

---

Volume 43  
Issue 3 *VOLUME 43 NUMBERS 3 & 4*  
*1999-2000: SYMPOSIUM LAW/MEDIA/  
CULTURE: LEGAL MEANING IN THE AGE OF  
IMAGES*

---

Article 12

January 2000

## **A SIMPLIFIED APPROACH TO COMPUTER-GENERATED EVIDENCE AND ANIMATIONS**

Gregory P. Joseph

Follow this and additional works at: [https://digitalcommons.nyls.edu/nyls\\_law\\_review](https://digitalcommons.nyls.edu/nyls_law_review)

---

### **Recommended Citation**

Gregory P. Joseph, *A SIMPLIFIED APPROACH TO COMPUTER-GENERATED EVIDENCE AND ANIMATIONS*, 43 N.Y.L. SCH. L. REV. 875 (1999-2000).

This Article is brought to you for free and open access by DigitalCommons@NYLS. It has been accepted for inclusion in NYLS Law Review by an authorized editor of DigitalCommons@NYLS.

# A SIMPLIFIED APPROACH TO COMPUTER-GENERATED EVIDENCE AND ANIMATIONS

GREGORY P. JOSEPH

It is not necessary to understand computers to be able to address the evidentiary issues that computer-generated evidence presents. Three principles simplify the process. *First*, there are certain common types of computer-generated evidence that present no genuine issues of trustworthiness. For these, ordinary evidence rules are sufficient to gauge admissibility without reference to the fact that the exhibits have in fact emanated from a computer. *Second*, some types of computer-generated exhibits are inherently hearsay because they reflect extrajudicial assertions. For those, it is necessary to consider whether any hearsay exception or exemption applies. *Third*, if a genuine issue of trustworthiness is raised, there are four straightforward criteria to apply, and a few checklists to follow, in order to assess admissibility.

These principles apply across the board to computer-generated evidence and provide a convenient framework for evaluating complex animations (reconstructions, re-creations, simulations and the like). There are also a few attendant issues raised by computer-generated evidence that should be addressed both pretrial and at trial.

## I. COMPUTER FOUNDATION PRESUMPTIVELY UNNECESSARY: FOUR CATEGORIES

There are at least four categories of frequently-proffered computer-generated evidence as to which no computer-specific foundation is usually necessary, unless the opponent raises a genuine issue as to the trustworthiness of the exhibit. As to each, the proponent's burden under Rule 104(a) is satisfied without the more elaborate foundation discussed in §§ II - IV, below, in the absence of a genuine issue as to trustworthiness.

### A. *Simple Demonstrative Evidence*

Charts, graphs and diagrams are admissible if they are fair and accu-

rate, are judged helpful in understanding the matters at issue, and any deficiencies are made known to the factfinder.<sup>1</sup> Exhibits of this sort today are commonly computer-generated rather than drawn by hand. The test of admissibility, however, remains the same.<sup>2</sup> Once a knowledgeable witness testifies that a graph, chart, diagram, or other demonstrative exhibit generated by a computer fairly and accurately portrays a relevant subject matter, the exhibit has been authenticated and may be received, without more, subject to Rule 403 (prejudice, confusion, waste of time, cumulativeness), Rule 611(a) (vesting in the trial judge discretion over the mode and order of the presentation of evidence), and, where applicable, Rule 1006 (charts, calculations and summaries permissible to present the contents of voluminous data that are independently admissible and have previously been made available to adversaries).<sup>3</sup> Unless the opponent raises a genuine issue as to trustworthiness—calling into question the computerized genesis of the exhibit—no additional authentication is generally requisite.

### B. *Business and Public Records*

Businesses and government offices generate innumerable documents by computer in ordinary course. A printout of this sort, prepared and maintained in accordance with Rule 803(6) or (8), is a "record" of the

---

1. See, e.g., *United States v. Williams*, 657 F.2d 199, 203 (8th Cir. 1981).

2. See, e.g., *People v. McHugh*, 124 Misc.2d 559, 560, 476 N.Y.S.2d 721, 722 (Sup. Ct. Bronx Co. 1984) ("Whether a diagram is hand drawn or mechanically drawn by means of a computer is of no importance"); *People v. Hood*, 53 Cal. App. 4th 965, 969-70, 62 Cal. Rptr. 2d 137 (4th Dist.), review denied, 1997 Cal. Lexis 4499 (Sup. Ct. July 16, 1997) ("The prosecution and defense computer animations were tantamount to drawings by the experts from both sides to illustrate their testimony. We view them as a mechanized version of what a human animator does when he or she draws each frame of activities"); *Ladeburg v. Ray*, 508 N.W.2d 694, 695-96 (S.D. 1993) (affirming admission of "diagrams drawn by a computer" where "[t]he expert testified that he used the computer as a drafting tool," on the theory that "[t]he diagrams were merely mechanical drawings made by a computer and the expert who prepared them was available for cross-examination").

3. See, e.g., *Pierce v. State*, 1997 Fla. App. Lexis 4947 at \*8, \*10 (Fla. App. May 7, 1997) ("to admit a demonstrative exhibit illustrating an expert's opinion, such as a computer animation, the proponent must establish the foundation requirements necessary to introduce the expert opinion ... and the computer animation must be a fair and accurate depiction of that which it purports to be").

business or public office involved.<sup>4</sup> Reliability and trustworthiness are said to be presumptively established by showing that a computer printout was made in conformance with Rule 803(6) and actually relied upon in the regular course of an enterprise's activities.<sup>5</sup> Computer-generated public records that satisfy Rule 803(8) are presumptively authentic under Rule 901(b)(7) (provided they derive from a "public office where items of this nature are kept"), Rule 902(4) (certified copies of public records self-authenticating), and Rule 1005 (certified copies of public records may be offered in lieu of originals).

### C. Admissions

Computer printouts associated with an adverse party may be admissions within Rule 801(d)(2).<sup>6</sup> After the proponent has offered proof that the computer output falls within one of the five types of admission catalogued in Rule 801(d)(2), it is the opponent's burden to challenge the exhibit as untrustworthy or otherwise inadmissible.

### D. Non-Prejudicial Illustrative Exhibits

Since illustrative exhibits often do not go to the jury room,<sup>7</sup> courts commonly employ a less rigorous standard in reviewing them. Even complex animations may, in the judge's discretion, fall within this category. However, because of the prejudicial potential of computer-generated reconstructions and re-creations, a more stringent standard of review is applied (assuming that admission is contested), regardless of

---

4. See, e.g., *Hughes v. Commissioner*, 953 F.2d 531, 540 (9th Cir. 1991) ("IRS documents, even if generated by a computer, are admissible as public records" without the necessity of the proponent "lay[ing] the foundation necessary for the admission of such computerized evidence"). As discussed below, the terms "record" within Rule 803(6) and "public records" in Rule 803(8) also encompass each of the electronic data entries that underlie the printout and are contained in the computer.

5. See, e.g., *Rosenberg v. Collins*, 624 F.2d 659, 665 (5th Cir. 1980).

6. See, e.g., *Potamkin Cadillac Corp. v. B.R.I. Coverage Corp.*, 38 F.3d 627, 631, 633-34 (2d Cir. 1994), and the unreported, non-precedential decision of the Ninth Circuit in *United States v. Lee*, Nos. 89-50571, 89-50695, 1991 U.S. App. LEXIS 14094, at \*14-15 (9th Cir. June 26, 1991).

7. See, e.g., *Browning v. Paccar, Inc.*, 448 S.E.2d 260, 265, (Ga. Ct. App. 1994) (upholding trial court's decision to exclude from jury room the computer-generated reconstruction that was admitted solely to illustrate the testimony of plaintiffs' expert); ABA, CIVIL TRADE PRACTICE STANDARD 7(c) (1998).

whether they are nominally offered for illustrative or substantive purposes.<sup>8</sup>

## II. HEARSAY FOUNDATION

If a genuine issue as to the trustworthiness of any computer-generated exhibit is raised, there are both hearsay and authentication issues that must be considered. As discussed below, there are two types of computerized evidence, and hearsay problems arise in connection with only one of them. Authentication issues arise in connection with both.

### A. *Two Types of Computerized Evidence:*

#### *Computer-Stored Declarations vs. Computer-Generated Output*

The hearsay rule applies to computerized evidence that reiterates human declarations, as opposed to evidence that does not consist of, or contain, extrajudicial assertions. Exhibits of the first sort (computer-stored declarations) are the more prevalent. They include, for example, accounting records, invoices, charts, graphs, and summaries—generally, any printouts reiterating data that has been entered into the computer. In contrast, purely computer-generated output includes, *e.g.*, automated telephone call records, computer-enhanced photographic images, temperature data collected by remote sensor, computerized test-scoring—generally, output not reiterating human declarations but simply performing programmed tasks on non-assertions.

### B. *Two Levels of Hearsay*

Both the entry of the data into the computer, and any underlying assertions that are so entered, must satisfy a hearsay exception or exemption.

#### 1. Data Entry

The act of data entry is an extrajudicial statement—*i.e.*, assertive

---

8. *See, e.g.*, the cases discussed in Gregory P. Joseph, MODERN VISUAL EVIDENCE at, §§ 4.5 and 9.02 (1984; Supp. 2000). The four criteria to be used in deciding whether—or how much—detailed computer authentication should be required are set forth in §§ III-IV, below.

nonverbal conduct within Rule 801(a)—as is any underlying declaration, under Rule 801(c). Data entry is usually a regularly-conducted activity within Rule 803(6) (or, in appropriate circumstances, falls within Rule 803(8) (public records exception)). It also often falls within Rule 803(1) (present sense impression exception).

The real question about the data entry function is its accuracy. This is, in substance, an issue of authenticity (see § III, below) and should be addressed as part of the requisite authentication foundation whenever a genuine doubt as to trustworthiness has been raised. If the foundational evidence establishes that the data have been entered accurately, the hearsay objection to the data entry function should ordinarily be overruled.<sup>9</sup>

a. The "Electronic Record"

As previously noted (in § I), the paper or other hard-copy output of a computer may constitute a business or public "record" within Rules 803(6) and (8). At the same time, each electronic data entry contained in the computer is itself a Rule 803(6) or (8) "record." In the terminology of these Rules, each electronic entry is a "data compilation, in any form."<sup>10</sup>

b. Implications of Entry-Based Analysis

Consequently, if each entry has been made in conformance with Rule 803(6) or Rule 803(8), the computer-generated output satisfies the hearsay exception even if it: (a) was not printed out at or near the time of the events recorded (as long as the entries were timely made), (b) was not prepared in ordinary course (but, e.g., for trial), and (c) is not in the usual form (but, e.g., is in graphic form).<sup>11</sup> If the data are simply downloaded into a printout, they do not lose their business-record character. To the extent that significant selection, correction and interpretation are involved, their reliability and authenticity may be questioned.<sup>12</sup>

---

9. See also Fed. R. Evid. 807.

10. See, e.g., *United States v. Sanders*, 749 F.2d 195, 198 (5th Cir. 1984); *United States v. Catabran*, 836 F.2d 453, 456 (9th Cir. 1988).

11. See, e.g., *United States v. Russo*, 480 F.2d 1228, 1240 (6th Cir. 1973).

12. See, e.g., *Potamkin Cadillac Corp.*, 38 F.3d at 633.

### c. Trustworthiness Requirement

Rules 803(6) and (8) effectively incorporate an authentication requirement. Rule 803(6) contemplates the admission of hearsay, if its criteria are satisfied, "unless the source of information or the method or circumstances of preparation indicate lack of trustworthiness." Rule 803(8) contains substantially identical language. This trustworthiness criterion parallels the Rule 901(a) requirement of "evidence sufficient to support a finding that the matter in question is what its proponent claims." (See the discussion in §§ III - IV, below, of the extent to which detailed authentication of the computer process is required to establish trustworthiness.)

### 2. Underlying Data

If the underlying data that are entered into the computer are themselves hearsay declarations, they in turn must satisfy a hearsay exception or exemption under Rule 805.

## III. AUTHENTICATION

### A. *Basic Requirements*

The authentication standard is no different for computer-generated evidence than for any other. Under Rule 901(a), "the requirement of authentication ... is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims." There is a specific illustration of sufficient authentication for computer evidence tucked into Rule 901(b)(9), and it requires only "evidence ... showing that the process or system produces an accurate result."

### B. *Four Primary Authentication Criteria*

Four criteria are generally sufficient to assess whether, and how much, detailed computer authentication is needed in any given case:

#### 1. Completeness of Data

To the extent that the computer process is dealing with known

data, fewer questions are raised than if the computer is performing operations on partial data that are assumed in whole or in part (for example, if the computer program is filling gaps in the data—using various assumptions—before it is manipulating the data).

## 2. Complexity of Manipulation

Simple addition and subtraction raise fewer questions than complex formulae.

## 3. Routineness of Entire Operation

Routineness suggests reliability. Key components are:

- Data collection.
- Input/processing (software)/output.
- Computer hardware

The duration of time that a system has been in use can be a telling factor in this regard. A system that has been running trouble-free for an extended period of time (and usage) bears more indicia of reliability than a system in use for a week.

## 4. Verifiability of Result

Can it be tested or checked? (Compare a pie chart depicting corporate sales results or inventory (testable) vs. a sophisticated animation depicting underground pollution contamination or recreating the cause of an aircraft crash (usually inherently untestable)).<sup>13</sup>

The weight to be given these variables will vary from case to case, but the implications are straightforward enough. More complete data, simpler manipulation, more routine processing and more verifiable re-

---

13. See, e.g., *Brown v. Boise-Cascade Corp.*, 946 P.2d 324 (Or. Ct. App. 1997) (affirming exclusion of computer animation purporting to recreate accidental fall from roof where the plaintiff had no memory of the fall and no one was present to witness it).

sults all augur against the need for elaborate, computer-specific authentication. As any of these variables tends in the opposite direction, the court must consider the magnitude of that variance and the strength of the doubt that has been raised as to the exhibit's genuineness. If more detailed authentication is appropriate, the following checklists may prove useful.

### C. *Detailed Computer Authentication—Checklists*

To the extent that detailed authentication is warranted or advisable in the circumstances, there are three primary areas to be covered:

- Input (getting the information into the computer),
- Processing (doing something with the data inside the computer), and
- Output (getting the result out of the computer).

Not all three areas will necessarily be implicated in every attack on a computer-generated exhibit.

#### 1. Input—Authentication Checklist

There are three distinct areas of potential concern with respect to input authentication: (a) the underlying data must be probative and admissible or otherwise usable; (b) the integrity of that data must be established (for example, that all of the documents were present to be input); and (c) the data must be input properly (for example, only once). As reflected in the following checklist, input authentication involves both hardware and software issues.

- a. Underlying Data
  - i. Authenticity.
  - ii. Relevance/Admissibility/Utility.<sup>14</sup>

---

14. *See, e.g.,* *Gracia v. Volvo Europa*, No. 87-C10005, 1996 U.S. Dist. LEXIS 3372 (N.D. Ill. Mar. 20, 1996) (whether it “constitutes reconstruction or mere demonstration, [the expert’s] testimony and the simulations on which he relies must be based on accurate

- b. Integrity of Input Data
  - i. Completeness of source documents/data.
  - ii. No duplication of documents/data.
  - iii. No tampering with data.<sup>15</sup> iv.
  - iv. Input Procedures.
    - A. Batch controls.
    - B. Verification processes.
    - C. Input edit routines.
    - D. System controls.
    - E. Back-up and recovery handling procedures and controls.
- c. Accuracy of Input Method
  - i. Proper conversion of data (machine readable).
  - ii. Hardware checks.
    - A. Capacity.
    - B. Capability.
    - C. Reliability.
  - iii. Software checks. —Sample tests of processing of source documents/data.

---

assumptions and information”). To the extent that the computer-generated output may take the form of, or comprise, an expert opinion, the underlying data need not necessarily be admissible, under Rule 703.

15. A similar issue pertains to software, which, if accessed and tampered with, will also result in modified data. *See infra*, item 2(b)(ii)(E)(II).

## 2. Processing—Authentication Checklist

The primary purpose of processing authentication is to show that the hardware and the software are properly functioning and including all of the appropriate data. Note that, as the following checklist highlights, there are two types of software—systems programs (which govern the operation of the computer) and application programs (which put the computer to a particular use, such as to create a balance sheet or recreate an event)—to be authenticated.

### a. Hardware

- i. Should detect errors in transmission.
- ii. Should take recovery measures:
  - A. Correct error or
  - B. Alert user.
- iii. Should not be subject to known, pertinent flaws (e.g., former Pentium processor that suffered problems with certain identified functions).

### b. Software

- i. Two Types.
  - A. Systems Programs.
    - I. Govern operation of computer.
    - II. Handle:
      - a. Input.
      - b. Output.
      - c. Error Recovery.
      - d. File Storage.
    - III. Oversee application programs.
  - B. Application Programs.
    - I. Put computer to a particular use.

## II. Three basic types:

### a. Standard (off-the-shelf).<sup>16</sup>

Note that certain standard programs (e.g., data base management systems) may themselves be standard but contemplate that the user will create customized software by using them (e.g., the design of the database).

### b. Customized.

### c. Custom-designed.

To the extent that the designer of any customized or custom-designed application program implemented accepted software engineering standards, that would be an indicium of a more robust, reliable program.

## III. Tests governing the admissibility of expert evidence—such as Daubert<sup>17</sup>—apply at the application program level to both:

### a. The scientific theory underlying the program,<sup>18</sup> and

---

16. The fact that a program is widely used in the business world or relevant technical community is evidence of its trustworthiness and authenticity. *See, e.g.*, *United States v. Casey*, No. NMCM 95 01495, CCA LEXIS 406 at \*8 (U.S. Navy-Marines Ct. Crim. App. Dec. 27, 1996) (“The BAMS/UNIX system was a commercially developed computer system which other businesses within and outside of the government relied upon for their billing and reservation processes. Errors in the records attributable to incorrect data entry or defects in the operation of the computer program go to weight, not admissibility”); *Bray v. Bi-State Devel. Corp.*, 949 S.W.2d 93, 98 (Mo. App. 1997) (“the relevant technical or scientific community’s use of or reliance on such software has been held sufficient to establish the accuracy of the software”); *Pierce v. State*, 718 So.2d 806, 809 (Fla. App. 4 Dist. 1997) LEXIS 4947 (noting, in affirming admission of animation, that “the AUTOCAD computer program [that the expert] used was established as accepted in the engineering field as one of the leading CAD (computer-aided design) programs in the world”).

17. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

18. *See, e.g.*, *In re TMI Litig. Cases Consol. II*, 911 F. Supp. 775, 799 (M.D. Pa. 1996) (expert’s testimony and computer generated animation excluded for failure to satisfy *Daubert* and its progeny).

- b. Implementation of that theory in the program<sup>19</sup>
  - ii. Authenticity Tests.
    - A. Not erroneously programmed.
    - B. Program does not introduce errors.
    - C. Flags errors (with sufficient specificity that the error can be identified and corrected).
    - D. Unbiased display.
      - I. Successful running of benchmark data.
      - II. Absence of prior problems.
      - III. Popular commercial programs.
    - E. Security of system (Absence of tampering after data input).
      - I. Security of physical plant.
      - II. Security of software. (Note that items accessible through a network are inherently more vulnerable than those residing on a non-networked computer.)
      - III. Systems security procedure

19. See, e.g., *Bray v. Bi-State Devel. Corp.*, 949 S.W.2d at 97 (Mo. App. 1997) (“Admissibility of computer simulations is governed by the standard applicable to results of experiments”). To the extent that an otherwise authenticated animation is offered solely to illustrate an expert’s theory, and not as substantive evidence, a number of courts have concluded that the application program used to generate the animation need not be shown to satisfy the *Daubert* or *Frye* standards. This is consistent with the point made in § I(A), *supra*, that demonstrative evidence need not be authenticated further than to establish the fairness and accuracy of its portrayal—in this instance, as a visualization of the expert’s opinion. See *Pierce v. State*, 1997 16 at \*5, \*7 (“the demonstrative exhibit [a computer-generated recreation of a vehicular accident] was not subject to the *Frye* analysis” because it “was a new form of expression, not a scientific or experimental test (such as a DNA test or a blood-spatter analysis)”; *People v. Hood*, 62 Cal. Rptr. 2d 137 (Cal. App. 4 Dist. 1997) (Sup. Ct. July 16, 1997) (conflicting prosecution and defense computer animations recreating crime “did not need to ... meet the requirements of the *Kelly [Frye]* formulation ... [which] applies to ‘new scientific procedures’” because “[t]he prosecution and defense computer animations were tantamount to drawings by the experts from both sides to illustrate their testimony”). Of course, even on this analysis, Rule 403 considerations may militate in favor of a fuller authentication despite the fact that the animation is offered solely for illustrative purposes.

- a. Key words.
- b. Passwords.
- c. Limited access.

IV. Computer alerts user of alteration of data or software.

3. Output—Authentication Checklist

Authentication of output largely consists of proof that the proffered exhibit is in fact the output that was described in the earlier foundational testimony. There are three principal areas:

- a. Security of output.
  - i. Dating/signing/other procedures.
- b. Proper request.
  - i. Output requested is same as output generated. (Note that errors in the request may lead to results that appear to be correct but are not.)
- c. No transmission errors.
  - i. Ability of hardware/software to detect errors due either to transmission problems or intentional modification by someone hacking into the transmission.
  - ii. Subtlety/obviousness of common errors.
  - iii. Statistical/historical experience.

IV. SPECIAL AUTHENTICATION ISSUES FOR  
COMPUTER-GENERATED ANIMATIONS AND SIMULATION

A. Animations

Computer-generated animations and simulations raise some unique issues. At its simplest, an animation is merely a sequence of illustrations that, when filmed, videotaped or computer-generated, creates the illusion that the illustrated objects are in motion. Traditionally—because they are drawings—animations have been subjected to the fair-and-accurate-portrayal test and have been admitted, within the trial judge's discretion, generally for illustrative purposes.<sup>20</sup>

B. Simulations (Reconstructions, Re-creations)

Computer-generated simulations are based on mathematical models, and particular attention must be paid to the reliability and trustworthiness of the model. A model is a set of operating assumptions—a mathematical representation of a defined set of facts, or system. To be accurate, it must produce results that are identical or very similar to those produced by the physical facts (or system) being modeled. In order to do that, the model must contain all relevant elements—and reflect all relevant interactions—that occur in the real world.

A simulation model, in particular, is a computer program that consists of a set of assumptions about precisely what would transpire under certain clearly defined circumstances. If the simulation model works well, the result is to show the probable consequences that are predicted by the theory that underlies the equations.

Because of the difficulty of reflecting all of the complexities of any real world system in a computer program, various simplification techniques are used. The danger is that the introduction of simplification creates the risk of invalidating the simulation that is produced.<sup>21</sup> This

---

20. See, e.g., *Rockwell Graphic Sys, Inc. v. DEV Indus., Inc.*, No. 84C 6746, 1992 U.S. Dist. LEXIS 17661 (N.D. Ill. Nov. 10, 1992) (computer-generated animation admitted); *Sommervold v. Grevlos*, 518 N.W.2d 733 (S.D. June 8, 1994) (computer-generated animation excluded).

21. See, e.g., *Constans v. Choctaw Trans*, 712 So.2d 885, 900 (La. App. 4 Cir. 1997) LEXIS 2942 at \*46-49 (La. App. Dec. 23, 1997) (no error in admitting animation "which admittedly did not conform to the laws of physics or mathematics" where short-

includes assumptions about unknown data.<sup>22</sup>

Because the mathematical model is converted into a computer program that produces the simulation, reliability issues involve: (a) the model, and (b) conversion of the model into the computer program (which will ordinarily involve the intermediate step of converting the model into one or more algorithms).

*C. Checklist of Authentication Issues For  
Computer-Generated Animations And Simulations.*

1. Factual Foundation.
  - a. Sufficiency.<sup>23</sup>
  - b. Admissibility.
  - c. Permissibility of Use (for example, under Rule 703).
2. Underlying Scientific Or Technical Theory.
  - a. Must satisfy *Daubert*<sup>24</sup> or any other governing test.
  - b. Under *Daubert*:

---

comings were stressed in limiting instruction and on cross-examination because the animation was concededly “not a simulation. ... Effectively, the animation was no different than if the expert had created a series of many diagrams. ... In [contrast, in] a simulation the computer functions in a sense as an expert itself, rendering its own opinion based on internal calculations of how the accident occurred”).

22. *Supra* §III (B)(4).

23. An animation that is inconsistent with the testimony is properly excludable as confusing and misleading. *Clark v. Cantrell*, 504 S.E.2d 605 (S.Ct. 1998) (citing an earlier version of this article). A related problem involves animations predicated on uncertain testimony (e.g., that of an eyewitness who had but a moment to view an event). *See, e.g., State v. Basten*, 577 N.W.2d 387 (Wis. App. 1998) (unpublished, limited precedent opinion).

24. *See Robinson v. Missouri Pacific R.R.*, 16 F.3d 1083, 1088-89 (10th Cir. 1994) and, *supra* the text accompanying n. 17. Note that this requirement applies to all scientific or technical theories that may be incorporated into an animation. *Cf., United States v. Quinn*, 18 F.3d 1461, 1464-65 (9th Cir. 1994) (affirming admission of photogrammetry evidence under *Daubert*).

- i. Tested?
  - ii. Subjected to peer review/publication?
  - iii. Known/potential error rate? Existence/maintenance of standards?
  - iv. Generally accepted?
3. Detailed Computer-Evidence Foundation.<sup>25</sup>
4. Mathematical Model:
  - a. Appropriately measures the selected factors.
  - b. Factors are relevant and inclusive.
  - c. Underlying mathematical formulae and simplification techniques are apt.

*Daubert* or other governing test is satisfied.<sup>26</sup>
  - d. Mathematical tools were correctly applied.
  - e. Problem was appropriately translated into the model.

## V. PRACTICAL ISSUES BEARING ON INTRODUCTION OF COMPUTER-GENERATED ANIMATIONS AND SIMULATIONS

### A. *Audio Narration*

Computer-generated animations are sometimes coupled with prerecorded narrations. Because any prerecorded narration is an extrajudicial statement, a hearsay exception or exemption is required. However, live testimony from the narrator—or, if a professional narrator is used, from the author of the narration—adopting the narration as true cures the hear-

---

25. *Supra* §§ II-III.

26. Principal *Daubert* criteria are set forth *supra* in item 2(b).

say objection.<sup>27</sup> Rule 611(a) vests the trial judge with discretion to decide whether to permit prerecorded narration or to require live testimony or narration from the witness on the stand. The court may also exclude all or any part of the narration, and permit the remainder—or just the video—to be displayed to the jury.<sup>28</sup>

### B. *Limiting Instructions*

Concerns about the potential of an animation or simulation to confuse or mislead the jury can frequently be addressed in cautionary or limiting instructions. At the time of admission, the jury should be instructed (and the record in a bench trial should reflect):

1. Purpose. The purpose for which the evidence is being received, such as:
  - a. To visualize or clarify a witness's testimony.
  - b. To illustrate a litigation theory.
  - c. To demonstrate scientific principles.
  - d. To show results of experiments or tests.
  - e. To re-create or reconstruct events at issue.
2. Assumptions. The principal assumptions underlying the exhibit. For example, that it is predicated on one party's versions of the facts; that the facts are in dispute; that the exhibit is no better than the assumptions on which it rests; and that it is for the jury to decide whether those assumptions are warranted.
3. Differences. Any salient differences between the exhibit and facts at issue—for example, that the exhibit does not purport to be drawn to scale or to include all (or certain specific) vari-

---

27. See FED. R. EVID. Advisory Committee Note [FED. R. EVID. 801(d)(1)] ("If the witness admits on the stand that he made the statement and that it was true, he adopts the statement and there is no hearsay problem").

28. See, e.g., *Abernathy v. Superior Hardwoods, Inc.*, 704 F.2d 963, 968 (7th Cir. 1983).

ables.<sup>29</sup>

### C. *Partial Admission*

As indicated above,<sup>30</sup> exclusion of any portion of an animation—video or audio—does not necessarily render the remainder inadmissible. Exclusion of the entirety of the audio does not preclude admission of the video, in whole or in part, in the court's discretion.

### D. *Pretrial Discovery And Disclosure*

#### 1. Need and Authority

If a party first sees a sophisticated computer-generated exhibit when it is offered at trial, that party labors under a very serious disadvantage in attempting to mount an effective inquiry into, or challenge to, any assumptions (factual or theoretical) on which the exhibit rests, the manner in which it has been created, and the fairness of the evidence. To avoid unfair prejudice, pretrial discovery of computerized evidence, including the underlying computer program, is essential.

The Federal Judicial Center's *Manual for Complex Litigation Third* (1995) provides (in § 21.446) that discovery into the reliability of computerized evidence, including inquiry into the accuracy of the underlying source materials, the procedures for storage and processing, and some testing of the reliability of the results obtained, should be conducted well in advance of trial.

The mandatory disclosure provisions of the 1993 amendments to the Federal Rules of Civil Procedure are also important in this regard since they mandate pretrial exchange of exhibits to be used as "support for the

---

29. See, e.g., the limiting instruction approved in *Hinkle v. City of Clarksburg*, 81 F.3d 416, 425 (4th Cir. 1996):

[T]his animation is not meant to be a recreation of the events, but rather it consists of a computer picture to help you understand [the expert's] opinion which he will, I understand, be giving later in the trial. And to re[i]nforce the point, the video is not meant to be an exact recreation of what happened during the shooting, but rather it represents Mr. Jason's evaluation of the evidence presented.

30. See *supra* § V.A. See also *supra* note 28 and accompanying text.

opinions" of any expert,<sup>31</sup> and animations are invariably offered in connection with expert testimony. As a practical matter, pretrial exchange of computerized exhibits, and discovery into underlying programs, should be assured by provisions in the pretrial order.

## 2. Scope of Discovery

The scope of discovery should (1) extend into the foundational areas described in §§ II, III and IV, above, and (2) expressly include any deleted excerpts, or outtakes, from any computer-generated video or exhibit, including any prior versions of any exhibit. 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 the 1993 amendment to Federal Rule of Civil Procedure 26(a)(2)(B), which requires disclosure of "the data or other information considered by the witness in forming the opinions."

### E. *Preview Prior To Introduction*

If for any reason a computerized exhibit has not been disclosed to all counsel prior to trial and is not to be excluded for that reason, the exhibit should be disclosed prior to introduction outside the presence of the jury and the opponent afforded a reasonable opportunity to review it.<sup>32</sup> The court, too, should review the exhibit before the jury is exposed to it, to preclude potential prejudice to either side.<sup>33</sup>

---

31. See FED. R. CIV. P. 26(a)(2)(B). See also FED. R. CIV. P. 26(a)(3)(C) and analogous local rules in force in many district courts, which similarly dictate pretrial exchange of "an appropriate identification of each ... exhibit, including summaries of other evidence..."

32. See American Bar Ass'n, Civil Trial Practice Standard 15(a) (1998) ("As with all other exhibits, the court should afford each party an adequate opportunity to review, and interpose objections to, demonstrative evidence before it is displayed to the jury").

33. See *Robinson v. Missouri Pacific R.R.*, 16 F.3d at 1088; See *Hinkle v. City of Clarksburg*, 81 F.3d at 425 ("we are not unmindful of the dramatic power of this type of evidence; hence, we encourage trial judges to first examine proposed videotaped simulation evidence outside the presence of the jury to assess its foundation, relevance, and potential for undue prejudice"); see also *Rizzo v. Mr. Coffee, Inc.*, 1996 U.S. Dist. LEXIS 1745, at \*49 (N.D. Ill. Feb. 15, 1996) ("The court asked to view the videotape but [defense] counsel was unable to work the video equipment. Because plaintiffs objected and the court was unable to view the videotape, the court did not admit the videotape into evidence.").

