testimony' is being offered by computers. In the above example of an air crash, there was no expert witness taking the stand to testify as to how the final moments of Flight 162 looked. The computer itself was the expert.").

61. See *infra* Part IV.G for a discussion of the issues attendant to the use of animations and simulations during opening statements and closing arguments.

62. *See supra* note 57.

63. *See supra* notes 34-36.

64. *See* Jones v. Kearfott Guidance & Navigation Corp., No. CIV. 93-64(DRD), 1998 WL 1184107, at *2 (D.N.J. Nov. 17, 1998).

Situations three and four are similar not only in that they are the most problematic in terms of admissibility,[65] but they are also similar in nature – so much so that, instead of considering them wholly separate categories, they may better be thought of as opposite ends of the simulation spectrum. While simulations are often a major component of testimony, an expert witness will likely be used to "fill in the gaps" with supporting testimony. In other words, an expert will rarely introduce a simulation but fail to opine about the material the jury is viewing (i.e., a pure situation four).

Under certain circumstances, a situation three or four simulation can be transformed into method one. That is to say, a substantive simulation can be changed into a demonstrative animation. This transformation occurs during the animation's production stage. Instead of the expert basing her conclusions on the computer simulation's *results*, the expert could manually process the information and create an animation based on the expert's own calculations.[66] Of course this method is often impractical when dealing with large volumes of data;[67] but when manual calculation is possible and practical, using a computer-generated demonstrative animation has the advantage of easier admissibility than using a substantive simulation.[68] Finally, using an animation during opening statements or closing arguments helps to cement the important points a jury will see or has seen throughout the trial.

II. THE NEED FOR MODEL GUIDELINES GOVERNING ADMISSIBILITY

A. *Persuasiveness*

The inordinate persuasive influence of animations and simulations demands clearly delineated guidelines for their admissibility. Referencing motion pictures generally, one court observed "caution is required in admitting motion pictures because, while the danger of false perspective or of intentional fabrication exists as to both still and motion pictures, these dangers are greater in the motion picture."[69] Animations and simulations are not subject to many of the practical encumbrances that

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65. Simulations, in addition to fulfilling all the requirements subject to animations, are subject to the *Frye/Daubert* admissibility requirements for scientific evidence. *See infra* Part IV.F.

66. Part V *infra* discusses this analysis in more detail.

67. *See* Schaeffer v. General Motors Corp., 360 N.E.2d 1062, 1067 (Mass. 1977) (noting that computer simulations can "perform rapidly and accurately an extensive series of computation not readily accomplished without the use of a computer").

68. Demonstrative animations are less troublesome to admit than substantive simulations because the computer programs creating the substantive evidence are subject to stricter reliability requirements – i.e., the *Frye/Daubert* standard.

69. Lopez v. Foremost Paving, Inc., 796 S.W.2d 473, 479 (Tex. App. 1990) (quoting Cryts v. Ford Motor Co., 571 S.W.2d 683, 691 (Mo. Ct. App. 1978)).

render real-life reenactments all but impossible. For instance, actually creating a plane crash is, among other things, prohibitively expensive. Furthermore, laws of nature such as gravity are not included in a computer animation or simulation unless the relevant data or program is designed to reflect those conditions.[70]

Computer-generated animations and simulations afford a versatility never before available. However, with this ability to account for every conceivable variable comes an equally great potential for fabrication and misrepresentation.[71] The proponent has control over all possible variables; thus, animations and simulations can just as easily distort potentially complex issues as clarify them.[72] Slight manipulations of data in an animation may go unnoticed by court and counsel, while still retaining a subtle impact on the jury.[73]

B. Cost Efficiency

Important byproducts of well-defined admission guidelines include cost efficiency in both the civil and criminal context and settlement value in civil litigation. That is to say, in terms of cost efficiency, when litigators know exactly what is necessary to admit either an animation or simulation, their cost/benefit analysis is more concrete. An error resulting in the inadmissibility of an animation can result in a loss of thousands of dollars in production costs.[74] Settlement value comes not from an increase in dollar value, but from the increased efficiency of cases settling before trial. Where opposing litigants know with relative certainty whether an animation or simulation is admissible, they have a much clearer picture of the incentives and disincentives surrounding a potential settlement.[75] Furthermore, although admissibility issues are by

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70. *See, e.g.*, Constans v. Choctaw Transp., Inc., 97-0863, p. 31 (La. App. 4 Cir. 12/23/97); 712 So. 2d 885, 900 (finding no error in the admission of an animation "which admittedly did not conform to the laws of physics or mathematics").

71. *See* 2 McCORMICK ON EVIDENCE, *supra* note 31, § 214, at 17-18 ("Motion pictures, when they were first sought to be introduced in evidence, were frequently objected to and sometimes excluded on the theory that they afforded manifold opportunities for fabrication and distortion."); *see also* Hutchison v. Am. Family Mut. Ins. Co., 514 N.W.2d 882 (Iowa 1994) (quoting 2 McCORMICK ON EVIDENCE, *supra* note 31, § 214, at 395).

72. *See* Boyle, *supra* note 21, at 382 (noting how facts can be distorted to represent a scenario other than that which took place).

73. *See What Computes in Court: Technologically Sophisticated Court Exhibits Can Raise Some Interesting Evidentiary Issues*, NAT'L L.J., Sept. 11, 1995, at C1 ("Computer-generated exhibits . . . can be modified very subtly – perhaps so subtly that it could easily escape detection by even an eyewitness to an event.").

74. *See supra* note 26.

75. *See* Boyle, *supra* note 21, at 372 ("The high cost of creating an animation has not kept it from being used in civil cases because it often leads to settlements, which are more cost effective than trials.").

no means subject to a bright line determination,[76] a concrete set of rules would affirmatively answer some issues that would otherwise result in unnecessary litigation.[77] Additionally, if the cost associated with using an animation or simulation is recoverable from the opposing party, potential litigants will be more apt to settle.[78] Overall, a set of clearly delineated admissibility guidelines would make using animations and simulations, and the litigation process in general, more cost efficient.[79]

C. *Uncertainty in the Introduction of Animations and Simulations*

In every trial, the parties must contend with a myriad of evidentiary and procedural rules. Animations and simulations are of particular concern because, in and of themselves, they implicate a multitude of distinct evidentiary and procedural issues. The procedural issues include: defining what constitutes an animation or simulation, pretrial notice and disclosure procedures including pretrial hearings, the preservation of animations and simulations for appellate review, and outlining the recoverable costs associated with producing animations and simulations. The evidentiary issues involve: hearsay, authentication, relevance, undue prejudice, limited admissibility, and, with simulations, reliability of the underlying scientific principles.

One court, addressing a computer-generated chart's admissibility, opined that trial courts already have sufficient guidance to determine computer-generated evidence's admissibility.[80] This view, however, fails to account for the stability that a model set of procedural rules would provide *at the pretrial stage*, when a litigator must determine whether to employ this type of evidence in the first instance.[81] Even assuming a trial court can fairly and efficiently decide the evidentiary and procedural issues without resorting to specifically tailored rules,

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76. For example, animations are subject to a balancing test to determine whether their potential probative value is outweighed by any potential unfair prejudice. *See* FED. R. EVID. 403.

77. The plainest example of such a rule would be a set time period before trial in which the animation or simulation must be disclosed. *See, e.g.,* Carbine & McLain, *supra* note 12, at 36 (suggesting a ninety-day pretrial notice requirement).

78. See *infra* Part III.B.6 for a discussion of a model procedural rule regarding the recovery of costs associated with animations and simulations.

79. It is worth noting that the more regulated a process is, the higher the transaction costs associated with employing that process. However, in this case, the costs saved by initiating admissibility guidelines clearly exceed any increase in transaction costs.

80. *See* Bray v. Bi-State Dev. Co., 949 S.W.2d 93, 99 (Mo. Ct. App. 1997) ("[T]here is a developing consensus . . . which agrees on how the accuracy of computer-generated evidence can be established and gives a trial court sufficient parameters to exercise its discretion in this area without the need for a precise formula.").

81. *See* Carbine & McLain, *supra* note 12, at 5 ("[Because animations and simulations are complex with] enormous potential for mischief[,] . . . the fundamental issues affecting [their] admissibility should not be decided at the time of trial.").

without such rules litigants might be faced with the prospect of risking thousands of dollars to create an animation whose admissibility is uncertain.

A review of multi-jurisdictional case law can give a litigant a sense of what procedures *should* be followed, but in the absence of specific rules, the decision to employ an animation is a risky investment. Thus, a cautious lawyer may take extra steps (i.e., spend additional money) to ensure an animation or simulation's admissibility, resulting in a needless expense. Even in jurisdictions where case law addresses computer-generated animations and simulations, the enunciated requirements are necessarily incomplete because those decisions address only the specific issues properly raised before them. Comprehensive guidelines would provide a much needed admissibility roadmap for the bench and bar alike.

III. PROPOSED MODEL RULES OF PROCEDURE GOVERNING THE ADMISSIBILITY OF ANIMATIONS AND SIMULATIONS

A. *The Aim of the Proposed Model Rules*

Litigants are entitled to present their case in what they consider the most effective manner possible.[82] At the same time, the judiciary, both state and federal, is under pressure to promptly and efficiently resolve cases.[83] Animations and simulations, if properly accounted for, would help ease this tension by enabling shorter trials, while preserving, if not increasing, the persuasiveness of the trial presentation.[84] Granted, increased animation and simulation use might not vastly decrease individual trial times, but considered in the aggregate, the increased judicial efficiency could prove substantial.[85] Relatedly, increased predictability in the use of animations and simulations could encourage settlements, further increasing judicial efficiency.[86]

These rules are intended to foster the introduction of fair and accurate animations and simulations, without hindering their use or increasing transaction costs.[87] Overall, the rules serve two functions. First,

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82. *See* Old Chief v. United States, 519 U.S. 172, 186 (1997) (noting "the familiar, standard rule that the prosecution is entitled to prove its case by evidence of its own choice").

83. *See* Flintoft & Butler, *supra* note 34, at 432 ("The crowding of the court system, plus the need for speedy trials combine to shorten the time available for individual trials.").

84. *See id.* at 432-33.

85. *See* Clark v. Cantrell, 529 S.E.2d 528, 536 (S.C. 2000) ("Computer animation is likely to become more prevalent, especially as the price of preparing such animation falls.").

86. *See* Boyle, *supra* note 21, at 372 ("[Animations and simulations] often lead[ ] to settlements, which are more cost effective than trials.").

87. Although "recent advances in technology have significantly decreased the production costs of computer generated evidence," the high cost of creating animations and simulations may

they provide a detailed set of parameters litigants must consider when deciding whether to use an animation or simulation. Second, once a litigant has made that decision, the rules provide a framework to which litigants must adhere when using animations and simulations.

All courts addressing this issue have uniformly recognized the trial judge's broad discretion in deciding whether to admit or exclude animations and simulations.[88] These procedural rules will not interfere with that necessarily broad discretion.[89] Instead, the rules frame and highlight the complex issues the trial judge must address when considering animations and simulations. While no narrowly tailored set of rules could possibly account for the variation and nuance that trial judges will inevitably confront, the model rules frame the issues in the most efficient format possible, while preserving the trial judge's discretion to determine evidentiary questions.[90]

The proposed model rules address only the procedural aspects of employing animations and simulations and would be added to the existing rules of civil procedure.[91] The evidentiary section does not propose changing the existing rules of evidence; rather, it offers a uniform means to apply existing rules of evidence to animations and simulations.

B.   *Model Rules of Procedure: Definitions, Notice, Discovery, Hearings, Preservation of Evidence, and Recovery of Costs*

The procedural matters raised by the use of animations and simulations during a trial include: defining what constitutes an animation or simulation, specifying pretrial notice and disclosure procedures, preserv-

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be prohibitive for some litigants. *Id.* at 372. See *infra* Part III.B.6 for a discussion of allocating the costs involved in the production of animations and simulations.

88. *See, e.g.,* Hinkle v. City of Clarksburg, 81 F.3d 416, 425 (4th Cir. 1996) (finding no undue prejudice due in the introduction of the animation and noting that in such a case "we will not disturb the broad discretion afforded trial judges in this area"); Robinson v. Mo. Pac. R.R., 16 F.3d 1083, 1086 (10th Cir. 1994) (finding, in the context of a non-computer-generated animation, that "[t]he admission or exclusion of evidence lies within the sound discretion of the trial court"); Strock v. S. Farm Bureau Cas. Ins. Co., No. 92-2357, 1993 WL 279069, at *1 (4th Cir. July 12, 1993) (discussing admission of animation and explaining that the "court chooses to rely on the sound discretion of trial judges who are in the best position to consider" the evidentiary issues); State v. Sayles, 662 N.W.2d 1 (Iowa 2003) (finding no error in the admission of animated slides and stating that the "[a]dmission or exclusion of demonstrative evidence rests largely within the trial court's discretion"); *Clark,* 529 S.E.2d at 537 (explaining that "the trial court, as with other evidence and testimony, has broad discretion in whether to admit a computer animation, and its discretion will be overturned only for an abuse of discretion").

89. *See* FED. R. EVID. 104(a) ("Preliminary questions concerning the . . . admissibility of evidence shall be determined by the court.").

90. *Id.*

91. The procedural rules proposed here can be added directly into the rules of civil procedure. However, constitutional concerns will not allow for all the provisions of the model rule to be added into the rules of criminal procedure. *See infra* Part III.B.7.

ing evidence, and recovery of costs. As noted previously, animations and simulations share many procedural and evidentiary concerns. Unless otherwise indicated, the following rules of procedure apply to both animations and simulations.

The issues addressed in the following sections are broken down and individually analyzed. In practice, however, because these issues are interrelated, they would all appear sequentially within a single rule of civil procedure, with the possible exception of the provision regarding the recovery of costs.[92]

1. DEFINITION OF ANIMATION AND SIMULATION

An important, if not elementary, first step in creating a set of model guidelines is to define the terms of animation and simulation. The proposed animation and simulation definitions are as follows:

(a) Definition – Animation and Simulation

    (1) An "animation" is a computer-generated demonstrative aid used to illustrate a witness's testimony. An animation is the equivalent of a series of diagrams strung together to produce what appears to be a moving image. The underlying program creating an animation may only reproduce images as an illustration. An animation may not utilize a program that employs formulas to draw conclusions about material issues which would, if allowed into evidence, only be admissible through qualified expert testimony. The program may reflect the opinions of qualified experts, but may not be used to generate those opinions. Although an animation is not substantive evidence and, as such, is not entered into evidence, its use at trial is governed by the Rules of Evidence as if it were evidence.

    (2) A "simulation" is computer-generated substantive evidence. A simulation creates a series of diagrams strung together to produce what appears to be a moving image. A simulation utilizes one or more programs which, after inputting data, use scientific formulas to produce conclusions based on that data regarding issues material to the trial. The results produced by a simulation's programming are equivalent in nature to the opinions reached by an expert witness.

These definitions reflect the notion that an animation is merely a demonstrative aid used to reflect the testimony of either an expert or a lay witness, whereas a simulation is the equivalent of expert testimony.[93]

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92. The proposed model rules of procedure are reproduced in their entirety *infra* Appendix A.

93. Part IV.A addresses possible hearsay concerns attendant to the introduction of animations and simulations.

The definitions typify the consensus view that has emerged from nation-wide state and federal case law.[94] As the definition indicates, animations are demonstrative in nature. As such, the primary concern is whether the animation adequately mirrors the witness's testimony.[95] Simulations involve the same issues as animations, along with added reliability concerns. A simulation resembles expert testimony; as a result, a simulation must satisfy of the admissibility guidelines for scientific testimony in the particular jurisdiction where it is utilized.[96] Not only must the scientific principles incorporated into the simulation's programming satisfy the *Frye* or *Daubert* reliability standards, but the programming used to create the simulation must itself also pass those same standards. Part IV.F contains an in-depth discussion of scientific and programming reliability issues.

These rules do not address static demonstrative aids such as charts, graphs, and diagrams, regardless of whether they are computer-generated.[97] Static aids are generally admissible if they are fair and accurate, helpful to the finder of fact in understanding material issues, and any deficiencies are made known.[98] These are much the same concerns attendant to introducing animations and simulations, except these goals are much simpler to attain when looking at a limited number of static demonstrative aids.[99] When an animation is introduced, it represents the equivalent of stringing together hundreds of static aids.[100] Although all demonstrative aids are similar in nature, the task of verifying the accuracy of each section of an animation is exponentially greater than verifying the accuracy of a single static depiction. The relative ease with which the current procedural and evidentiary rules deal with static com-

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94. *See, e.g.*, Livingston v. Isuzu Motors, Ltd., 910 F. Supp. 1473, 1494 (D. Mont. 1995); People v. Hood, 62 Cal. Rptr. 2d 137, 140 (Cal. Ct. App. 1997); Pierce v. State, 718 So. 2d 806, 808 (Fla. 4th Dist. Ct. App. 1997); Cox v. State, 2001-KA-01427-SCT (¶ 57) (Miss. 2003), 849 So. 2d 1257, 1273; Commonwealth v. Serge, 896 A.2d 1170, 1175 (Pa. 2006); Clark v. Cantrell, 529 S.E.2d 528, 535 (S.C. 2000); State v. Farner, 66 S.W.3d 188, 208 (Tenn. 2001).

95. *See infra* Part IV.B.

96. *See Livingston*, 910 F. Supp. at 1494; Starr v. Campos, 655 P.2d 794, 797 (Ariz. Ct. App. 1982); *Pierce*, 718 So. 2d at 808; Commercial Union Ins. Co. v. Boston Edison Co., 591 N.E.2d 165, 168 (Mass. 1992); Schaeffer v. General Motors Corp., 360 N.E.2d 1062, 1067 (Mass. 1977); *Serge*, 58 Pa. D. & C.4th at 71-72; *Clark*, 529 S.E.2d at 382 n.2.

97. *See* Gregory P. Joseph, *A Simplified Approach to Computer-Generated Evidence and Animations*, 156 F.R.D. 327, 328 (1994) ("Exhibits of this sort today are commonly computer-generated rather than drawn by hand.").

98. *See* 29 AM. JUR. 2D *Evidence* § 335 (2003); *see also* United States v. Williams, 657 F.2d 199, 203 (8th Cir. 1981).

99. *See Pierce*, 718 So. 2d at 809 (noting that the "fair and accurate" standard is "the same foundation that must be established to admit any pictorial representation, be it videotape, motion picture, or photograph").

100. *See* Galves, *supra* note 7, at 180-81.

puter-generated aids negates the necessity of addressing them along with animations and simulations.

Nor is it necessary to separately address so-called "real-life" recreations or experiments because their innate limitations often render them prohibitively expensive and practically impossible – e.g., crashing a multimillion-dollar jet airliner.[101] Moreover, existing case law addressing experiments, whether used for demonstrative or substantive purposes, has proven adequate.[102] In dealing with experiments, the rule employed for substantive evidence is generally known as the "substantially similar" standard,[103] while experiments used for demonstrative purposes need not adhere as strictly to the incident at issue.[104]

Additionally, the proposed definition of simulation does not encompass computer programs used to generate data that is not presented to the jury as a moving image.[105] Computer programs are

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101. *But see* Hinkle v. City of Clarksburg, 81 F.3d 416, 425 (4th Cir. 1996) (applying the "substantially similarity" standard to computer-generated animation and stating that "[w]e fail to see a practical distinction . . . between a real-life recreation and one generated through a computer animation").

102. *See, e.g.*, Robinson v. Mo. Pac. R.R., 16 F.3d 1083, 1086-87 (10th Cir. 1994) (discussing admission of animated scale model); Gilbert v. Cosco, Inc., 989 F.2d 399, 402 (10th Cir. 1993); Nachtsheim v. Beech Aircraft Corp., 847 F.2d 1261, 1278 (7th Cir. 1988); Lopez v. Foremost Paving, Inc., 796 S.W.2d 473, 480 (Tex. App. 1990).

103. *See Hinkle*, 81 F.3d at 425; Richardson v. State Highway & Transp. Comm'n, 863 S.W.2d 876, 882 (Mo. 1993); Fort Worth & Denver Ry. Co. v. Williams, 375 S.W.2d 279, 281-82 (Tex. 1964); Horn v. Hefner, 115 S.W.3d 255, 256 (Tex. App. 2003).

104. *See Gilbert*, 989 F.2d at 402 (noting that "experiments which purport to recreate an accident must be conducted under conditions similar to the accident, while experiments which demonstrate general principles used in forming an expert's opinion are not required to adhere strictly to the conditions of the accident").

105. Maryland is currently the only state with a rule of civil procedure specifically addressing computer-generated evidence. *See* MD. RULE 2-504.3, *reproduced infra* app. B; *see also* Carbine & McLain, *supra* note 12, at 46 (discussing the drafting of Maryland Rule of Civil Procedure 2-504.3, which covers all forms of computer-generated evidence, not just animations and simulations). The Maryland rule defines computer-generated evidence as:

> (1) a computer-generated aural, visual, or other sensory depiction of an event or thing and (2) a conclusion in aural, visual, or other sensory form formulated by a computer program or model. The term does not encompass photographs merely because they were taken by a camera that contains a computer; documents merely because they were generated on a word or text processor; business, personal, or other records or documents admissible under Rule 5-803 (b) merely because they were generated by computer; or summary evidence admissible under Rule 5-1006, spread sheets, or other documents merely presenting or graphically depicting data taken directly from business, public, or other records admissible under Rules 5-802.1 through 5-804.

MD. RULE 2-504.3(a); *see also* Carbine & McLain, *supra* note 12, at 32 (discussing the drafters choice of language behind the Maryland rule). The Maryland rule was designed "to focus on computer animations and simulations" because "[i]t is that where the need for reliability is greatest and the trial process is best served by the rule's mandatory procedures." *Id.* Though similar, the definitions provided by this author attempt to integrate specificity with purpose. The

often used to produce information solely for the purpose of either presenting that data as evidence in static form[106] or for use solely as the basis of an expert's opinion.[107] For the sake of clarity, these uses are referred to here as replications.

Because of the substantive nature of replications, they implicate all the same reliability concerns as simulations. Yet, because they produce only static images, replications do not implicate the admissibility concerns of animations. Hence, only the evidentiary rules exclusive to simulations apply to replications. In other words, because animation and simulation admissibility requirements overlap, one can isolate the simulation-exclusive issues and apply them to replications.[108]

2. PRETRIAL NOTICE

The following subsection enumerates the animation and simulation pretrial notice requirement:

(b) Notice

(1) Except as provided for in subsections (b)(2) and (b)(3) of this Rule, any party who intends to use an animation or simulation at trial for any purpose shall file a written notice no later than ninety days before trial that contains:

(A) a statement as to whether the party intends to use an animation or simulation;

(B) a descriptive summary of the subject matter of the animation or simulation including what the animation or simulation intends to illustrate or prove; and

(C) a statement acknowledging that the party has the responsibility to:

(i) make available any equipment or personnel necessary to present the animation or simulation to the

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language of the model definition proposed here is precise enough to capture what the terms encompass without the need for enumerated exclusions.

In addition, the Maryland definition coins animations used as demonstrative aids as "evidence," even though they are not evidence at all. *Compare* MD. RULE 2-504.3(a), *with* N.D. & S.D. Iowa LR 83.7(h) (directing that "[t]he term 'demonstrative aid' . . . does not include exhibits admitted into evidence"). The Maryland definition also encompasses static computer-generated demonstrative aids, mandating that such static aids be subjected to the rule. MD. RULE 2-504.3(a). However, due to the similarity to other static aids, preexisting rules addressing demonstrative aids are sufficient.

106. *See, e.g.*, Bray v. Bi-State Dev. Co., 949 S.W.2d 93, 95-96 (Mo. Ct. App. 1997) (use of computer program to produce a chart depicting light intensity levels).

107. *See, e.g.*, Perma Research & Dev. v. Singer Co., 542 F.2d 111, 115 (2d Cir. 1976) (use of computer program to determine the perfectibility of an anti-skid device).

108. Of course, this article does not address all the procedural and evidentiary issues incident to the introduction of a replication. However, because the complexities of using replications comes in establishing reliability, referencing replications' analogous application to simulations in this respect is adequate.

trial court and, when requested, any appellate court
with competent jurisdiction;

(ii) make available any equipment or personnel neces-
sary to present for review the software comprising
the simulation to the trial court and, when
requested, any appellate court with competent juris-
diction; and

(iii) preserve the animation or simulation as provided in
section (e) of this Rule.

(2) If the ninety-day deadline as prescribed in subsection (b)(1)
of this Rule has passed, a party may still use an animation or
simulation by filing written notice as provided in (b)(1)(A)-
(C) if the court finds that:

(A) notice as prescribed by (b)(1)(A)-(C) was filed as soon
as practicable;

(B) the decision to employ an animation or simulation was
made as soon as practicable; and

(C) the opposing party or parties will not be unduly
prejudiced by the introduction of the animation or simu-
lation based on the lack of a ninety-day pretrial notice
period.

(3) The notice provisions of this section need not be complied
with where a party intends to use an animation or simulation
prepared by or on behalf of a party-opponent for the purpose
of rebuttal or impeachment.

Because computer-generated animations and simulations are com-
plex and can be easily manipulated,[109] litigants must have a significant
period of time to evaluate the other side's proffered animation and simu-
lation evidence.[110] Courts and commentators have recognized the neces-
sity of an adequate notice period,[111] and have even gone so far as to

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109. *See supra* notes 71-73 and accompanying text.

110. *See* Carbine & McLain, *supra* note 12, at 5-6 ("[T]he inner workings of computer-
generated evidence are not easily understood; and it has enormous potential for mischief. For
these reasons, the fundamental issues affecting its admissibility should not be decided at the time
of trial. . . . A polished and seemingly flawless computer analysis could suffer from bad
underlying data, erroneous data entry, inaccurate software code, or invalid software design. It
might take weeks of intense study to examine the software's documentation and the data gathering
process.").

111. *See, e.g., Bray,* 949 S.W.2d at 98 (Mo. Ct. App. 1997) (noting that "[p]retrial disclosure
gives the opposing party an adequate opportunity to raise objections by motion in limine and to
prepare for cross-examination and rebuttal"); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 85
(C.P. Ct. Lackawanna County 2001) (ordering finalized version of animation presented to
opposing party "[a]t least 30 days" prior to trial); Clark v. Cantrell, 529 S.E.2d 528, 536-37 (S.C.
2000) (noting that "late disclosure may prevent the opposing party from adequately attempting to
explain why the animation is not a fair and accurate representation"); Anderson, *supra* note 45, at
11 (suggesting that "pretrial strategy is essential to ensure the admission of [computer animation]

exclude animations based on a lack of notice.[112] A few jurisdictions specifically address computer animations in their rules of civil procedure,[113] but only Maryland Rule of Civil Procedure 2-504.3(b) ("Maryland rule") is comprehensive in terms of a well-reasoned notice requirement specifically aimed at animations and simulations.

Subsection (b)(1) facilitates the discovery process by forcing the animation or simulation proponent to reveal basic information about its use. In particular, subsection (b)(1)(A) is indispensable because the classification as either animation or simulation triggers differing evidentiary concerns regarding admissibility.[114] With no governing statement, courts have often been forced to scrutinize the record to determine whether they are dealing with an animation or a simulation.[115] Animations and simulations demand very different inquiries; courts and litigants should not be in this uncertain position.[116] Without such information, the ninety-day pretrial period may prove inadequate to properly investigate the animation or simulation.[117]

Subsection (b)(2) recognizes that information prompting a litigant to employ an animation or simulation may not materialize until after the

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evidence"); Carbine & McLain, *supra* note 12, at 35-37 (commenting on MD. RULE 2-504.3's ninety-day notice requirement for animations and simulations).

112. *See* Van Houten-Mayhard v. ANR Pipeline Co., No. 89-C0377, 1995 WL 317056, at *12 (N.D. Ill. May 23, 1995) (granting a motion in limine seeking to exclude a computer animation based on a lack of "timely notice" and finding that "[the opposing party] has thus been severely prejudiced in its ability to respond to the credibility, reliability, accuracy and materiality of [the animation]"); Richardson v. State Highway & Transp. Comm'n, 863 S.W.2d 876, 882 (Mo. 1993) (upholding exclusion of non-computer-generated evidence based on in part on a lack of notice).

113. *See* E.D. Cal. L.R. 16-281(b)(5) (giving ten days prior to the final pretrial conference to file a statement as disputed evidentiary issues, among which "computer animation" is included); N.D. & S.D. Iowa LR 83.7(h) (instructing that all demonstrative aids, including "animations," must be shown to the opposing parties prior to being viewed by the jury).

114. *Serge*, 58 Pa. D. & C.4th at 71 (finding that "[t]he classification . . . as a simulation or an animation also determines the evidentiary foundation which governs its admissibility").

115. *See, e.g.*, People v. Cauley, 32 P.3d 602, 607 (Colo. Ct. App. 2001) (basing the determination of whether an animation or simulation was before the court on the trial record); *Serge*, 58 Pa. D. & C.4th at 74 (basing the determination of whether an animation or simulation was before the court on a review of the testimony and materials submitted by the parties); State v. Farner, 66 S.W.3d 188, 208 (Tenn. 2001) (using the record to make the determination of whether an animation or simulation was before the court).

116. A declaration by the proponent of the animation or simulation, of course, will not necessarily govern the classification; the actual substance of animation or simulation controls the classification. However, the classification by the proponent, as a practical matter, will direct the particular type of inquiries posed by the other parties. The inquiries for an animation are wholly included in those for simulations. In other words, a party in opposition to the introduction of a simulation will ask all the same questions as if an animation were proffered, plus more. Thus, where a proponent of a simulation misclassifies the simulation as an animation during the initial notice period, the proper remedy would be to either limit its use to that of a demonstrative animation (if possible) or exclude the simulation altogether.

117. *See supra* notes 71-73, 110 and accompanying text.

ninety-day pretrial period has passed. Subsection (b)(2) aims to provide the court the flexibility to allow litigants to use animations and simulations after the ninety-day period, if the litigant can demonstrate that notice was not practicable at an earlier date.[118] In an effort to prevent the exception from swallowing the rule, the litigant must demonstrate impracticability and establish that an opposing party or parties will not suffer undue prejudice due to the reduced notice period. As a practical matter, due to the *Frye/Daubert* concerns surrounding simulations, the prejudice from a shortened notice period may be more difficult to overcome in the case of a simulation rather than an animation.

An optional pretrial notice waiver provision is a possibility for simple animations, but would ultimately be superfluous. Such a provision would add needless complexity, and, due to the animation's relative simplicity, abiding by the provisions of the rule should not be overly burdensome. Furthermore, subsection (b)(2) provides the court the flexibility to avoid the ninety-day notice period under appropriate circumstances.

Subsection (b)(3) recognizes that, where a proponent proffers an animation or simulation in accordance with the preceding notice provisions, the opposing party ought to be able to use that animation or simulation for rebuttal or impeachment purposes. The opposing party, however, may use the animation or simulation *only* for rebuttal or impeachment purposes. Accordingly, they cannot attempt to soften the blow by presenting the animation or simulation before the proffering party has the chance to do so. Otherwise, the opposing party could unfairly take advantage of the proponent's animation or simulation investment.

The proposed model rule shares many features with its Maryland rule counterpart.[119] The Maryland rule also requires a ninety-day notice period, but differs in both form and function from the rule proposed here. Most notably, the Maryland rule does not apply to animations and simulations used during opening statements and closing arguments.[120] In contrast, the proposed model rule applies to animations and simulations used during opening statements and closing arguments.[121]

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118. *See* Clark v. Cantrell, 529 S.E.2d 528, 536-37 (S.C. 2000) (opining that "[u]ntimely disclosure should not, standing alone, necessarily result in exclusion of the animation").

119. *See* MD. RULE 2-504.3(b), *reproduced infra* app. B.

120. *Id.*; *see also* Carbine & McLain, *supra* note 12, at 36 (discussing the reasoning behind excluding animations used in opening statements and closing arguments from the rule).

121. See *infra* Part IV.G for a more thorough discussion of animations and simulations in the context of opening statements and closing arguments.

3. DISCOVERY

The discovery provision immediately follows subsection (b)(2) because discovery is the next logical step once the notice provision is satisfied:

> (c) Required Disclosure; Additional Discovery
>
> > (1) Within five days after service of notice under section (b) of this Rule, the proponent of the animation or simulation shall make available to any party:
> >
> > > (A) the animation or simulation;
> > >
> > > (B) all underlying data and scientific principles upon which the animation or simulation is based; and
> > >
> > > (C) reasonable access to the software used to generate the animation or simulation.
> >
> > (2) The filing of notice under section (b) of this Rule entitles any other party to a reasonable period of time to discover any relevant information needed to oppose the use of the animation or simulation before the court holds the hearing provided for in section (d) of this Rule.

Section (c) complements section (b) by facilitating the opposing party's receipt of all the relevant information necessary to formulate possible objections before the pretrial hearing (as described in section (d)). Providing the animation or simulation within five days of the notice may seem somewhat onerous at first glance in that the animation or simulation must be substantially complete at least eighty-five days before trial. However, the complexities inherent in even the simplest animation or simulation demand a reasonable time for discovery.[122] Not only must the time for discovery be factored in, but the pretrial hearing that is likely to follow must be accounted for. That is to say, opposing parties must have sufficient time to discover any defects in the animation or simulation, and the proffering party must have sufficient time to edit the animation or simulation if the court determines revisions must be made.

Section (c) is similar to Maryland rule section (c) with the exception of proposed rule subsections (B) and (C).[123] Subsection (B) clarifies that subsection (c)(2) covers "all underlying data and scientific principles upon which the animation or simulation is based." Placing this information under the section addressing required disclosure reduces uncertainty and speeds up the discovery process. Because of this particular information's importance, any possible ambiguity is laid to rest via explicit reference.

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122. *See supra* notes 71-73, 110 and accompanying text.
123. *See* MD. RULE 2-504.3(c).

One must possess at least a basic understanding of the software used to create an animation or simulation in order to undertake a meaningful examination of the animation or simulation's merits or deficiencies. Subsection (C) recognizes this necessity in light of the fact that such software may not be readily available to other parties or may only be available at prohibitively high costs. Placing the burden on the proponent to make the software available is one of the necessary costs associated with using an animation or simulation.

An animation or simulation's production software usually consists of valuable proprietary information, as undoubtedly some entity placed a substantial investment in the development of that software.[124] Subsection (C) contemplates that the only discoverable information regarding the software is information available from a user standpoint. Opposing parties do not need access to the software code to scrutinize an animation or simulation's reliability. For animations, the actual coding, while arguably useful, is not the primary inquiry in determining reliability. Animations must illustrate some other form of evidence. Thus, the primary concern regarding an animation is whether the animation sufficiently mirrors the accompanying testimony; how the images were created – i.e., the underlying code – is an ancillary concern.

With simulations, however, what they depict and how they were created are equally important concerns from a reliability standpoint. The simulation must accurately represent what it purports to demonstrate *and* have programming that reliably produced those images. Even so, opposing parties do not need access to the underlying software code. Because the underlying program is subject to the *Frye/Daubert* admissibility standard,[125] it is incumbent on the proponent to demonstrate the program's reliability. Establishing that reliability under *Frye* or *Daubert* analysis, however, does not require access to the program's code.[126]

Restricting discovery to only select code portions (in an effort to protect proprietary interests) is untenable as the court would be entangled in complex, time-consuming, costly, and ultimately unnecessary

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124. *See* Perma Research & Dev. v. Singer Co., 542 F.2d 111, 121 (2d Cir. 1976) (J. Van Graafeiland, dissenting) (mentioning high cost of simulation perfectibility program, the results of which were used at trial); D'Angelo, *supra* note 26, at 562-63 (discussing changing costs of animation and simulation software over time).

125. *See infra* Part IV.F.

126. Under a *Frye* jurisdiction, the proponent of the simulation would have to demonstrate that the program is generally accepted within the relevant scientific community. Frye v. United States, 293 F. 1013 (D.C. Cir. 1923). Under *Daubert*, the proponent proves reliability through such factors as (1) whether the program can or has been tested; (2) whether the program has been subjected to peer review and publication; (3) the known or potential rate of error; and (4) general acceptance in the scientific community. Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 593-94 (1993).

technical determinations.[127] The limited access subsection (C) provides is the most efficient mechanism possible to both protect the software manufacturer's proprietary interests and ensure the opposing party's access to the information that is necessary to understand the animation or simulation.

Subsection (c)(2) addresses other "relevant information" such as all physical measurements, observations, physical and mathematical properties, and assumptions[128] upon which the animation or simulation is based.[129] Of course, parties are also entitled to discover how the proponent gathered that information; not only must the proponent properly enter the data into the computer, the data must be accurate.[130] For example, in a case where an animation was used to illustrate expert testimony of how a fatal shooting allegedly occurred, "the autopsy report, firearm report, crime scene photographs and crime scene measurements" were used to create the animation.[131] One commentator suggests "[t]he scope of discovery should . . . expressly include any deleted excerpts, or outtakes, from any computer-generated video or exhibit, including prior versions of any exhibit."[132] To effectively evaluate a simulation or animation, the parties reviewing the animation or simulation must know what data the proponent entered *and* how the proponent obtained the data.

Federal Rule of Civil Procedure 26(a)(2)(B) alleviates any work-product privilege concerns regarding the underlying data.[133] Rule 26(a)(2)(B) states that when employing an expert, "the data or other information considered by the witness in forming the opinions [and] any exhibits to be used as a summary of or support for the opinion" must be disclosed. Using an animation or simulation necessarily involves using

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127. Considering the complex and technical nature of the software involved, the trial judge would likely have to employ the services of a computer expert to make this determination.

128. Different versions of animations and simulations can be utilized to illustrate expert testimony of how an event would have or did occur *if* certain issues in dispute are assumed true. *See* State v. Clark, 655 N.E.2d 795, 810 (Ohio Ct. App. 1995) (allowing expert testimony based on AutoCAD simulation as to the possible trajectories of fatal gunshot).

129. *See* Cox v. State, 2001-KA-01427-SCT, 849 So. 2d 1257, 1273 (Miss. 2003) (discussing an animation based on "pictures, investigative reports, the weapon, the crime scene, the vehicles, etc." and acknowledging "that the animation *must* be based on scientific, identifiable, and objective facts") (citing Pierce v. State, 718 So. 2d 806, 807 (Fla 4th Dist. Ct. App. 1997); Clark v. Cantrell, 529 S.E.2d 528, 536 (S.C. 2000); State v. Farner, 66 S.W.3d 188, 207-08 (Tenn. 2001) (emphasis in original)); *Pierce*, 718 So. 2d at 807; Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 56 (C.P. Ct. Lackawanna County 2001) (animation based on "measurements and physical evidence").

130. *See supra* note 129.

131. *Serge*, 58 Pa. D. & C.4th at 57.

132. Joseph, *supra* note 97, at 337.

133. *See* Robinson v. Mo. Pac. R.R. Co., 16 F.3d 1083, 1089 n.6 (10th Cir. 1994) (noting the effect of the 1993 amendment on Rule 26 as facilitating discovery).

experts.[134] Even if an animation is used to illustrate a lay witness's testimony, experts must participate in the creation process.[135] As such, where a jurisdiction has a rule similar to Federal Rule 26(a)(2)(B), the work-product doctrine in relation to the discovery of animations and simulations should not be an issue.[136]

4. PERMISSIVE AND MANDATORY OBJECTION PERIOD AND PRETRIAL HEARING

The section explaining the pretrial objection and hearing process follows the discovery section:

(d) Objection Period; Hearing

(1) Within sixty days after service of notice under section (b) of this Rule, the party:

(A) may file any objection to the use of the animation or simulation at trial; and

(B) shall file any objection based on the assertion that the animation or simulation does not meet the requirements of [Federal Rule of Evidence 901(b)(9) or the equivalent thereof[137]]. If not so filed, any objection based on a failure to meet the requirements of [Federal Rule of Evidence 901(b)(9) or the equivalent thereof] is waived unless excused by the court for good cause.

(2) If an objection is filed under subsection (d)(1) of this Rule, the court shall hold a pretrial hearing on the objection. If the hearing is an evidentiary hearing, the court may appoint an expert to assist the court in ruling on the objection and may assess against one or more parties the reasonable fees and expenses of the expert. In ruling on the objection, the court may require modification of the animation or simulation and

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134. *See supra* Part I.C.

135. See *supra* Part I.C for a discussion of the animation and simulation production process.

136. *See* Joseph, *supra* note 97, at 337 ("If there ever was a viable work-product defense to production – which is dubious in light of the good cause that the opponent could always show – it cannot likely survive . . . [Rule] 26(a)(2)(B), which requires disclosure of 'the data or other information considered by the witness in forming the opinions.'").

137. The pertinent section of Federal Rule of Evidence 901 states:

(a) General Provision. The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims.

. . . .

(b) Illustrations. By way of illustration only, and not by way of limitation, the following are examples of authentication or identification conforming with the requirements of this rule:

. . . .

(9) Process or System. Evidence describing a process or system used to produce a result and showing that the process or system produces an accurate result.

FED. R. EVID. 901.

may impose conditions relating to its use at trial. The ruling by the court is definitive under [Federal Rule of Evidence 103(a) or the equivalent thereof[138]]. [Federal Rule of Evidence 103(a) or the equivalent thereof] governs the preservation of claims of error for appeal.

This section contemplates the resolution of most of the issues attendant to introducing animations and simulations during the pretrial process.[139] Because of the complexity of animations and simulations, delaying resolution until the trial can significantly delay the process and create difficult problems. For instance, if certain portions of an animation must be excised or revised due to, for example, an overly graphic portrayal resulting in what the court considers undue prejudice, the animation proponent must either request a continuance or accept that the time and money spent preparing the animation is lost.

Authentication, as it relates to the reliability of the process utilized in production of animations and simulations, can involve intricate issues.[140] As with any item admitted into evidence, authentication requires only that the evidence presented is what it purports to be.[141] However, with animations and simulations, there are several sub-issues attendant to that determination.[142] An animation or simulation need not be completely exact in every detail, but the proponent must disclose any

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138. Federal Rule of Evidence 103(a) states:

> Effect of Erroneous Ruling. – Error may not be predicated upon a ruling which admits or excludes evidence unless a substantial right of the party is affected, and
>
> (1) Objection. – In case the ruling is one admitting evidence, a timely objection or motion to strike appears of record, stating the specific ground of objection, if the specific ground was not apparent from the context; or
>
> (2) Offer of Proof. – In case the ruling is one excluding evidence, the substance of the evidence was made known to the court by offer or was apparent from the context within which questions were asked.
>
> Once the court makes a definitive ruling on the record admitting or excluding evidence, either at or before trial, a party need not renew an objection or offer of proof to preserve a claim of error for appeal.

FED. R. EVID. 103(a). The last clause of Rule 103(a) regarding the non-necessity of renewing objections at trial is the focus for the purposes of this subsection.

139. *See* MANUAL FOR COMPLEX LITIGATION (THIRD) § 21.446 (1995) ("Issues concerning accuracy and reliability of computerized evidence, including necessary discovery, should be addressed during pretrial proceedings and not raised for the first time at trial.").

140. *See generally* Joseph, *supra* note 97 (examining the basic requirements and processes for authenticating computer-generated animations and simulations and noting unique issues raised by animations and simulations).

141. *See* FED. R. EVID. 901(a); *see also* People v. Cauley, 32 P.3d 602, 607 (Colo. Ct. App. 2001) ("An item of demonstrative evidence is authenticated if there is evidence to support a finding that the item is what the proponent claims it to be.").

142. See Joseph, *supra* note 97, at 330-36, for a detailed checklist of issues implicated in the authentication determination for all computer-generated evidence.

variation from what the animation or simulation purports to represent.[143] Addressing those problems at the pretrial stage alleviates complex problems, which are not amenable to efficient resolution during the trial process.[144]

As the allusion to Federal Rule of Procedure 901(b)(9) makes clear, the proposed rule does not focus on authentication in general, but on authentication as it relates to the computerized process that created the animation or simulation.[145] This subsection indicates that a party waives any objection to Rule 901(b)(9) authentication if an objection is not served within the sixty-day period.[146] Once the parties settle this pretrial authentication issue, trial authentication need only address whether the animation or simulation is what it purports to be in terms of the evidence – a problem settled by the experts involved in the creation of the animation or simulation.[147]

Although both animations and simulations are subject to authentication, an important aim of subsection (d)(1) is to remedy *Frye/Daubert* concerns attendant to the underlying programming of simulations prior to trial.[148] At this point it is important to note the distinction between the *Frye/Daubert* issue as it relates to the program and the *Frye/Daubert* issue as it relates to the scientific principles upon which the program is based.[149] Though often times inextricably linked, Rule 901(b)(9) is only

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143. *See Cauley*, 32 P.3d at 607 ("Once authenticity is established, defects in physical evidence go to the weight of that evidence, not its admissibility.").

144. See *infra* Part IV.B for an examination of what the authentication requirement entails.

145. *See* Bray v. Bi-State Dev. Corp., 949 S.W.2d 93, 99 (Mo. Ct. App. 1997) (using FED. R. EVID. 901(b)(9) in the authentication process of computer-generated chart).

146. *See* MANUAL FOR COMPLEX LITIGATION (THIRD), *supra* note 139, § 21.446 (noting that "[t]he court may order that any objections to the foundation, accuracy, or reliability of data are deemed waived unless raised during pretrial (or good cause is shown for the failure to object)"); *see also* FED. R. CIV. P. 26(a)(3) (directing that certain objections are deemed waived unless objected to within the prescribed timeframe).

147. Those experts must be ready to testify that the animation or simulation correctly reflects what it purports to show by testifying that all the data entered is accurate as reflected by physical measurements, eyewitness accounts, etc., and all the data was correctly entered into the program. *See* Pierce v. State, 718 So. 2d 806, 809 (Fla. 4th Dist. Ct. App. 1997); Cox v. State, 2001-KA-01427-SCT (¶¶ 56-57), 849 So. 2d 1257 (Miss. 2003); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 71-73 (C.P. Ct. Lackawanna County 2001); Clark v. Cantrell, 529 S.E.2d 528, 537 (S.C. 2000).

148. If an animation meets the definition proposed in subsection (a)(1), the underlying program would not be subject to a *Frye/Daubert* analysis. In essence, because an animation is only demonstrative, the program is not creating anything that cannot be readily verified by the underlying data (as discoverable through section (c)). Furthermore, by definition, an animation can neither be relied on by an expert nor draw any substantive conclusions. If the animation, or the program underlying the animation, performed either of those functions, it would cease to be an animation and be subject to the *Frye/Daubert* analysis as a simulation.

149. *See* Joseph, *supra* note 97, at 333 (noting that "[t]ests governing the admissibility of expert evidence – such as Daubert – apply . . . to both: a. [t]he scientific theory underlying the program, and b. [i]mplementation of that theory in the program").

aimed at the former. As Part IV.F discusses, simulations are subject to *Frye/Daubert* on two levels: the basic programming and the scientific principles that the program purports to implement.[150] In other words, it is conceivable that the program creating the simulation is overwhelmingly accepted as reliable in the underlying community, yet the conclusions drawn do not pass the *Frye/Daubert* standard because the proponent input formulas that do not satisfy the *Frye/Daubert* standard.[151] A Rule 901(b)(9) evaluation does not deal with this particular contingency.

Similarly, a program may fail the *Frye/Daubert* analysis because of its lack of acceptance in the relevant scientific community, even though the science the program purports to represent is well accepted and would easily satisfy the *Frye/Daubert* standard.[152] This circumstance would fall under the ambit of subsection (d)(1). The distinction between the two *Frye/Daubert* analyses can best be thought of as follows. The non-Rule 901(b)(9) analysis deals with the reliability of the scientific process that created the conclusion. In this instance the process is simply embedded in a computer program. The process, as with DNA or handwriting matching, is extracted and analyzed under the usual *Frye/Daubert* analysis. The Rule 901(b)(9) analysis deals with the reliability of the computer program itself to accurately implement the process at issue, regardless of what the process substantively purports to accomplish.

Of course, a litigant may, and likely will, challenge a simulation on both types of *Frye/Daubert* grounds at the pretrial hearing, but only an

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150. For an example of the *Frye* standard being applied to separate steps in the process of introducing evidence, see *Brim v. State*, 695 So. 2d 268, 270 (Fla. 1997), which notes that the "DNA testing process consists of two distinct steps and that both steps must satisfy the requirements of *Frye*."

151. An extremely basic non-simulation illustration of this possibility can be found in the Microsoft Excel program. Excel is a highly accepted program used to create spreadsheets. However, in displaying certain results, Excel allows the user to input formulas which the program utilizes in creating the results. Under such a scenario, the program would be reliable, but the formulas utilized by the program may not. This situation, while certainly the source of a viable pretrial objection, is not the focus of subsection (d)(1).

152. One might argue that, in a jurisdiction utilizing the *Frye* standard, the sole factor of the lack of acceptance of a computer program should not necessarily lead to its exclusion from evidence. In fact, such a rule may exclude the possibility of using programs developed exclusively for litigation. *See, e.g.*, Pearl Brewing Co. v. Jos. Schlitz Brewing Co., 415 F. Supp. 1122, 1134-39 (S.D. Tex. 1976) (discussing discoverability of econometric model created for litigation by computer experts and economics experts). However, this debate parallels the debate over the use of *Daubert* over the use of *Frye* generally in terms of the admissibility of all scientific evidence and is beyond the scope of this Article. The proposed rule would simply mirror the jurisdiction's treatment of scientific evidence generally (i.e., the *Frye/Daubert* analysis, by treating the admissibility of computer programs the same as any other evidence subject to *Frye* or *Daubert*).

objection to the reliability of the software on *Frye/Daubert* grounds is waived if not filed within sixty days after service of notice under section (b) of the proposed rule. That is to say, regardless of whether the opposing party makes an objection at the pretrial hearing, a litigant may properly object at trial to the simulation's underlying scientific principles.[153] By failing to lodge an objection within the sixty-day period, the opposing party waives only a Rule 901(b)(9) objection – an objection claiming that the underlying program itself does not "produce[ ] an accurate result."[154]

This section is similar to its Maryland rule counterpart.[155] The Maryland rule also requires Rule 901(b)(9) authentication objections to be filed within sixty days after service of notice of the intent to use computer-generated evidence.[156] The proposed rule, however, collapses and simplifies Maryland rule sections (b) and (c) into one section.[157] Proposed rule subsection (d)(1)'s "good cause" language was modified to track Federal Rule of Civil Procedure 26(a)(3)'s language, the general provision regarding pretrial disclosure.[158] In addition, much of the language contained in Maryland rule section (c) was replaced with a reference to Federal Rule of Evidence 103(a).[159] Repeating the language of Federal Rule of Evidence 103(a) is superfluous unless, of course, the particular jurisdiction does not have such a rule. Furthermore, explicitly referencing the court's pretrial determination as "definitive" alleviates any ambiguity in terms of the application of Federal Rule of Evidence 103(a).[160]

5. PRESERVATION OF EVIDENCE

Although somewhat perfunctory, the last section necessarily deals with the preservation of computer-generated animations and simulations:

> (e) Preservation of Computer-Generated Animations and Simulations
>> (1) A party offering an animation at any proceeding shall pre-

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153. See *infra* Part IV for a framework of the evidentiary concerns attendant to (and possible objections to) the use of animations and simulations at trial.

154. FED. R. EVID. 901(b)(9).

155. *See* MD. RULE 2-504.3(b)-(c).

156. *See id.* at 2-504.3(d).

157. *See id.* at 2-504.3(b)-(c).

158. *See* FED. R. CIV. P. 26(a)(3) (directing that "[o]bjections not so disclosed . . . are waived unless excused by the court for good cause").

159. *See* MD. RULE 2-504.3(c).

160. *See* FED. R. EVID. 103(a)(2) (directing that "[o]nce the court makes a *definitive* ruling . . . a party need not renew an objection or offer of proof to preserve a claim of error for appeal") (emphasis added)).

serve the animation in a form suitable for transmittal as a part
of the record on appeal and furnish it to the clerk of the court.

(2) A party offering a simulation at any proceeding shall pre-
serve the simulation in a form suitable for transmittal as a
part of the record on appeal and furnish it to the clerk of the
court. That party must also preserve the software used to
generate the simulation offered in each proceeding. The
party shall give any appellate court of competent jurisdiction
access to the software as that court so requests.

This section recognizes that animation and simulation issues will
inevitably transcend the trial level. As such, the proponent must pre-
serve the animation or simulation for a potential record on appeal.[161]
Usually, the proponent can preserve the animation or simulation on
some conventional medium such a videotape or DVD.[162] Unlike the
Maryland rule,[163] the proposed rule creates an additional burden for the
proponent to preserve not only the product (i.e., the actual simulation),
but also the software that created the simulation. Preserving the
software is necessary because, as noted in section (d), the software itself
can be subject to evidentiary rulings. Preserving the software is not
meant to jeopardize the proprietary nature of the program; the proponent
need not disable any security measures used to prevent the program
from duplication. In fact, program access may be restricted by, for
example, an encryption program, so long as the restriction does not
affect the functioning of the program. However, in accordance with
model rule subsection (b)(1)(C)(ii), a party representative proffering the
simulation must be available to present the program to the court. The
proponent need only make the program available at trial or for appellate
review if and when the parties properly raise an issue implicating the
program.

6. ANIMATIONS AND SIMULATIONS AS REASONABLE COSTS RECOVERABLE IN CERTAIN CIRCUMSTANCES

Many jurisdictions have rules of civil procedure allowing the pre-
vailing party to recover costs under certain circumstances.[164] Accompa-

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161. *See, e.g.*, Bledsoe v. Salt River Valley Water Users' Ass'n, 880 P.2d 689, 692 (Ariz. Ct.
App. 1994) (court viewed videotape of animation before determining that the trial court erred in
allowing the jury to view it); Commonwealth v. Shea, 644 N.E.2d 244, 248 (Mass. App. Ct. 1995)
(appeals court viewed non-computer-generated videotape in the course of deciding whether
admission was error).

162. *See, e.g., Bledsoe*, 880 P.2d at 692; *Shea*, 644 N.E.2d at 248.

163. MD. RULE 2-504.3(f).

164. *See, e.g.*, FED. R. CIV. P. 54(d)(1) ("Except when express provision therefor is made
either in a statute of the United States or in these rules, costs other than attorneys' fees shall be
allowed as of course to the prevailing party unless the court otherwise directs."); CAL. CODE. CIV.

nying those rules, either in a companion rule or in the rule itself, is often a general listing of which costs a prevailing party may recover.[165] This article proposes placing the following model rule within the rule of civil procedure addressing which costs are recoverable:

> The prevailing party may recover the reasonable costs associated with the preparation of animations and simulations which the court deems reasonably necessary. "Animation" and "simulation" as referred to in this Rule are as defined in subsection (a) of this Rule.

Because of the persuasiveness of animations and simulations, a litigant would nearly always choose to employ one when circumstances permit. An important aspect of this proposed rule is to encourage parties who might not otherwise take advantage of these tools to use animations and simulations.[166]

To award costs pursuant to the proposed rule, the court must make two separate determinations. First, the court must find that the animation or simulation was "reasonably necessary." If the court decides the first question affirmatively, the court must determine what portions of the costs associated with creating the animation or simulation were "reasonable." The court will make both decisions by balancing such factors as the amount in controversy, the complexity of the issue depicted by the animation or simulation, usefulness to the trier of fact, the reasonableness of the fees based on an industry review, and other considerations the court deems relevant. By using the term "reasonable," the court is necessarily afforded discretion to determine the recoverable amount.

As the incidence of animation use increases, courts are beginning to deal with whether costs incident to their use are recoverable.[167] A federal district court in Colorado taxed the defendant almost $23,000 for the

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P. § 1032(b) ("Except as otherwise expressly provided by statute, a prevailing party is entitled as a matter of right to recover costs in any action or proceeding."). In some jurisdictions, however, entitlement to costs at the trial level is contingent upon an authorizing statute specific to the action. *See, e.g.*, § 57.111, FLA. STAT. (2006) (regarding costs for businesses in actions initiated by state agencies); § 61.535, FLA. STAT. (2006) (regarding costs within the Uniform Child Custody Jurisdiction and Enforcement Act).

165. *See, e.g.*, 28 U.S.C. § 1920 (2000); CAL. CODE. CIV. P. § 1033.5.

166. *See supra* note 87.

167. *See* Summit Tech., Inc. v. Nidek Co., 435 F.3d 1371, 1374-78 (Fed. Cir. 2006); Ishida Co. v. Taylor, No. C-02—1617-JF (PVT), 2004 WL 2713067, at *1 (N.D. Cal. Nov. 29, 2004); Glenayre Elecs., Inc. v. Jackson, No. 02 C 0256, 2003 WL 21947112, at *4-6 (N.D. Ill. Aug. 11, 2003); *In re* Air Crash Disaster, Nos. MDL 751, 88-F-664, 1989 WL 259995, at *4 (D. Colo. July 24, 1989) (taxing costs of computer simulation based on information from black box to defendants as a "reasonably anticipated cost of litigating air crash cases"); Arcadian Fertilizer, L.P. v. MPW Indus. Servs., Inc., 249 F.3d 1293, 1296-97 (11th Cir. 2001); Sci. Applications Int'l Corp. v. Superior Court, 46 Cal. Rptr. 2d 332, 337 (Cal. Ct. App. 1995) (allowing recovery of certain costs associated with video animation as "possibly fitting with the [civil procedure rule] category of 'models and blowups'").

costs associated with preparing a "computer-generated graphic simulation of [a] plane crash" created using information obtained from the plane's "black box."[168] The court found the exhibit "was necessary for trial" and awarded costs under 28 U.S.C. § 1920(4).[169] The court further found that "such demonstrative exhibits are a reasonably anticipated cost of litigating air crash cases, and thus do not fall within the authorities cited by defendants."[170]

The Eleventh Circuit, on the other hand, has taken a more restrictive view of the scope of costs allowable under § 1920(4).[171] The restriction, however, is not the result of the nature of animation, but the result of the Eleventh Circuit's narrow definition of "exemplification" in § 1920(4).[172] The Federal Circuit has come to a similar conclusion under § 1920(4).[173]

In addition, a California appeals court affirmed the expenses related to creating a computerized California Highway Patrol video, noting that, "in the opinion of the trial court, [the video was] reasonably helpful to the trier of fact and possibly fitting within the category of 'models and blowups,'" a category explicitly enunciated in the California Code of Civil Procedure for recoverable costs.[174] The court went on to say that:

> Although we endorse the CHP video with less enthusiasm than the exhibit boards because of associated costs of writing, directing and filming the video, we cannot rule it out on this basis alone because the same kind of "creative" design and production expenses go into the final cost of professional charts and exhibits used in trial everyday.[175]

The analogy to other forms of demonstrative evidence is a useful way to appreciate the categorization of animations and simulations.

By specifically listing the costs associated with producing anima-

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168. *In re Air Crash Disaster*, 1989 WL 259995, at *4.

169. *Id.* 28 U.S.C. § 1920(4) states: "A judge or clerk of any court of the United States may tax as costs the following: . . . (4) Fees for exemplification and copies of papers necessarily obtained for use in the case."

170. *In re Air Crash Disaster*, 1989 WL 259995, at *4; *see also Glenayre Elecs., Inc.*, 2003 WL 21947112, at *4-5.

171. *Arcadian Fertilizer, L.P.*, 249 F.3d at 1296-97.

172. *Id.* at 1297.

173. Summit Tech., Inc. v. Nidek Co., 435 F.3d 1371, 1377 (Fed. Cir. 2006).

174. Sci. Applications Int'l Corp. v. Superior Court, 46 Cal. Rptr. 2d 332, 337 (Cal Ct. App. 1995).

175. *Id.*; *see also* Ishida Co. v. Taylor, No. C-02—1617-JF (PVT), 2004 WL 2713067, at *1 (N.D. Cal. Nov. 29, 2004) (recognizing that the costs associated with animation production can be recovered under the jurisdiction's rule which allows for "'[t]he cost of preparing charts, diagrams, videotapes and other visual aids to be used as exhibits' so long as such exhibits 'are reasonably necessary to assist the jury or the Court in understanding the issues at the trial'") (quoting N.D. CAL. CIVIL L.R. 54-3(d)(5)).

tions and simulations as a recoverable cost, the proposed rule allows the court to award such costs without overreaching its discretion. Although constant changes in technology can make it difficult to continually list specific items as compensable, with no rule (or case law) explicitly articulating the court's ability to award such costs, animations and simulations will likely go uncompensated in most circumstances.[176] Due to the expense of creating animations and simulations, omitting this rule would likely preclude litigants of modest financial means from hiring a firm capable of using animations and simulations. This outcome would foster an already-tarnished perception of our legal system as a system where the financial status of a litigant is determinative of the litigation's outcome.[177]

In terms of the costs associated with animations and simulations allocatable before trial, rules such as Federal Rule of Civil Procedure 26(b)(4)(c) allow courts the needed flexibility to grant costs for indigent parties to properly *evaluate* animations and simulations.[178] In granting funding to *create* animations and simulations for use at trial in criminal cases, former U.S. District Judge Richard Bilby would allocate indigent defendants an allowance to match the government's planned technology expenses.[179] However, no tenable rule-based solution exists in the civil arena for allocating funds to indigent parties to create an animation or simulation – the biggest practical stumbling block to their use.[180] As with most costs, law firms representing such indigent parties can front

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176. *See Sci. Applications Int'l Corp.*, 46 Cal. Rptr. 2d at 337 ("Providing the trial court with discretion under [the section enumerating allowable costs] in terms of allowance of new categories of costs is a way of opening a door that would otherwise more often than not be closed.").

177. *See* Mark I. Pinsky, *Jury Out on High-Tech Courtroom*, L.A. TIMES, Dec. 17, 1993, at A1 (Pinsky noted Los Angeles Superior Court Judge Eli Chernow as indicating that "the latest advances in technology may give the side with the most money a decisive – and thus unfair – advantage with juries"); *see also* D'Angelo, *supra* note 26, at 580 ("The concern is that the advancements in computer animation may be 'pricing people out of the system' and denying justice to those who cannot afford to combat this high-tech tool.").

178. *See* FED. R. CIV. P. 26(b)(4)(c) ("Unless manifest injustice would result, (i) the court shall require that the party seeking discovery pay the expert a reasonable fee for time spent in responding to discovery under this subdivision; and (ii) with respect to discovery obtained under subdivision (b)(4)(B) of this rule the court shall require the party seeking discovery to pay the other party a fair portion of the fees and expenses reasonably incurred by the latter party in obtaining facts and opinions from the expert."); *see also* Carbine & McLain, *supra* note 12, at 42. In addressing disparate resources, Carbine and McLain suggest:

>In the event that an opponent cannot afford to employ a necessary expert, or if the court itself needs expert assistance, the proposed rule provides that the court may appoint experts. The court may use its discretion in allocating these costs, so that in the event of vastly disparate resources, the wealthier party may, in effect, pay for its opponent's expert.

Id. (referring to MD. RULE 2-504.3).

179. *See What Computes in Court*, *supra* note 73, at C1.

180. *See id.*

the costs and then either attempt to retrieve them post-trial through the proposed rule or have the costs deducted from the award.

7. ANIMATION AND SIMULATION PROCEDURES IN THE CRIMINAL CONTEXT

For constitutionally based reasons, many of the proposed model rule's provisions cannot apply in the criminal context. Due to Sixth Amendment speedy trial concerns, the proposed notice and objection periods would likely not pass constitutional muster.[181] Similarly, because most jurisdictions have limited criminal discovery, the discovery provisions would have to be adjusted accordingly.[182] Mandating disclosure from an accused may also implicate untenable constitutional difficulties.[183] Furthermore, due process and fairness concerns may necessitate a pretrial cost allocation system in the criminal arena such as that used by Judge Bilby in the U.S. District Court for Arizona.[184] At least one court suggests that the parties' relative resources is a factor that can be considered in determining whether to admit an animation or simulation.[185]

IV. EVIDENTIARY CONCERNS

In a general sense, the rules of evidence apply to animations and simulations as they would with any other type of evidence.[186] Although animations are not evidence, the proposed definition providing they be treated as evidence dispels any ambiguity regarding their relationship with rules of evidence.

Using animations and simulations implicates a multitude of evidentiary concerns. However, the rules of evidence employed by most jurisdictions are sufficient to competently address the admission of animations and simulations.[187] This part addresses the application of

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181. *See* Carbine & McLain, *supra* note 12, at 42. *See generally* 21A AM. JUR. 2D *Criminal Law* § 1021 (2003).

182. *See, e.g.,* MD. RULE 4-263(b)(5) (allowing for discovery of animations and simulations by both the defense and the prosecution and referencing Maryland Rule of Procedure 2-504.3).

183. *See* Carbine & McLain, *supra* note 12, at 42 (citing WAYNE R. LAFAVE & JEROLD H. ISRAEL, CRIMINAL PROCEDURE § 20.4 (2d ed. 1992)).

184. *See supra* Part III.6.

185. Commonwealth v. Serge, 896 A.2d 1170, 1185 (Pa. 2006).

186. *See* MANUAL FOR COMPLEX LITIGATION (THIRD), *supra* note 139, § 21.446 ("In general, the Federal Rules of Evidence apply to computerized data as they do to other types of evidence.").

187. *See Serge,* 896 A.2d at 1176 ("[B]efore we are too quick to differentiate CGA's [computer-generated animations] or create a special test for their admission, it must be noted that the rules for analyzing the admission of such evidence have been previously established. In particular, a CGA should be treated equivalently to any other demonstrative exhibit or graphic representation and, thus, a CGA should be admissible if it satisfies the requirements of" the Pennsylvania rules of evidence.); Carbine & McLain, *supra* note 12, at 6-7 (noting that the Rules

preexisting rules of evidence to animations and simulations in the areas of hearsay, authentication, relevance, unfair prejudice, jury instructions, special admissibility requirements for scientific evidence, and viewing "animations" during jury deliberations, opening statements, and closing arguments. Because of the peculiarly persuasive nature of animations and simulations and the volume of evidentiary concerns their use implicates, commentary examining the rules as they apply to animations and simulations is warranted.

A. *Hearsay*

Hearsay is generally accepted as "a statement, other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted."[188] "A 'statement' is (1) an oral or written assertion or (2) nonverbal conduct of a person, if it is intended by the person as an assertion."[189] Of course, a hearsay statement is inadmissible unless authorized by an exception to the hearsay rule.[190]

An animation, by definition, cannot implicate hearsay concerns because it is not offered as substantive evidence; that is, it is not offered to prove the truth of the matter asserted.[191] In hearsay terms, an animation is better described as illustrating a witness's in-court assertion of the truth of the matter asserted.[192] A simulation, on the other hand, is substantive evidence offered to prove the truth of the matter asserted. However, because a "statement" as defined in Rule 801 is made by a "person" rather than a computer, the question arises whether a *com-*

Committee responsible for the creation of Maryland Rule of Civil Procedure 2-504.3 "concluded that the existing rules of evidence adequately deal with the admissibility of computer-generated evidence").

188. FED. R. EVID. 801(c).

189. FED. R. EVID. 801(a).

190. FED. R. EVID. 802.

191. *See* Jones v. Kearfott Guidance & Navigation Corp., No. CIV. 93-64(DRD), 1998 WL 1184107, at *4 (D.N.J. Nov. 17, 1998) (stating that "[t]he video [animation] is not hearsay as it is not a statement offered to prove the truth of the matter asserted; rather it is offered to illustrate the expert witness's theory"); Boyle, *supra* note 21, at 411 ("Demonstrative evidence does not qualify as hearsay because it is not offered to prove the truth of the matter asserted. . . . It follows that because the computer animation [ ] was used solely as demonstrative evidence, . . . it is not subject to the hearsay rule."); Carbine & McLain, *supra* note 12, at 9-10 (noting that hearsay concerns are implicated only for "computer-generated evidence . . . offered as substantive evidence"); Ira H. Leesfield, *Maximize the Benefits of Your Electronic Trial Notebook*, 1 ATLA ANNUAL CONVENTION REFERENCE MATERIALS 1009 (2000) (stating that "because demonstrative evidence is only offered to illustrate the testimony of a witness and is not offered for the truth of the matter asserted, it is rarely subject to hearsay objections").

192. *See Jones*, 1998 WL 1184107, at *4; Boyle, *supra* note 21, at 411; Carbine & McLain, *supra* note 12, at 11; Leesfield, *supra* note 191.

puter-generated simulation can be subject to the hearsay rule at all.[193] Because a computer-generated simulation (i.e., not a person) is the source of the statement, a literal reading of the hearsay definition indicates simulations are not subject to the hearsay rule.[194] One might argue that courts have impliedly rejected the argument that such computer statements are exempt from the hearsay rule by applying the hearsay exception for records of regularly conducted activities,[195] more commonly referred to as the business records exception, to such evidence.[196] However, unlike business records where the data entered by the person *is* the evidence, in a simulation, although the raw data is entered by a person, the *computer* is producing the evidence.

Assuming a court would overlook the fact that a simulation is not a "person" making a "statement," simulations would still only be subject to the hearsay rule if considered an out-of-court statement offered to prove the truth of the matter asserted. Note that a statement is only hearsay if it contains an "assertion."[197] "A statement that is intended to communicate a thought, idea, or fact is an assertion."[198] For example,

> If a witness testifies that "I saw X buying milk in a supermarket on January 11," the testimony is not hearsay because X's conduct is not assertive. X does not intend to communicate – X only intends to buy the milk. The testimony would be admissible if it was relevant and not otherwise inadmissible.[199]

For a simulation to be admissible, the process the computer program is using to create the simulation must satisfy the *Frye/Daubert* standard.[200] That means the program creating the simulation is actually illustrating

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193. *See* CHARLES W. EHRHARDT & MASON LADD, FLORIDA EVIDENCE § 801.2 (2003) ("[The rules regarding hearsay] define[ ] a 'declarant' as being a 'person who makes a statement.' Thus only statements by persons are treated as hearsay. Evidence not generated by a person, such as 'caller ID' on a telephone, is not hearsay and is admissible if not excluded by the other exclusionary rules."). *But see* Joseph, *supra* note 97, at 329-30 (opining that "[t]he act of data entry is an extrajudicial statement – i.e., assertive nonverbal conduct within Rule 801(a)," but recognizing that "[t]he real question about the data entry function is its accuracy"); Carole E. Powell, Note, *Computer Generated Visual Evidence: Does* Daubert *Make a Difference?*, 12 GA. ST. U. L. REV. 577, 586 (1996) (reasoning that "[o]ne potential problem with [animations and simulations] is that [they] may be found to be hearsay because the declarant, probably some type of computer expert, has entered data into the computer and, through the computer, has created an assertion about the truth of a matter at issue . . . or hearsay"). The dissenting commentators have apparently failed to realize the nature of simulations, namely that the computer program is the entity creating the evidence, not the technician simply entering data.
194. *See* EHRHARDT & LADD, *supra* note 193, § 801.2, at n.10 (citing Bowe v. State, 785 So. 2d 531, 532 (Fla. 4th Dist. Ct. App. 2001)) (using the caller I.D. example).
195. *See* FED. R. EVID. 803(6).
196. *See, e.g.*, United States v. Jenkins, 345 F.3d 928, 935 (6th Cir. 2003).
197. FED. R. EVID. 801(a).
198. EHRHARDT & LADD, *supra* note 193, § 801.2.
199. *Id.*
200. *See supra* Part III.B.4; *infra* Part IV.F.

(what the court is satisfied as) reliable scientific, physical, and mechanical principles based on raw data. In likening the above example to a simulation of the effects of gravity on an inanimate object X, the example could be rewritten to read:

> If a simulation illustrates that "X acted this way under the effects of gravity," the simulation is not hearsay because X's actions are not assertive. X does not intend to communicate – X only acts as the effects of gravity demand. The simulation would be admissible if it was relevant and not otherwise inadmissible.

In other words, a simulation is basically a computer's observation of what occurs when X is subjected to certain physical principles. Because a simulation contains no assertion, it cannot be subject to a hearsay objection and, barring other admissibility objections, can be introduced into evidence.

Case law holding that evidence is admissible when used to illustrate scientific principles supports the understanding of simulations as nonassertive.[201] These cases indicate that an illustration depicting scientific principles is not an assertion for hearsay purposes.[202] The process used to create a simulation is based on accepted scientific principles; hence, a simulation is simply a way of representing the results of a program used to illustrate accepted scientific principles. If simulations were governed under the same principles as other forms of evidence illustrating scientific principles, they would not be subject to hearsay objections.

The definition of assertion, coupled with case law allowing the introduction of evidence illustrating scientific principles, leads to the conclusion that simulations are not subject to hearsay objections. This is not to say that because simulations are not hearsay, they are inherently reliable. The issue of simulation reliability is the very reason procedural guidelines must be put into place.[203] The two-tiered *Frye/Daubert* analysis is the proper mechanism to test a simulation's reliability.[204]

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201. *See* Misener v. Gen. Motors, 165 F.R.D. 105, 107 (D. Utah 1996) (citing nine Tenth Circuit cases allowing the admission of evidence used to illustrate scientific principles).

202. *See, e.g., id.* at 106-07 ("[A crash test video] illustrat[ing] relevant principles of acceleration and gravity forces, inertial forces, and inertial unlatching. . . . is not hearsay as there is no assertion."). Most courts, however, have not addressed the issue of hearsay when introducing evidence illustrating scientific principles. However, because simulations clearly fit the other elements of the definition of hearsay (i.e., made out of court and offered to prove the truth of the matter asserted), logic dictates that the reason such evidence is not hearsay is because they are not assertive (or the simulation is excluded from the hearsay rule because it is not a "person").

203. *See supra* Part II.A.

204. The two-tiered *Frye/Daubert* analysis involves (1) the actual program being subjected to *Frye/Daubert*, and more importantly (2) the underlying scientific analysis employed by the program being subjected to *Frye/Daubert*. *See infra* Part IV.F. Of course, general authentication

Several commentators nevertheless suggest that simulations are subject to hearsay objections and that no specifically enumerated hearsay exceptions apply.[205] Some commentators also suggest that, because computer-generated simulations do not fit into any hearsay exception, they can only be entered into evidence through a hearsay catch-all rule – Federal Rule of Evidence 807 or some variation thereof.[206] Rule 807 states:

> A statement not specifically covered by Rule 803 or 804 but having equivalent circumstantial guarantees of trustworthiness, is not excluded by the hearsay rule, if the court determines that (A) the statement is offered as evidence of a material fact; (B) the statement is more probative on the point for which it is offered than any other evidence which the proponent can procure through reasonable efforts; and (C) the general purposes of these rules and the interests of justice will best be served by admission of the statement into evidence. However, a statement may not be admitted under this exception unless the proponent of it makes known to the adverse party sufficiently in advance of the trial or hearing to provide the adverse party with a fair opportunity to prepare to meet it, the proponent's intention to offer the statement and the particulars of it, including the name and address of the declarant.[207]

Under that analysis, the court would allow the simulation into evidence only once the court was satisfied that all the Rule 807 factors were met.[208] Note that several jurisdictions, Florida for example, do not have an equivalent of Federal Rule of Evidence 807. Subjecting simulations to a hearsay requirement in jurisdictions that lack a catch-all provision would effectively forbid their use in those jurisdictions if simulations were considered hearsay.

Voice-over narrations complementing animations or simulations raise their own unique concerns and are properly excluded from evi-

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concerns unique to simulations and animations also act to assure a measure of reliability. *See infra* Part IV.B.

205. *See* Boyle, *supra* note 21, at 411; D'Angelo, *supra* note 26, at 570-71; Joseph, *supra* note 97, at 329-30; Leesfield, *supra* note 191; Powell, *supra* note 193, at 586.

206. D'Angelo, *supra* note 26, at 571 ("Because computer animation does not fall under any of the specific exceptions to the hearsay rule, the proponent must argue admissibility under the catchall exceptions of Rule 807 (formerly Rules 803(24) and 804(b)(5))."); Powell, *supra* note 193, at 586 ("Because [animations and simulations] do[ ] not fit into any of the enumerated exceptions [to the hearsay rule], [they] must be shown to fit into the hearsay 'catchall exceptions.'").

207. FED. R. EVID. 807 (formerly Rules 803(24) and 804(b)(5)). See D'Angelo, *supra* note 26, at 571-72, for a discussion of how the requirements of Rule 807 would relate to animations and simulations if applicable.

208. *See generally* Grimes v. Employers Mut. Liab. Ins. Co., 73 F.R.D. 607 (D. Alaska 1977) (applying Federal Rule of Evidence 803(24) to a video portraying the daily activities of plaintiff).

dence.[209] Although voice-overs may be properly excluded under the hearsay rule,[210] several cases have excluded animation voice-overs on the basis that voice-overs tip the Rule 403 balance in favor of exclusion.[211] However, if the narrator is a witness whose testimony is reflected in the animation, or an expert properly introducing a simulation, an in-court voice-over would not raise hearsay concerns.[212]

B. *Authentication*

Federal Rule of Evidence 901(a) states that "[t]he requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims." As discussed in Part III.B.4, animation and simulation authentication involves two separate inquires: (1) authenticating the underlying program, and (2) authenticating the animation or simulation as fairly and accurately depicting what it purports to illustrate or prove. Authentication, of course, is a discretionary threshold question for the trial judge.[213]

1. AUTHENTICATION OF THE PROCESS USED TO GENERATE ANIMATIONS AND SIMULATIONS

By definition, the process of generating animations and simulations will involve some type of computer program. The processes used to create evidence must be authenticated,[214] thus the animation or simulation proponent must authenticate the computer program.[215] In other words, the proponent must demonstrate that the program used to create

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209. *See* Datskow v. Teledyne Cont'l Motors Aircraft Prod., 826 F. Supp. 677, 685 (W.D.N.Y. 1993); Macaluso v. Pleskin, 747 A.2d 830, 833-35 (N.J. Super. Ct. App. Div. 2000); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 82 (C.P. Ct. Lackawanna County 2001).

210. *See Serge*, 58 Pa. D. & C.4th at 82 (noting that "the animation [should not] invite hearsay objections by including extra-judicial commentary such as a pre-recorded narration"); *see also* Carbine & McLain, *supra* note 12, at 21-22 (stating that "narrations are normally excluded under the hearsay rule, unless the narrator testifies and is subject to cross examination"); Joseph, *supra* note 97, at 335 (asserting that "[b]ecause any prerecorded narration is an extrajudicial statement, a hearsay exception or exemption is required").

211. *Datskow*, 826 F. Supp. at 685 ("To reduce the possibility that the jury might interpret [the animation] as a re-creation of the accident, [the trial judge] also ordered that it be played with the volume turned off."); *Macaluso*, 747 A.2d at 835 (finding reversible error in animation due in large part to the inclusion of extensive pre-recorded narration which made the animation "testimonial in nature and . . . its contents . . . susceptible of being accepted by the jury as substantive evidence"); *Serge*, 58 Pa. D. & C.4th at 81-82.

212. *See* Carbine & McLain, *supra* note 12, at 21-22 (stating that "narrations are normally excluded under the hearsay rule, unless the narrator testifies and is subject to cross examination").

213. *See* FED. R. EVID. 104(a).

214. *See* FED. R. EVID. 901(b)(9).

215. *See, e.g.*, People v. Cauley, 32 P.3d 602, 607 (Colo. Ct. App. 2001); Sommervold v. Grevlos, 518 N.W.2d 733, 738 (S.D. 1994).

the animation or simulation generates accurate results. This inquiry is completely separate from whether the actual product (i.e., the animation or simulation) properly reflects the evidence it purportedly illustrates. Accordingly, the focus is on the program in general, not on what the program purports to illustrate or prove. According to Federal Rule of Evidence 901(b)(9), authentication of a process can be accomplished by presenting "[e]vidence describing a process or system used to produce a result and showing that the process or system produces an accurate result."

Challenging an animation solely on Rule 901(b)(9) grounds is pointless, as the most important inquiry relating to authentication of animations is whether the animation properly illustrates the accompanying testimony. If the animation is a fair and accurate depiction of the evidence it professes to illustrate, the authenticity of the process used to create the animation is irrelevant. In sum, whether an animation fairly and accurately represents the accompanying testimony should govern its authenticity; the court need not resort to an inquiry regarding the program used to generate the animation.

On the other hand, challenging a simulation on Rule 901(b)(9) grounds is an important strategic consideration for opposing parties. The court will decide the Rule 901(b)(9) contest based on whether the program used to produce the simulation passes the *Frye/Daubert* standard.[216] Although authentication does not generally involve a *Frye/Daubert* analysis, simulations present a unique set of circumstances: providing the jury with scientific, expert-like substantive evidence created by a non-human source. These unique circumstances bring the *Frye/Daubert* standard into the realm of Rule 901(b)(9) for simulations.[217] Thus, to satisfy authentication under Rule 901(b)(9), the program underlying the simulation must pass the *Frye/Daubert* analysis.[218] The particular requisites of the *Frye/Daubert* standard as they relate to simulations are discussed below in Part IV.F.

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216. *See supra* Part IV.F.

217. This proposition is the result of the hybrid nature of simulations. While the program is an inanimate object, where threshold admissibility is normally governed by traditional authentication principles, the program also produces the equivalent of expert-like testimony, where threshold admissibility is normally governed by the *Frye/Daubert* standard. This unique situation calls for an unusual consequence: the *Frye/Daubert* standard is drawn into the authentication realm (along with the attendant increase in threshold admissibility).

218. *See* Joseph, *supra* note 97, at 334-35 (listing satisfaction of the *Frye/Daubert* standard as an authentication issue); *see also* State v. Sipin, 123 P.3d 862, 868 (Wash. Ct. App. 2005).

2. AUTHENTICATION OF ANIMATIONS AND SIMULATIONS AS FAIR AND
ACCURATE DEPICTIONS OF WHAT THEY PURPORT TO REPRESENT

To demonstrate that an animation or simulation "is what its propo-
nent claims,"[219] the court must be satisfied that the animation or simula-
tion fairly and accurately depicts what it purports to represent.[220] As
with all pictorial representations,[221] most contemporary courts dealing
with animations and simulations have settled on the "fair and accurate"
standard,[222] though not necessarily recognizing this inquiry as an
authentication issue.[223] Regardless of the label employed, courts have
followed an authentication framework in determining whether anima-
tions and simulations satisfy the fair and accurate standard.[224]

The first step in the authentication process is to produce the experts
and forensic technicians who were involved in the creation process.
These experts and technicians must attest that the animation or simula-
tion is what it purports to be – or, more specifically, that the data from
which the animation or simulation was purportedly created is the data
the experts and technicians put into the animation or simulation.[225] A
party challenging an animation or simulation's authenticity might also

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219. FED. R. EVID. 901(a).

220. *See infra* notes 218-19; *see also* Joseph, *supra* note 97, at 334 (noting that "animations
have been subjected to the fair-and-accurate-portrayal test").

221. *See* Pierce v. State, 718 So. 2d 806, 809 (Fla. 4th Dist. Ct. App. 1997) (noting that the
"fair and accurate" standard is "the same foundation that must be established to admit any
pictorial representation, be it videotape, motion picture, or photograph").

222. *See id.* at 809 (holding that "the computer animation must be a fair and accurate depiction
of that which it purports to be"); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 76 (C.P. Ct.
Lackawanna County 2001) (noting that proper authentication requires that the animation be a fair
and accurate depiction of the scene); State v. Farner, 66 S.W.3d 188, 210 (Tenn. 2001) (explaining
that "as a prerequisite to admissibility, the State must establish that the animation . . . fairly and
accurately illustrate[s] and explain[s] the testimony of [the witness]"). Even as far back as 1984,
the court in *People v. McHugh*, 476 N.Y.S.2d 721, 723 (N.Y. Gen. Term. 1984), recognized that
animations must "fairly and accurately reflect the oral testimony offered."

223. *See* Bledsoe v. Salt River Valley Water Users' Ass'n, 880 P.2d 689, 692 (Ariz. Ct. App.
1994) (holding that "[a]t a minimum, the proponent must show that the computer simulation fairly
and accurately depicts what it represents"); People v. Cauley, 32 P.3d 602, 607-08 (Colo. Ct. App.
2001) (discussing the fair and accurate standard *after* the court was satisfied that the jurisdiction's
version of Federal Rule of Evidence 901 was satisfied); Cleveland v. Bryant, 512 S.E.2d 360, 362
(Ga. Ct. App. 1999) (holding that, because substantial differences might be prejudicial and
misleading, "a computer-generated animation is admissible if it is a fair and accurate
representation of the scene sought to be depicted"); *Farner*, 66 S.W.3d at 209 (holding that
because the animation was not a fair and accurate portrayal of the event depicted, its probative
value was substantially outweighed by the danger of unfair prejudice).

224. *See supra* notes 218-19.

225. *See* Clark v. Cantrell, 529 S.E.2d 528, 537 (S.C. 2000) ("[A] party may authenticate a
video animation by offering testimony from a witness familiar with the preparation of the
animation and the data on which it is based. In this case, the animation was authenticated by the
testimony of the expert who prepared the underlying data *and the computer technician who used
that data to create it*.") (emphasis added)).

dispute whether the computer used to generate the animation was func-
tioning properly.[226] In sum, this authentication inquiry assures the data
was not tainted en route to becoming part of the finished product (i.e.,
the animation or simulation).[227]

The more important aspect of the "fair and accurate" standard is
demonstrating what the name implies – that the animation or simulation
fairly and accurately represents that which it purports to depict.[228] Satis-
fying this inquiry can be as simple as having the proper witnesses attest
to that fact.[229] This inquiry, in contrast with authenticating the underly-
ing data, demands that a witness testify that the finished product prop-
erly represents what it purports to depict.

In keeping with the traditional notion that defects in the evidence
go to the weight accorded that evidence and not its admissibility,[230] sat-
isfaction of the "fair and accurate" standard does not require that the
animation or simulation be exact in every possible detail.[231] In fact, one
court allowed an animation that, admittedly, did not conform to the laws

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226. *See* Commercial Union Ins. Co. v. Boston Edison Co., 591 N.E.2d 165, 168 (Mass. 1992);
Kudlacek v. Fiat S.p.A., 509 N.W.2d 603, 617 (Neb. 1994) (citing *Commercial Union*, 591
N.E.2d at 168); State v. Clark, 655 N.E.2d 795, 812 (Ohio Ct. App. 1995) (citing *Commercial
Union*, 591 N.E.2d at 168).

227. *See Pierce*, 718 So. 2d at 807 (noting that testimony established that the detective's
"measurements were drawn directly onto a computer, such that they were input with no human
contamination of her measurements").

228. *See supra* notes 218-19.

229. *See, e.g.*, People v. Cauley, 32 P.3d 602, 608 (Colo. Ct. App. 2001) (noting that "[the fair
and accurate] requirement was satisfied when the expert witness stated that she believed the video
[animation] fairly and accurately described shaken baby syndrome, and she agreed with the
prosecutor that the video 'fairly depict[ed] the type of injuries and movements' that cause shaken
baby syndrome"); *Pierce*, 718 So. 2d at 807 (observing that the detective whose testimony the
animation was to accompany supervised every aspect of the creation of the animation and testified
that the computer animation "fairly and accurately reflected his opinion of how the accident
occurred"); State v. Sayles, 662 N.W.2d 1, 9 (Iowa 2003) (finding that authentication requirement
was satisfied for computer-generated animations where "the doctor knew of the facts represented
by the slide presentation and, in addition, was able to positively state that the slides correctly and
adequately portrayed those facts"); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 77 (C.P. Ct.
Lackawanna County 2001) (noting that for authentication to be satisfied the law enforcement
personal who gathered the measurements from the crime scene and the experts in ballistics, crime
scene reconstruction, and forensic pathology whose opinions are illustrated by the animation or
simulation must testify).

230. *See, e.g.*, *Cauley*, 32 P.3d at 607 (noting that "[o]nce authenticity is established, defects in
physical evidence go to the weight of that evidence, not its admissibility").

231. *See* Datskow v. Teledyne Cont'l Motors Aircraft Prods., 826 F. Supp. 677, 686
(W.D.N.Y. 1993) (explaining that "the various differences between what was shown on the
[computer-animated] tape and the actual conditions of the flight went only to weight to be given to
the animation, not to its admissibility"); Clark v. Cantrell, 529 S.E.2d 528, 537 (S.C. 2000)
(stating that "[the animation] need not be exact in every detail, but the important elements must be
identical or very similar to the scene as described in other testimony and evidence presented by
the animation's proponent in order to constitute a fair and accurate representation").

of physics.[232] Furthermore, that the animation or simulation conflicts with the opposing parties' version of events is not grounds for exclusion, provided the animation or simulation accurately portrays the proffering party's version of events.[233] However, in terms of authentication, as long as all other evidentiary requisites are satisfied, animations and simulations can represent *any* set of circumstances, as long as testimony establishes what the animation or simulation purports to depict.[234] At the same time, if an animation or simulation purports to demonstrate a specific issue, the proponent can authenticate the animation or simulation only with testimony from witnesses sufficiently familiar with that issue.[235]

C. *Relevance*

As with most jurisdictions, the federal rules dictate that " '[r]elevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence."[236] In other words, "an animation [or simulation] is relevant when it has a direct bearing upon and tends to establish or make more or less probable the matter in controversy."[237] In most cases, the relevance of an animation or simulation can clearly be established.[238] Although more com-

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232. *See* Constans v. Choctaw Transp., Inc., 97-0863 (La. App. 4 Cir. 12/23/97); 712 So. 2d 885, 900.

233. *See* Bray v. Bi-State Dev. Corp., 949 S.W.2d 93, 100 (Mo. Ct. App. 1997) (citing Lawson v. Schumacher & Blum Chevrolet, Inc., 687 S.W.2d 947, 954 (Mo. Ct. App. 1985)) (finding the introduction of a computer-generated chart proper and noting that " '[v]ariances in conditions which are more detrimental to the proponent of the test than those which existed in the original will not bar admission' "); *Serge*, 58 Pa. D. & C.4th at 78 ("The fact that the proffered animation may be inconsistent with the defense version of events is not grounds for its exclusion provided that it accurately portrays the [proffering party's] account of the shooting.").

234. *See* Robinson v. Mo. Pac. R.R., 16 F.3d 1083, 1087 (10th Cir. 1994) (finding introduction of accident recreation animation proper where "objections to certain missing or inaccurate details – for example, lights on the crossing sign, sound, unproven vehicle speeds – do not bear on the purpose of the exhibit which was to illustrate the expert's theory").

235. *See* Hutchison v. Am. Family Mut. Ins. Co., 514 N.W.2d 882, 890 (Iowa 1994) (excluding animation of closed-head injury where expert whose testimony the animation was to illustrate did not demonstrate sufficient knowledge of the circumstances surrounding the accident causing the injury); *Serge*, 58 Pa. D. & C.4th at 73 (opining that "if the animation purports to contain exact measurements or to be drawn to scale, the party seeking to utilize it must offer testimony as to how the data was obtained and inputted into the computer").

236. FED. R. EVID. 401.

237. Clark v. Cantrell, 529 S.E.2d 528, 537 (S.C. 2000).

238. *But see* Macaluso v. Pleskin, 747 A.2d 830, 835 (N.J. Super. Ct. App. Div. 2000) (finding that narration accompanying animation of soft tissue injury made animation testimonial in nature rather than a mere demonstrative aid and "was not relevant to plaintiff's precise medical condition and included speculation regarding the possible consequences of hypothetical injuries").

monly used to clarify witness testimony,[239] parties have used animations to demonstrate such issues as specific intent for murder.[240] As explained in the following section, the primary purpose of establishing relevance is to convince the judge that the probative value of the animation or simulation is not outweighed by other factors in favor of its exclusion.

D.   *Exclusion of Relevant Evidence on Grounds of Prejudice, Confusion, or Waste of Time*

Federal Rule of Evidence 403 states that "[a]lthough relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence."[241] Most states have a similar rule in their respective evidence codes.[242] The particularly persuasive nature of simulations and animations[243] heightens the Rule 403 concern.[244] Note, however, persuasiveness is not the issue; rather, the animation or simulation's *undue* effect is the relevant inquiry under Rule 403. Litigants largely have the prerogative to put on the most effective case as they see fit and courts should not penalize litigants for presenting their case using persuasive tools such as animations or simulations.[245] Rule

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239. *See* People v. Cauley, 32 P.3d 602, 608 (Colo. Ct. App. 2001) (noting that an animation "was relevant to the expert's opinion regarding the manner in which shaken baby syndrome injuries occur"); State v. Sayles, 662 N.W.2d 1, 11 (Iowa 2003) (noting how animation depicting shaken-baby syndrome was relevant to help "the jury in understanding the witness's explanation of how shaking could cause such severe injuries to an infant"); State v. Clark, 655 N.E.2d 795, 814 (Ohio Ct. App. 1995) (finding testimony based on computer-generated simulation clearly relevant to exclude certain positions where the victim could have been shot); *Clark*, 529 S.E.2d at 537 (explaining that "the animation was relevant because it was related to the testimony of several witnesses about the accident" and "would have aided the jury in understanding that testimony, provided it did not have to be excluded on other grounds").

240. *See* Commonwealth v. Shea, 644 N.E.2d 244, 248 (Mass. App. Ct. 1995) (non-computer-generated video relevant to the issue of specific intent); *Serge*, 58 Pa. D. & C.4th at 78 (animation relevant to issue of specific intent, specifically to rebut defense contention of self-defense).

241. FED. R. EVID. 403.

242. *See, e.g.,* § 90.403, FLA. STAT. (2006); LA. CODE EVID. art. 403; PA.R.E. 403; S.C. R. EVID. 403.

243. *See supra* Part I.B.

244. The court may also exercise control over the use of animations and simulations as directed by Federal Rule of Evidence 611, which states that "[t]he court shall exercise reasonable control over the mode and order of interrogating witnesses and presenting evidence so as to (1) make the interrogation and presentation effective for the ascertainment of the truth, (2) avoid needless consumption of time, and (3) protect witnesses from harassment or undue embarrassment." FED. R. EVID. 611.

245. *Compare Serge*, 58 Pa. D. & C.4th at 81 (quoting Galves, *supra* note 7, at 224) ("Simply because an attorney or witness is articulate, smart, credible, likable, or even passionate in her courtroom presentation, her argument or testimony need not be excluded on the Rule 403 ground that the jury might be 'overwhelmed' by her persuasive trial presentation skills or credible testimony. We recognize that good argumentation or persuasive testimony does not constitute

403 is aimed at the *improper* use of those tools.[246] For example, the opposing party might suffer undue prejudice if an animation is introduced on the eve of trial, precluding a sufficient opportunity for investigation,[247] or if the animation depicts a gruesome bloody scene.[248] An animation that is based on data that is not supported by the evidence should also be excluded.[249]

Because animations and simulations are often used to capture and convey complex ideas with great clarity in short periods of time,[250] it is unlikely courts will exclude such evidence as an "undue delay" or a "waste of time."[251] Similarly, because of the unique perspectives that animations and simulations allow,[252] it is doubtful that they would be excluded under Rule 403 as "needless presentation of cumulative evidence."[253]

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unfair prejudice. Accordingly, a well-prepared CGE that helps an attorney or witness communicate persuasively – like good diction, a well-timed dramatic pause, an effective appeal to an appropriate metaphor, or any other oratory skill – should not be a basis for a Rule 403 unfair prejudice exclusion. Rule 403 was never intended to exclude the likes of Clarence Darrow simply because he was effective and persuasive in the courtroom. Therefore, just because a CGE helps a jury absorb, understand, and believe attorney argument or witness testimony does not mean that Rule 403 has been violated."), *with* Racz v. R.T. Merryman Trucking, Inc., No. 92-3404, 1994 WL 124857, at *5 (E.D. Pa. Apr. 4, 1994) (excluding animation, apparently solely on basic Rule 403 grounds).

246. *But see* Van Houten-Maynard v. ANR Pipeline Co., No. 89 C 0377, 1995 WL 317056, at *12 (N.D. Ill. May 23, 1995) (granting motion in limine to exclude animation for lack of notice and, "under FED. R. EVID. 403[,] by reasons of its great potential for being misleading and prejudicial"); *Racz*, 1994 WL 124857, at *5 (excluding an animation solely on Federal Rule of Evidence 403 grounds and stating "[r]elying upon the old adage, 'seeing is believing,' we conclude that the jury may give undue weight to an animated reconstruction of the accident"). It does not appear that any other courts have taken such a hard-line view of Rule 403 in relation to animations or simulations.

247. Subsection (b)(2)(C) of the proposed model rules of procedure discussed in Part III.B.2 explicitly addresses the notice concern.

248. See *infra* notes 262-66 regarding what sort of accompaniments animations and simulations can contain.

249. Dunkle v. State, 2006 OK CR 29, ¶ 65, 139 P.3d 228, 250 (Okla. Crim. App. 2006).

250. *See supra* Part I.B.

251. FED. R. EVID. 403. *But see* Pino v. Gauthier, 633 So. 2d 638, 652 (La. Ct. App. 1993) (in excluding a simulation, in part, as not helpful to the jury, the court found that "[the expert's] testimony was clear and understandable. It was not necessary for the jury to view a computer simulation to understand how a vehicle might lose control during a lane change maneuver"). The *Pino* court's reasoning, however questionable, seems more like grounds for exclusion under Federal Rule of Evidence 702 rather than Rule 403. *See* FED. R. EVID. 702 ("*If* scientific, technical, or other specialized knowledge *will assist the trier of fact to understand the evidence* or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.") (emphasis added)).

252. *See supra* note 45.

253. FED. R. EVID. 403; *see, e.g.*, State v. Harvey, 26613-KA (La. App. 2 Cir. 01/25/95); 649 So. 2d 783, 789 (finding that "the animations were not merely cumulative of [the expert's] testimony, autopsy report, and autopsy pictures" as "they enhanced the jury's understanding" of

Nonetheless, Rule 403 is the most important rule of evidence for proponents of animations or simulations to take into account during the creation process[254] because, in reported decisions where the animation or simulation was excluded, the principles behind Rule 403 often provided the basis for exclusion, regardless of whether the court explicitly referenced Rule 403.[255] Of those cases, some combination of "unfair prejudice, confusion of the issues, or misleading the jury" was the general basis for the Rule 403 exclusion.[256] An animation or simulation is not misleading simply because it conflicts with the opposing party's version of events.[257] Furthermore, although dissimilarities from actual conditions may not affect authentication,[258] the jury may be misled if those differences are not disclosed.[259] However, explaining variations to the jury can help avoid exclusion on unfairness grounds.[260]

Any prerecorded narration or voice over as an accompaniment to the animation or simulation may present an unfair prejudice problem by unduly bolstering the animation or simulation's legitimacy.[261] Pro-

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the evidence); Harris v. State, 2000 OK CR 20, ¶ 26, 13 P.3d 489, 496 (Okla. Crim. App. 2000) (finding that Rule 403 concerns were not implicated where the computer-generated animation "cleared up the confusion and made the expert's testimony easier to understand").

254. *See* Kristin L. Fulcher, Comment, *The Jury as Witness: Forensic Computer Animation Transports Jurors to the Scene of a Crime or Automobile Accident*, 22 U. DAYTON L. REV. 55, 70 (1996) (noting that "[p]erhaps the most formidable obstacle faced by the proponent of a computer re-creation is the balancing process required by Rule 403 of the Federal Rules of Evidence").

255. *See, e.g.*, Van Houten-Maynard, v. ANR Pipeline Co., No. 89 C 0377, 1995 WL 317056, at *12 (N.D. Ill. May 23, 1995); Racz v. R.T. Merryman Trucking, Inc., No. 92-3404, 1994 WL 124857, at *5 (E.D. Pa. Apr. 4, 1994); State v. Basten, No. 97-0918-CR, 1998 WL 61129, at *19 (Wis. Ct. App. Feb. 17, 1998).

256. FED. R. EVID. 403. "Confusion of the issues" should be sufficiently dispelled once authentication has been satisfied. As one court observed, "[i]t is difficult to conceive how a properly authenticated computer animation could be excluded based upon a 'confusion of the issues' objection since such a demonstrative exhibit is designed to clarify—not compound—any potential confusion in an expert's opinion." Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 81 n.6 (C.P. Ct. Lackawanna County 2001). *But see Basten*, 1998 WL 61129, at *19 (excluding animation as confusing and misleading to the jury because the main variable upon which it was based was not verifiable).

257. *See* Jones v. Kearfott Guidance & Navigation Corp., No. CIV 93-64(DRD), 1998 WL 1184107, at *5 (D.N.J. Nov. 17, 1998) (finding that, in the context of an animation illustrating an expert's theory of the cause behind a helicopter crash, "[a] theory or hypothesis that contradicts one propounded by an opposing party does not become misleading merely because its sets forth a different perspective").

258. *See supra* Part IV.B.

259. *See* Lopez v. Foremost Paving, Inc., 796 S.W.2d 473, 481 (Tex. App. 1990) (finding error in the admission of non-computer-generated animation where "[t]he jury was not instructed as to the extent to which it was to consider the videotape in light of factual dissimilarities with the actual occurrence").

260. *See id.* at 480-81 (recognizing that "the offering party's affirmative acknowledgement to the jury of dissimilarities between a videotaped reconstruction and the actual occurrence can serve to alleviate unfairness").

261. *See* Datskow v. Teledyne Cont'l Motors Aircraft Prods., 826 F. Supp. 677, 685

longed exposure to the animation or simulation – i.e., playing the animation or simulation multiple times – can also negatively impact the Rule 403 analysis.[262] Of course, that concern should prompt only a limitation on the number of times the animation or simulation is shown to the jury, rather than exclusion of the animation or simulation altogether.

The difficulties associated with recreating subtleties also play a part in the Rule 403 analysis. Animations and simulations that contain subtleties such as human gestures emulating emotion are likely unduly prejudicial because they cannot generally represent such features with sufficient accuracy.[263] Adding certain features such as sound effects and blood can also make an animation or simulation overly graphic, leading to its exclusion under Rule 403.[264] As a result, several courts have held that the animation or simulation must be "clinical and emotionless," which means the animation or simulation cannot depict facial expressions, blood, or sounds like screams or gunshots.[265]

(W.D.N.Y. 1993) (finding a video simulation admissible where the court had "ordered that it be played with the volume turned off, so that the jury could not hear the taped voice-over"); Macaluso v. Pleskin, 747 A.2d 830, 835 (N.J. Super. Ct. App. Div. 2000) (finding reversible error in animation due in large part to the inclusion of extensive prerecorded narration which made the animation "testimonial in nature and . . . its contents were susceptible of being accepted by the jury as substantive evidence"). See also *supra* Part IV.A for a discussion of narrations as hearsay.

262. *See* Pierce v. State, 718 So. 2d 806, 810 (Fla. 4th Dist. Ct. App. 1997) (recognizing that "no undue emphasis [was] placed upon the computer animation videotape, which was shown to the jury for a total of approximately six minutes during the course of an eleven-day trial"); State v. Farner, 66 S.W.3d 188, 210 (Tenn. 2001) (noting that "animations generally have a substantial impact upon jurors, and that impact is no doubt increased where jurors are allowed to view the animated visualization not once or twice, but fifteen separate times").

263. *See* Boyle, *supra* note 21, at 383-84; Sherman, *supra* note 20.

264. *See Pierce*, 718 So. 2d at 810 (noting that "[a]lthough evidence in this case indicated a bloody scene with screaming victims, the computer animation videotape demonstrated no blood and replicated no sound. . . . [and] the mannequins used in the computer animation videotape depicted no facial expressions"); State v. Harvey, 26613-KA (La. App. 2 Cir. 01/25/95); 649 So. 2d 783, 788 (finding Rule 403 concerns over the use of animation alleviated where, *inter alia*, no blood was depicted in the animation); Commonwealth v. Serge, 896 A.2d 1170, 1183 (Pa. 2006) (noting that the animation did not include "(1) sounds; (2) facial expressions; (3) evocative or even life-like movements; (4) transition between the scenes to suggest a story line or add a subconscious prejudicial effect; or (5) evidence of injury such as blood or other wounds"); Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 82 (C.P. Ct. Lackawanna County 2001) (holding that "[animations and simulations] should not display any blood or facial expressions or attempt to replicate the sound of gunshots or other noise").

265. *See* People v. Hood, 62 Cal. Rptr. 2d 137, 141 (Cal. Ct. App. 1997) (finding admission of simulation proper due, in part, to it being "clinical and emotionless"); State v. Sayles, 662 N.W.2d 1, 11 (Iowa 2003) (finding animation depicting shaken-baby syndrome not unduly prejudicial where "[t]he animation . . . was clinical in nature and the computer-generated infant showed no facial expression and emitted no sound during the shaking"); *Serge*, 58 Pa. D. & C.4th at 82 (citing *Hood*, 62 Cal. Rptr. 2d at 141) (holding that "the [animation or simulation] must be 'clinical and emotionless'").

E. *Limited Admissibility and Model Jury Instructions*

Federal Rule of Evidence 105 states that "[w]hen evidence which is admissible as to one party or for one purpose but not admissible as to another party or for another purpose is admitted, the court, upon request, shall restrict the evidence to its proper scope and instruct the jury accordingly."[266] The limited utility of common demonstrative aids such as charts and blowups is usually so clear that a limiting instruction would be inconsequential. However, limited admissibility is important as it relates to animations because animations are exceptionally persuasive and, unlike other demonstrative aids, they are susceptible to being taken by the jury as more than they are worth.[267] Unlike simulations, animations serve solely as an illustration of a witness's testimony – they have no independent evidentiary value. The jury must be made to understand that they can only credit the animation as far as they credit the accompanying witness's testimony.[268] As one court described in an accident reconstruction context, making this distinction clear "is the difference between a jury believing that they are seeing a repeat of the actual event and a jury understanding that they are seeing an illustration of someone else's *opinion* of what happened."[269]

Limiting instructions are also valuable when dealing with simulations. As previously discussed, simulations can be used as either the basis of an expert's opinion or as a stand alone recreation of events. Simulations, like animations, are highly persuasive, so the proponent must explain to the jury exactly what the simulation represents. For example, if the results of a simulation are the basis of an expert's opinion, this should be explained to the jury. Similarly, the jury should understand whether the simulation is demonstrating scientific principles based on data provided by the proponent. Admittedly, because simulations are substantive evidence, a simulation limiting instruction is not as critical as an animation limiting instruction. Some situations, however, may call for a limiting instruction. For instance, where the parties contest material factual issues, a limiting instruction should accompany any simulation which is based on those contested material facts.[270]

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266. Fed. R. Evid. 105.

267. *See supra* Part I.B.

268. Datskow v. Teledyne Cont'l Motors Aircraft Prods., 826 F. Supp. 677, 686 (W.D.N.Y. 1993) (noting that as long as the jury understands the function of an animation "there is no reason for them to credit the illustration any more than they credit the underlying opinion").

269. *Id.* (emphasis in original).

270. One commentator suggests that both animations and simulations be accompanied by an instruction regarding the underlying assumptions upon which they are based. Carbine & McLain, *supra* note 12, at 26-27. The model instruction Carbine and McLain propose regarding assumptions is as follows:

In evaluating what weight, if any, to give to the testimony that relies on the

One commentator suggests that courts should provide limiting instructions regarding an animation or simulation's underlying inaccuracies.[271] However, opposing counsel will have sufficient opportunity to clarify all such characteristics for the jury during cross-examination and closing argument. Of course, the judge has the discretion to issue limiting instructions when the situation calls for them, but in the normal course of events, *the judge* need not specifically point out inaccuracies. Animations and simulations are subjected to scrutiny by the parties in the form of the procedural rules and other evidentiary rules discussed above, ensuring that any inconsistencies are acceptable; further instruction by the judge might do more harm than good.

The only way to effectively communicate an animation or simulation's limited purpose is for the judge to instruct the jury before the proponent plays the animation or simulation.[272] As intimated earlier, a limiting instruction should accompany all animations, while simulations will require limiting instructions only under specific circumstances. In introducing animations, many courts have instructed the jury regarding the limited purpose the animation purports to serve.[273] Reported instructions range in length and treatment, but the general purpose is to ensure the jury understands they should only credit the animation to the extent they credit the witness's testimony.[274]

Because animations and simulations vary depending on the particu-

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computer [animation] [simulation], bear in mind [the principal assumptions
underlying the exhibit, e.g., that it is predicated on [the party's] version of the facts;
that the facts are in dispute; that the exhibit is no better than the assumptions on
which it rests]. It is for you to decide whether those assumptions are warranted.

Id. (brackets in original). However, because animations are merely a reflection of a witness's testimony, any underlying assumptions contained in the animation are inherent in the witness's testimony. The jury, as trier of fact, must weigh the credibility of each witness and their testimony. Because the animation and the witness testimony are essentially one in the same, an instruction as to underlying assumptions, in addition to an instruction regarding limited admissibility, would be superfluous.

271. *Id.*

272. *See* John Selbak, Comment, *Digital Litigation: The Prejudicial Effects of Computer-Generated Animation in the Courtroom*, 9 HIGH TECH. L.J. 337, 365 (1994) ("Since juries are strongly affected by visual evidence, the prejudicial effect of an improper viewpoint shown live in the courtroom cannot be undone. In these instances, a limiting instruction by the judge, instructing the jury to disregard the highly-prejudicial image would be largely ineffective.").

273. *See, e.g., Datskow*, 826 F. Supp. at 684-85 (W.D.N.Y. 1993); Jones v. Kearfott Guidance & Navigation Corp., No. CIV. 93-64, 1998 WL 1184107, at *5 (D.N.J. Nov. 17, 1998); People v. Hood, 62 Cal. Rptr. 2d 137, 139 (Cal. Ct. App. 1997); People v. Cauley, 32 P.3d 602, 608 (Colo. Ct. App. 2001); State v. Holmes, No. 04-0664, 2005 WL 2989667, at *2 (Iowa Ct. App. Nov. 9, 2005); Commonwealth v. Shea, 644 N.E.2d 244, 247 (Mass. App. Ct. 1995); Clark v. Cantrell, 529 S.E.2d 528, 537 (S.C. 2000).

274. *See, e.g.,* Pierce v. State, 718 So. 2d 806, 810 (Fla. 4th Dist. Ct. App. 1997) (noting with approval that "it was made clear to the jury that if the information entered into the computer was inaccurate, then the computer animation itself was inaccurate").

lar circumstances, a single model instruction cannot fully account for all animations and simulations. However, a skeleton model of an "animation limited purpose instruction" would read as follows:

> You are about to see a computer-generated animation created by [the proffering party]. The purpose of the animation is solely to help you understand the testimony of [the witness]. The animation is not an actual recreation of [the event]. The animation is not evidence; the only evidence is the testimony of [the witness]. The animation is only a visual aid, such as a chart or picture, to help you understand [the witness's] particular interpretation of [the event]. If you find any inaccuracies in the testimony the animation is illustrating, then the animation itself is similarly inaccurate.

Each simulation's underlying assumptions are particularly fact dependant and, as such, simulations do not lend themselves to a model limiting instruction. Limiting instructions are intended to make the jury realize a simulation is not authoritative – that the simulation is simply used to illustrate a scenario based on facts that may or may not be true. The jury's job is to determine what the underlying facts are *and* to accord the simulation whatever weight they see fit.

F.   *Requirements for the Admissibility of Scientific Evidence:* Frye *and* Daubert *in Relation to Simulations*

Animations, as mere illustrations of witness testimony (whether lay or expert witness testimony), are not subject to a *Frye/Daubert* analysis. In contrast, because simulations utilize scientific processes, simulations are subject to *Frye*,[275] *Daubert*,[276] or some variation thereof.[277] To satisfy the *Frye* standard, the proponent of scientific evidence must establish that his or her expert's theory and method are generally accepted within the relevant scientific community.[278] On the other hand, in *Daubert* the Supreme Court interpreted Federal Rule of Evidence 702,[279]

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275. Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

276. Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993).

277. The federal courts are subject to the *Daubert* standard. *Id.* See Lustre, *supra* note 14, for a review of the various standards for the admissibility of scientific evidence in state courts.

278. *Frye*, 293 F. at 1014.

279. Federal Rule of Evidence 702 is the general rule regarding the admissibility of testimony by expert witnesses. Rule 702 states:

> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

FED. R. EVID. 702.

holding that the proponent of scientific evidence must demonstrate that the evidence is sufficiently reliable through such factors as: (1) whether the theory can or has been tested; (2) whether the theory has been subjected to peer review and publication; (3) the known or potential rate of error; and (4) general acceptance in the scientific community.[280]

Regardless of the particular standard employed, substantive simulations must satisfy a two-stage *Frye/Daubert* analysis.[281] The initial consideration[282] is whether the scientific process the simulation is purporting to demonstrate is reliable. This consideration transcends the simulation and should be dealt with like any other scientific evidence. That the proponent chose to demonstrate the scientific principles via a simulation is irrelevant to the analysis: the scientific methodology must satisfy the *Frye/Daubert* analysis.[283] Because this *Frye/Daubert* consideration is the same for all scientific processes regardless of format, further elucidation of this point is outside this Article's scope.[284]

The second *Frye/Daubert* consideration deals directly with the programming used to generate the simulation.[285] In general terms, the program must satisfy the relevant *Frye/Daubert* standard.[286] To do so, the computer program must reliably simulate the proffered scientific processes.[287] For example, Newtonian physics is perceived as reliable under any standard. The *Frye/Daubert* inquiry for a program utilizing Newtonian physics is whether the computer program reliably employs those physical principles. As discussed earlier in Part III.B.4, under the proposed model rules of procedure, this issue is dealt with during the pretrial authentication stage.[288]

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280. *Daubert*, 509 U.S. at 593-94. The court noted that this list is not exhaustive and no one factor is necessarily decisive. *Id.* at 593.

281. *See supra* Part III.B.4.

282. In terms of the practical approach of a litigant dealing with the *Frye/Daubert* analysis, this consideration would be dealt with after the next consideration. However, because the analysis logically flows better in this order, this consideration is discussed first.

283. What exactly must be demonstrated to satisfy the particular *Frye/Daubert* standard in terms of scientific process employed is the subject of much debate. Because the debate is not unique to simulations, the specifics of the argument will not be elucidated any further in this Article.

284. In other words, the issue may be understood by using a somewhat oversimplified example: A computer program is used to predict the weather. The computer program uses a meteorological theory to produce its results. The inquiry under this *Frye/Daubert* consideration is whether or not the meteorological theory is reliable, regardless of the fact that it was employed by a computer.

285. *See supra* Part III.B.4.

286. *See, e.g.*, Livingston v. Isuzu Motors, Ltd., 910 F. Supp. 1473, 1495 (D. Mont. 1995) (discussing each *Daubert* factor as it relates to a computer-generated accident simulation).

287. *See, e.g.*, Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 76 n.5 (C.P. Ct. Lackawanna County 2001) (listing programs that would likely pass the *Frye/Daubert* reliability standard).

288. *See* FED. R. EVID. 901(b)(9).

G. *Opening Statements and Closing Arguments*

By definition, the information relayed in opening statements and closing arguments is not substantive evidence.[289] Because simulations are substantive evidence, simulations cannot be introduced during those times.[290] Nevertheless, opening statements and closing arguments pose somewhat of a special problem for animations. Parties are normally allowed to use demonstrative aids during opening and closing, subject to the court's discretion. Animations, however, are not run-of-the-mill demonstrative aids.

"[T]he admissibility of demonstrative evidence is a matter within the discretion of the trial court."[291] Similarly, trial courts are vested with control over the scope of opening statements and closing arguments.[292] Thus, even though animations are not demonstrative *evidence*, the court has discretion to allow their use during opening statements and closing arguments.[293]

That being said, for a party to use any animation or simulation during opening statements or closing arguments, he or she must comply with the relevant provisions of the proposed model rule of procedure.[294] If the proffering party complies with all notice and discovery provisions, the trial judge, at the final pretrial conference, has the discretion to allow that party to use an animation during their opening statement or closing argument.[295] If, however, the proffering party wishes to use the anima-

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289. *See* Prestige Ford Co. v. Gilmore, 56 S.W.3d 73, 79 (Tex. App. 2001) ("[I]f a demonstrative exhibit contains factual information that is not in evidence, it would be error to show the exhibit to the jury. A party may not make factual statements during closing argument, whether orally or visually, without any reference to or inference from the evidence."); 75 AM. JUR. 2D *Trial* § 323 (2006) ("The opening statement of counsel generally is only an outline or a brief summary of anticipated proof.").

290. Note, however, that this does not completely bar the use of a simulation during opening statements or closing arguments. Because a simulation contains all the characteristics of an animation, a simulation can serve the function of both an animation *and* a simulation. In other words, the proffering party can call the item an animation for the purpose of opening or closing, but introduce the item as a simulation during the case in chief. Such a tactic could not result in surprise for opposing parties as notice, disclosure, etc. is required under the proposed model rules of procedure.

291. 29A AM. JUR. 2D *Evidence* § 935 (2006); *see also* ROGER HAYDOCK & JOHN SONSTENG, TRIAL: ADVOCACY BEFORE JUDGES, JURORS AND ARBITRATORS § 9.1, at 430 (2d ed. 1999); MAUET, *supra* note 31, at 176-77.

292. *See, e.g.*, Smith v. Kansas City S. Ry. Co., 02-1505 (La. App. 3 Cir. 5/28/03); 846 So. 2d 980, 984 ("The trial court is vested with wide discretion in his control of the opening statement."); 75A AM. JUR. 2D *Trial* § 544 (2006) ("The scope of closing argument is within the sound discretion of the trial court.").

293. *See, e.g.*, *Smith*, 846 So. 2d at 984; 75A AM. JUR. 2D *Trial* § 544 (2006).

294. *See* Proposed Model Rule of Procedure Regarding the Admission of Animations and Simulations ("[A]ny party who intends to use an animation or simulation at trial *for any purpose* shall . . . .") (emphasis added)), *reproduced infra* app. A.

295. *Id.*

tion only during either opening or closing, the trial judge need only consider those issues attendant to introducing animations in general. On the other hand, if the proffering party wishes to use the animation multiple times (e.g., during their opening, case-in-chief, and closing), the trial judge must also consider whether multiple exposures will cause the jury to place undue reliance on the animation.[296]

It is worth noting that the Maryland rule[297] does not apply to animations or simulations used during opening or closing arguments.[298] According to commentators involved with developing the Maryland rule:

> This result was reached because of concerns as to attorney work product, and also due to the changing nature of any animation or depiction to be used in closing, depending on what evidence was admitted or excluded at trial and on tactical decisions. Whether computer graphics could be shown during opening statements or, although not having been admitted in evidence, during closing arguments, would be determined by the trial court in its discretion, under Uniform and Federal Rule of Evidence 611(a).[299]

The attorney work product to which those authors are referring encompasses both materials "prepared in anticipation of litigation" and "the mental impressions, conclusions, opinions, or legal theories of an attorney or other representative of a party concerning the litigation" as protected by Federal Rule of Civil Procedure 26(b)(3).[300]

Assuming the animation the proffering party uses during opening statements or closing arguments is the same animation they use during their case-in-chief, a work product issue never materializes. In other words, the proponent must comply with the notice and disclosure requirements to use the animation during their case-in-chief, and, therefore, an additional attorney work product concern never arises if the proponent uses the same animation during their opening statement and/or closing argument. However, when the proffering party contemplates using the animation exclusively during their opening statement or closing argument – for example to generally illustrate their theory of the case[301] – attorney work product difficulties arise. Complying with the

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296. *See, e.g.*, State v. Farner, 66 S.W.3d 188, 210 (Tenn. 2001) (noting that "animations generally have a substantial impact upon jurors, and that impact is no doubt increased where jurors are allowed to view the animated visualization not once or twice, but fifteen separate times").

297. MD. RULE 2-504.3, *reproduced infra* app. B.

298. *Id.*; Carbine & McLain, *supra* note 12, at 36.

299. Carbine & McLain, *supra* note 12, at 36.

300. FED. R. CIV. P. 26(b)(3).

301. *See* Borelli, *supra* note 3, at 450 (noting that animations can "demonstrate[ ] the plausibility of [the] theory of the case").

proposed rule of procedure results in a limited waiver of Rule 26(b)(3) with respect to the contents of the animation. Applying the proposed rules of procedure where the proffering party intends to use the animation exclusively during their opening statement or closing argument would, concededly, limit animation use in those arenas.

Be that as it may, more than just work product concerns arise. Allowing parties to use animations and simulations unchecked during their openings and closings would ignore the resulting persuasive impact; and avoiding that result is the very reason this Article counsels jurisdictions to adopt the proposed rule of procedure. Though not evidence, openings and closings create a lasting impression for jurors. On balance, the issues that accompany using animations and simulations in general also weigh in favor of applying the model rule of procedure to opening statements and closing arguments.

H. *Viewing Animations and Simulations During Jury Deliberations*

The potentially enormous persuasive impact of animations and simulations demands that jurisdictions address whether the jury may bring animations or simulations into the jury room during deliberations. In general, demonstrative aids such as animations[302] are not entered into evidence as exhibits and consequently may not be reviewed in the jury room during deliberations.[303]

Simulations, on the other hand, are substantive evidence and must be properly admitted into evidence.[304] Through either explicit procedural rules or common law, judges in most jurisdictions have discretion to allow the jury to take certain evidentiary exhibits into deliberations.[305] Allowing the jury to view a simulation during deliberations increases the

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302. *See, e.g.*, N.D. & S.D. Iowa L.R. 83.7(i) ("The term 'demonstrative aid' includes charts, diagrams, models, samples, and animations, but does not include exhibits admitted into evidence or outlines of opening statements or closing arguments.").

303. *See, e.g.*, Pierce v. State, 718 So. 2d 806, 808 (Fla. 4th Dist. Ct. App. 1997) (noting that "because [the animation] was ruled inadmissible as substantive evidence, it was not permitted to be taken to the jury room during deliberations"); Cox v. State, 2001-KA-01427-SCT (Miss. 2003); 849 So. 2d 1257, 1274 (concluding "that [a computer-generated animation] which is admitted for demonstrative purposes only *should not* be given to the jury for its consideration during deliberations").

304. *See supra* Part III.B.1.

305. *See, e.g.*, Fla. R. Crim. P. 3.400 ("The court may permit the jury, upon retiring for deliberation, to take to the jury room . . . all things received in evidence other than depositions."); Ky. R. Crim. P. 9.72 ("Upon retiring for deliberation the jury may take all papers and other things received as evidence in the case."); Miss. URCCC 3.10 ("The court shall permit the jury, upon retiring for deliberation, to take into the jury room the instructions and exhibits and writings which have been received in evidence, except depositions."); State v. Roberts, 948 S.W.2d 577, 596 (Mo. 1997) ("Even where an exhibit is properly admitted into evidence, the decision whether the exhibit should be sent back to the jury during deliberations remains a matter within the sound discretion of the trial court.").

possibility that unfair prejudice might outweigh the simulation's proba-
tive value.[306] In sum, the more times the jury views the simulation, the
less apt they are to maintain an objective understanding of the limited
function of the simulation. On balance, these factors weigh against
allowing juries to review simulations during deliberations.

V. CONCLUSION

The additional procedural and evidentiary issues simulations raise
counsel in favor of using animations whenever possible, as they lead to
the path of least resistance while maintaining a very similar impact on
the jury. Rules of procedure and evidence treat animations and simula-
tions as two separate and distinct entities. However, savvy litigators
have realized that, regardless of the scientific methodology employed,
under most circumstances an animation can be used in place of a simula-
tion. That is to say, a litigator could easily plug one program's com-
puter-generated scientific results into a separate program to create an
animation.[307] This course of action does not sidestep the general relia-
bility measures that ensure the accuracy of the results, but it does bifur-
cate the admissibility analysis. Furthermore, because the information
experts rely on in forming their opinions need not be admissible, the
simulation program does not necessarily have to brave the rigors of the
Frye/Daubert analysis.[308] That said, if an expert uses the underlying
program to form their opinion, the program must still be "of a type rea-

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306. *See, e.g.,* State v. Farner, 66 S.W.3d 188, 210 (Tenn. 2001) (noting that "animations
generally have a substantial impact upon jurors, and that impact is no doubt increased where
jurors are allowed to view the animated visualization not once or twice, but fifteen separate
times"); Marcotte, *supra* note 12, at 56 ("Judges might not allow animation to be shown more than
once for fear of a cumulative effect that repeated showings would have on jurors.").

307. *See, e.g.,* General Motors Corp. v. Porritt, 891 So. 2d 1056, 1059 (Fla. 2d Dist. Ct. App.
2004) (rejecting argument that video demonstration was merely demonstrative); Lally v.
Volkswagen Aktiengesellschaft, 698 N.E.2d 28, 40 (Mass. App. Ct. 1998) (noting without ruling
on the issue that "[t]he defendants maintain that the animation was not itself a simulation, but
rather, a visual representation of [an expert witness's] testimony concerning the results of one
computer simulation program"); State v Tollardo, 2003-NMCA-122, ¶¶ 8-18, 134 N.M. 430, 434-
36, 77 P.3d 1023, 1027-29.

308. *See* FED. R. EVID. 703 ("The facts or data in the particular case upon which an expert
bases an opinion or inference may be those perceived by or made known to the expert at or before
the hearing. If of a type reasonably relied upon by experts in the particular field in forming
opinions or inferences upon the subject, the facts or data need not be admissible in evidence in
order for the opinion or inference to be admitted. Facts or data that are otherwise inadmissible
shall not be disclosed to the jury by the proponent of the opinion or inference unless the court
determines that their probative value in assisting the jury to evaluate the expert's opinion
substantially outweighs their prejudicial effect."); *see also Pierce,* 718 So. 2d at 809 (noting that
"the proponent must establish that the facts or data on which the expert relied in forming the
opinion expressed by the computer animation are of a type reasonably relied upon by experts in
the subject area" and that "[t]he facts or data need not themselves be admissible in evidence").

sonably relied upon by experts in the particular field."[309]

No matter how the practicalities play out, animations and simulations are finding their way into courtrooms. "Just as the telegraph gave way to the telephone, the stagecoach gave way to the automobile, and the typewriter gave way to the word processor, so too will courtroom chalkboards, easels and blow-up placard charts give way to computer-generated exhibits."[310] Progress inevitably marches on − even within the walls of American courtrooms. We must do our best to ensure jurisprudence stays abreast of current technology. The set of procedural rules this Article proposes, coupled with an understanding of the evidentiary issues animations and simulations raise, will ensure that this inexorable transition occurs smoothly and equitably.

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309. FED. R. EVID. 703.
310. Commonwealth v. Serge, 58 Pa. D. & C.4th 52, 84 (C.P. Ct. Lackawanna County 2001) (quoting Galves, *supra* note 7, at 300).

APPENDIX A

Proposed Model Rule of Procedure Governing the Admission of Animations and Simulations

(a) Definition – Animation and Simulation

    (1) An "animation" is a computer-generated demonstrative aid used to illustrate a witness's testimony. An animation is the equivalent of a series of diagrams strung together to produce what appears to be a moving image. The underlying program creating an animation may only reproduce images as an illustration. An animation may not utilize a program that employs formulas to draw conclusions about material issues which would, if allowed into evidence, only be admissible through qualified expert testimony. The program may reflect the opinions of qualified experts, but may not be used to generate those opinions. Although an animation is not substantive evidence and, as such, is not entered into evidence, its use at trial is governed by the Rules of Evidence as if it were evidence.

    (2) A "simulation" is computer-generated substantive evidence. A simulation creates a series of diagrams strung together to produce what appears to be a moving image. A simulation utilizes one or more programs which, after inputting data, use scientific formulas to produce conclusions based on that data regarding issues material to the trial. The results produced by a simulation's programming are equivalent in nature to the opinions reached by an expert witness.

(b) Notice

    (1) Except as provided for in subsections (b)(2) and (b)(3) of this Rule, any party who intends to use an animation or simulation at trial for any purpose shall file a written notice no later than ninety days before trial that contains:

        (A) a statement as to whether the party intends to use an animation or simulation;

        (B) a descriptive summary of the subject matter of the animation or simulation including what the animation or simulation intends to illustrate or prove; and

(C) a statement acknowledging that the party has the responsibility to:

   (i)   make available any equipment or personnel necessary to present the animation or simulation to the trial court and, when requested, any appellate court with competent jurisdiction;

   (ii) make available any equipment or personnel necessary to present for review the software comprising the simulation to the trial court and, when requested, any appellate court with competent jurisdiction; and

   (iii) preserve the animation or simulation as provided in section (e) of this Rule.

(2) If the ninety-day deadline as prescribed in subsection (b)(1) of this Rule has passed, a party may still use an animation or simulation by filing written notice as provided in (b)(1)(A)-(C) if the court finds that:

   (A) notice as prescribed by (b)(1)(A)-(C) was filed as soon as practicable;

   (B) the decision to employ an animation or simulation was made as soon as practicable; and

   (C) the opposing party or parties will not be unduly prejudiced by the introduction of the animation or simulation based on the lack of a ninety-day pretrial notice period.

(3) The notice provisions of this section need not be complied with where a party intends to use an animation or simulation prepared by or on behalf of a party-opponent for the purpose of rebuttal or impeachment.

(c) Required Disclosure; Additional Discovery

(1) Within five days after service of notice under section (b) of this Rule, the proponent of the animation or simulation shall make available to any party:

   (A) the animation or simulation;

(B) all underlying data and scientific principles upon which the animation or simulation is based; and

(C) reasonable access to the software used to generate the animation or simulation.

(2) The filing of notice under section (b) of this Rule entitles any other party to a reasonable period of time to discover any relevant information needed to oppose the use of the animation or simulation before the court holds the hearing provided for in section (d) of this Rule.

(d) Objection Period; Hearing

(1) Within sixty days after service of notice under section (b) of this Rule, the party:

(A) may file any objection to the use of the animation or simulation at trial; and

(B) shall file any objection based on the assertion that the animation or simulation does not meet the requirements of [Federal Rule of Evidence 901(b)(9) or the equivalent thereof]. If not so filed, any objection based on a failure to meet the requirements of [Federal Rule of Evidence 901(b)(9) or the equivalent thereof] is waived unless excused by the court for good cause.

(2) If an objection is filed under subsection (d)(1) of this Rule, the court shall hold a pretrial hearing on the objection. If the hearing is an evidentiary hearing, the court may appoint an expert to assist the court in ruling on the objection and may assess against one or more parties the reasonable fees and expenses of the expert. In ruling on the objection, the court may require modification of the animation or simulation and may impose conditions relating to its use at trial. The ruling by the court is definitive under [Federal Rule of Evidence 103(a) or the equivalent thereof]. [Federal Rule of Evidence 103(a) or the equivalent thereof] governs the preservation of claims of error for appeal.

(e) Preservation of Computer-Generated Animations and Simulations

(1) A party offering an animation at any proceeding shall preserve

the animation in a form suitable for transmittal as a part of the record on appeal and furnish it to the clerk of the court.

(2) A party offering a simulation at any proceeding shall preserve the simulation in a form suitable for transmittal as a part of the record on appeal and furnish it to the clerk of the court. That party must also preserve the software used to generate the simulation offered in each proceeding. The party shall give any appellate court of competent jurisdiction access to the software as that court so requests.

Provision Regarding Costs

The prevailing party may recover the reasonable costs associated with the preparation of animations and simulations which the court deems reasonably necessary. "Animation" and "simulation" as referred to in this Rule are as defined in subsection (a) of this Rule.

APPENDIX B

Maryland Rule of Civil Procedure – Circuit Court

"Rule 2-504.3. Computer-Generated Evidence

(a) Definition – Computer-Generated Evidence. "Computer-generated evidence" means (1) a computer-generated aural, visual, or other sensory depiction of an event or thing and (2) a conclusion in aural, visual, or other sensory form formulated by a computer program or model. The term does not encompass photographs merely because they were taken by a camera that contains a computer; documents merely because they were generated on a word or text processor; business, personal, or other records or documents admissible under Rule 5-803 (b) merely because they were generated by computer; or summary evidence admissible under Rule 5-1006, spread sheets, or other documents merely presenting or graphically depicting data taken directly from business, public, or other records admissible under Rules 5-802.1 through 5-804.

(b) Notice.

(1) Except as provided in subsection (b)(2) of this Rule, any party who intends to use computer-generated evidence at trial for any purpose shall file a written notice within the time provided in the scheduling order or no later than ninety days before trial if there is no scheduling order that:

(A) contains a descriptive summary of the computer-generated evidence the party intends to use, including (i) a statement as to whether the computer- generated evidence intended to be used is in the category described in subsection (a)(1) or subsection (a)(2) of this Rule, (ii) a description of the subject matter of the computer-generated evidence, and (iii) a statement of what the computer-generated evidence purports to prove or illustrate; and

(B) is accompanied by a written undertaking that the party will take all steps necessary to (i) make available any equipment or other facility needed to present the evidence in court, (ii) preserve the computer-generated evidence and furnish it to the clerk in a manner suitable for transmittal as a part of the record on appeal, and (iii) comply with any request by an appellate court for presentation of the computer-generated evidence to that court.

(2) Any party who intends to use computer-generated evidence at trial for purposes of impeachment or rebuttal shall file, as soon as practi-

cable, the notice required by subsection (b)(1) of this Rule, except that the notice is not required if computer-generated evidence prepared by or on behalf of a party-opponent will be used by a party only for impeachment of other evidence introduced by that party-opponent. In addition, the notice is not required if computer-generated evidence prepared by or on behalf of a party-opponent will be used only as a statement by a party-opponent admissible under Rule 5-803 (a).

(c) Required Disclosure; Additional Discovery. Within five days after service of a notice under section (b) of this Rule, the proponent shall make the computer-generated evidence available to any party. Notwithstanding any provision of the scheduling order to the contrary, the filing of a notice of intention to use computer-generated evidence entitles any other party to a reasonable period of time to discover any relevant information needed to oppose the use of the computer-generated evidence before the court holds the hearing provided for in section (e) of this Rule.

(d) Objection. Not later than sixty days after service of a notice under section (b) of this Rule, a party may file any then-available objection that the party has to the use at trial of the computer-generated evidence and shall file any objection that is based upon an assertion that the computer-generated evidence does not meet the requirements of Rule 5-901 (b)(9). An objection based on the alleged failure to meet the requirements of Rule 5-901 (b)(9) is waived if not so filed, unless the court for good cause orders otherwise.

(e) Hearing and Order. If an objection is filed under section (d) of this Rule, the court shall hold a pretrial hearing on the objection. If the hearing is an evidentiary hearing, the court may appoint an expert to assist the court in ruling on the objection and may assess against one or more parties the reasonable fees and expenses of the expert. In ruling on the objection, the court may require modification of the computer-generated evidence and may impose conditions relating to its use at trial. The court's ruling on the objection shall control the subsequent course of the action. If the court rules that the computer-generated evidence may be used at trial, when it is used, (1) any party may, but need not, present any admissible evidence that was presented at the hearing on the objection, and (2) the party objecting to the evidence is not required to re-state an objection made in writing or at the hearing in order to preserve that objection for appeal. If the court excludes or restricts the use of computer-generated evidence, the proponent need not make a subsequent offer of proof in order to preserve that ruling for appeal.

(f) Preservation of Computer-Generated Evidence. The party offering computer-generated evidence at any proceeding shall preserve the computer-generated evidence, furnish it to the clerk in a manner suitable for transmittal as a part of the record on appeal, and present the computer-generated evidence to an appellate court if the court so requests.

Committee note: This section requires the proponent of computer-generated evidence to reduce the computer-generated evidence to a medium that allows review on appeal. The medium used will depend upon the nature of the computer-generated evidence and the technology available for preservation of that computer-generated evidence. No special arrangements are needed for preservation of computer-generated evidence that is presented on paper or through spoken words. Ordinarily, the use of standard VHS videotape or equivalent technology that is in common use by the general public at the time of the hearing or trial will suffice for preservation of other computer-generated evidence. However, when the computer-generated evidence involves the creation of a three-dimensional image or is perceived through a sense other than sight or hearing, the proponent of the computer-generated evidence must make other arrangements for preservation of the computer-generated evidence and any subsequent presentation of it that may be required by an appellate court."[311]

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311. MD. RULE 2-504.3.