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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

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* This is a paraphrase of the title of the popular children's book by Maurice Sendak, *Where the Wild Things Are* (1992), a story about a little boy who is frightened by "scary monsters" until he gets to know them, whereupon they become friends.

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The computer animations and the companion CD-ROM disc for this article were donated by Engineering Animation, Inc., ("EAI"). EAI has served litigators since 1988 by providing scientific visualization tools in many high-profile cases across the country. Engineers, scientists, lawyers, and graphic artists working together with state-of-the-art technology serve to create high-quality CGEs that make complex issues easier for juries to understand. EAI is a recognized industry leader with offices all over the country and has produced animations for more than 1,000 cases involving patent infringement, products liability, environmental, construction, biotechnology, toxic torts, medical malpractice, insurance defense, accident reconstruction for aviation, and ground vehicles cases.

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I. INTRODUCTION

An invasion of armies can be resisted; but not an idea whose time has come.[1]

A. Coming to Grips with the Inevitable

The use of computer generated exhibits ("CGEs")[2] in the courtroom has glided through its first wave of novelty, hyperbole, and even fear, with less roar than many predicted, and increasingly with much more acceptance from those who actually have used CGEs at trial.[3] Still, as late as 1994, an experienced trial attorney, Timothy W. Cerniglia,[4] in

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1. VICTOR HUGO, HISTOIRE D'UN CRIME (1852), *quoted in* BARTLETT'S FAMILIAR QUOTATIONS 427:18 (16th ed. 1992).

2. The term "Computer-Generated Exhibits" ("CGEs") describes a wide range of types of exhibits. Simple types include word processed documents or diagrams projected by a computer. More sophisticated applications calculate complex equations such as the estimate of damages in an antitrust action. Yet another type is an animated clip shown on a video monitor illustrating an accident scene as recalled by a witness, or the recreation of a 3D crime scene that can be rotated by the computer to allow the jury to see the action from the perspective of the defendant or a witness. *See generally* William F. Lee, *Using Computer-Generated Evidence at Trial, in* HOW TO TRY A COMMERCIAL CASE IN THE 1990S, at 159 (PLI Litig. & Admin. Practice Course Handbook Series No. H4-5214, 1995) *available in* WL 523 PLI/Lit 159.(describing categories of computer-generated exhibits). For ease of reference, "Computer-Generated Exhibits" hereinafter will be referred to as "CGEs."

3. *See* Fred Misko, Jr. & Charles E. Ames, *Using Technology in the Management and Trial of Complex Case*, COMPUTER L. REV. & TECH. J., Summer 1997, at 17–18, *available at* <http://www.smu.edu/~csr/articles.html>. When asked why a judge would choose to have a trial using CGEs, Judge Carl B. Rubin, U.S. District Judge for the Southern District of Ohio, replied as follows:

> Our trials take too long; they are too expensive; and sometimes in the process of them, the jury loses the continuity . . . . [Presenting imaged evidence to a jury] is a way to make trials less expensive, more understandable and proceed faster . . . . People simply don't get their information [through printed media] anymore. They get it from the little box, and that is what we do in the courtroom. We put these exhibits on monitors and now the jury can see [them], close up, and in the same fashion that they would see [the exhibits] on television. I am convinced that [the use of monitors] speeds up the trial . . . . [It] is the greatest advance in trial techniques that I have seen in over twenty-one years as a federal judge.

Id. Judge Rubin predicts that within five to ten years, computer monitors "will be in every courtroom in the country." *Id.*

4. Cerniglia has practiced as a trial attorney for over 20 years.

describing the admissibility problems of evidence associated with CGEs, asserted that "for legal scholars and commentators, this computer technology present[s] a tangled evidentiary knot of Gordian proportions."[5] He also characterized the essence of CGEs as a "wondrous beast."[6] Later, another commentator noted that the legal profession is susceptible to viewing computerization "as a magic world, ruled by the wizards who operate the machines."[7] Some legal scholars, using very colorful imagery, warn against "computerized 'razzle-dazzle' . . . used to Disney-up the evidence."[8] It appears that the view of some is that computer technology will continue to forge ahead on its inexorable conquest of our social institutions, with the law and our courtrooms being just the latest casualties.[9]

Fortunately, it has taken little time for most to witness what an anti-phenomenon, in many respects, the introduction of CGEs in the courtroom actually has been. By July of 1996, a commentator observed that "desktop portable computers now bedeck courtrooms like dandelions in May and, like dandelions, their number, use and application continue to grow."[10] Indeed, any perspective that may have

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5. Timothy W. Cerniglia, *Computer-Generated Exhibits — Demonstrative, Substantive or Pedagogical — Their Place in Evidence*, 18 AM. J. TRIAL ADVOC. 1, 1 (1994). *See also infra* Part III (discussing admissibility issues under the current Federal Rules of Evidence).

6. Cerniglia, *supra* note 5, at 11.

7. Mario Borelli, *The Computer as Advocate: An Approach to Computer-Generated Displays in the Courtroom*, 71 IND. L.J. 439, 439 (1996).

8. CHARLES ALAN WRIGHT & KENNETH W. GRAHAM, JR., FEDERAL PRACTICE AND PROCEDURE § 5174.1 (Supp. 1998) (titling the section "The MTV Defense" and criticizing CGEs as the "latest threat to justice," referring to legal trial technology consultants as "fast-buck artists [who] . . . peddle their illusion-making skills to lawyers," and comparing CGEs themselves to "the supposed 'Wizard of Oz' [who] was in fact the voice of a charlatan with a megaphone").

9. *See* Ted Brousseau, *Training to Use Technology: As Important As What You Buy*, JUDGE'S J., Summer 1993, at 67, 70 (listing fear of computers replacing employees as a problem in the introduction of computers in courts and law offices); *see also* United States v. Crumby, 895 F. Supp. 1354, 1361–62 (D. Ariz. 1995) (describing the "Fear of Technology and 'Big Brother's' Use of Technology" by saying "[o]ne of the main undercurrents of the 'prejudice' argument is society's fear of technology"). Some judges especially may exhibit a fear of loss of control in allowing computers in the courtroom. *See* Brousseau, *supra*, at 70. Even movies and television reflect the still prevalent view in American society that computers and technology could run amok. In 1995 alone, five films were released that depicted computer technology as the embodiment of evil: *The Net*; *Virtuosity*; *Hackers*; *Strange Days*; and *Johnny Mnemonic*. *See* Caryn James, *Why Hollywood Loves Killer-Computers*, MACWORLD, Feb. 1, 1996, at 268, 268.

10. Edward A. Hannan, *Computer-Generated Evidence: Testing The Envelope*, 63 DEF. COUNS. J. 353, 362 (1996).

initially prevailed of computerization in the courtroom as a threatening newcomer — unwelcome to a well-established, and perhaps even a technophobic clique[11] — is fading into the view that the incorporation of CGEs in the courtroom is positive,[12] inevitable,[13] and in many ways quite natural.[14]

Although CGEs may be a way to up the ante of advocacy in the courtroom because they allow an attorney to communicate more clearly, powerfully, and efficiently,[15] another compelling reason to

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11. *See* Adam T. Berkoff, Comment, *Computer Simulations in Litigation: Are Television Jurors Being Misled?*, 77 MARQ. L. REV. 829, 845 (1994) (explaining that the "stunning impression on the minds of the jurors" made by computer simulations can be seen as a terrible disadvantage, since jurors assume that information on the televison monitor must be true); *see also* Perma Research & Dev. v. Singer Co., 542 F.2d 111, 125–26 (2d Cir. 1976) (Van Graafeiland, J., dissenting) (cautioning that while use of computers in the justice system has tremendous potential, it presents a "real danger of being the vehicle of introducing erroneous, misleading or unreliable evidence," and citing several reports of computer programs with errors built into them).

12. The ability to better clarify and communicate complex ideas to a judge and jury should be welcomed, not cynically and automatically suspected as "technical trickery." Thus, the concern should not be so much that CGEs will mislead juries, but that if CGEs are *not* used, then juries will be more easily misled or at least less likely to understand the complicated facts of the case.

13. Even as far back as 1973, courts were cognizant of the fact that "computerized record keeping is rapidly becoming a normal procedure in the business world." Union Elec. Co. v. Mansion House Ctr. N. Redevelopment Co., 494 S.W.2d 309, 315 (Mo. 1973).

14. *See* Mary Micheletti, *The Big Picture*, S.F. DAILY J. CYBER ESQ., Summer 1998, at 12 (describing the ever growing frequency of courts accepting technology as a standard course of business). Indeed, the computer is becoming more and more of an acceptable staple of life. As of early 1997, 38–40% of U.S. households had a personal computer. *See* Russ Britt, *Home PC Sales Growth May Slow to 6% in '97*, INVESTOR'S BUS. DAILY, Jan. 7, 1997, at A8. Just one year later, *Computer Intelligence*'s 1998 Consumer Technology Index reported that 45% of all households had personal computers. *See* Roger C. Lanctot, *U.S. Home PC Penetration Tops 45 Percent*, COMPUTER RETAIL WEEK (visited Feb. 1, 2000) <http://www.techweb.com/news/story/TWB19980 311S0025> (printed copy on file with the author).

15. According to Timothy Piganelli, CEO of Legal Technology Consulting LLC, in his six years of experience in automating trial presentations and managing litigation documents with various computer programs:

> CGEs allow attorneys to educate the jury about the nature of the case in a way that is far more compelling and meaningful than without such exhibits. CGEs allow the attorney to take the jury, step-by-step, illustratively and graphically, through the alleged wrongdoing, or non-wrongdoing of their clients, and do so relatively inexpensively, in an organized, clear, concise manner beyond the attorney's mere words, voice inflections, and hand gestures. In short, CGEs increase jury comprehension, which is

incorporate CGEs is that they allow attorneys to keep up with the general advancement of technology in our society — an advancement upon which many lawsuits are based. Over the last few decades, courts have dealt with injuries and infringements stemming from intricate, complex products such as artificial heart valves and their parts, pesticides, asbestos, breast implants, and computer chips. Courts have also been faced with disasters such as bombings, plane crashes, and fires caused by highly technical elements.[16] Thus, CGEs are not solely being introduced to add "sparkle" to cases, or "entertain" or even "dazzle" easily-bored jurors, as much as they are simply necessary to

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what a trial is supposed to be all about.

Telephone Interview with Timothy Piganelli, CEO, Legal Technology Consulting LLC (July 19, 1998) [hereinafter Piganelli telephone interview].

16. *See* CD-ROM Example #1 (setting forth general examples of computer animations: (1) the workings of a heart valve, (2) simulation of the Oklahoma City Bombing, (3) environmental accidents, and (4) vehicular accidents and aviation disasters, as well as other computerized exhibits, such as "virtual reality" exhibits, case management systems, and static image demonstrative exhibits). Attached to this article (hard copy only) is a CD-ROM. On the CD-ROM, the reader can read the text of this entire article, access special files created by Engineering Animation, Inc. (EAI), a firm that specializes in applying 3D technology to 3D visualization software, interactive multimedia, and custom animation, located on the web at <http://www.eai.com>, and view demos of various legal software applications. The reasons for requesting the reader to take the additional step of accessing the examples on the CD-ROM are threefold. First, it is to demonstrate the type of exhibits on which this whole article is based. Instead of describing through the written word only certain types of exhibits, we have made actual examples of the exhibits available for the reader to view and experience, as a juror and/or a court would, when prompted to do so in a corresponding footnote (for those readers who choose not to access the "CD-ROM Example," a short parenthetical verbal explanation of the exhibit will be given in the footnote). Second, the CD-ROM examples underscore the fact that I do not want to be hypocritical in my whole thesis about the value of evidence displayed in this fashion. Because an attorney should be able to argue using a computer animation and not be limited to the spoken word, I simply want to "practice what I preach" in this article by communicating with more than just the written word — as has always been done in traditional law review articles (I am unaware of any law review article that has attempted this before). Finally, if footnotes are the bane of our existence as research scholars, see C. Steven Bradford, *As I Lay Writing: How to Write Law Review Articles for Fun and Profit: A Law-and-Economics, Critical, Hermeneutical, Policy Approach and Lots of Other Stuff That Thousands of Readers Will Find Really Interesting and Therefore You Ought to Publish in Your Prestigious, Top-Ten, Totally . . .* , 44 J. LEGAL EDUC. 13, 24 (1994) (satirizing the research scholar's need to footnote extensively and with precision), we might as well make our footnotes as interesting as possible so that they are not so, dare I say, boring. The reader should insert the CD-ROM (if such has not been done already) at this point and read the article on their monitor. When prompted in a footnote to click onto a "CD-ROM Example," the reader should simply click the mouse on the hyperlink and view the computer animation in conjunction with the footnote.

explain the complexities of the case so that the jury can understand the factual issues involved before they attempt the more difficult task of determining how to resolve the challenging factual disputes.[17]

Although computers can greatly assist lawyers in their practice, much like the telephone, the mails and the fax machine do — and it is really impossible to imagine the practice of law today without these basic modes of communication — there is still some lingering resistance to the *full* incorporation of computerization into the practice of law, especially in the courtroom.[18] Some of this resistance to innovation can be attributed to the normal and perhaps unavoidable implementation time lags associated with change,[19] fear of new technology,[20] and a social

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17. *See* Berkoff, *supra* note 11, at 845 ("As the complexity of issues presented to a jury increases, the amount of interest, comprehension, and retention will decrease. For a party presenting such complex issues to a jury, the object is to present them in the most comprehensible, succinct, and attention-getting method possible.").

18. This has not been true, of course, for computers used for word processing, as they have replaced the typewriter in virtually every law office. This technological move toward the future is taking place throughout other sectors of society as well. For example, in the press, "[c]omputers have replaced typewriters that replaced fountain pens. Digital cameras that take pictures without film have replaced glass plates and Speed Graphics. Images on computer screens have replaced Linotype machines and their cauldrons of molten lead. Color is replacing black and white." Frank Ahrens, *The Washington Post: One Day in the Life*, WASH. POST, Feb. 11, 1998, at H01. In education, "[y]esterday's high-school typing class has been replaced by computer programs geared to elementary school youngsters. Typewriters have given way to computers that offer instant feedback, sound effects and game rewards." Lynn O'Dell, *Learning Keys to Success: Computer Software Helps Kids Tune Up Their Typing Skills*, L.A. TIMES, Dec. 8, 1997, at B2. However, this rapid technological deployment is not as prevalent when it comes to courtroom computerized display systems and document storage software, as many lawyers still opt to use physical documents in court without the aid of computer display systems and many law offices still have file rooms to physically store and retrieve physical documents. *See* Fred H. Cate & Newton N. Minow, *Symposium: Improving Communications in the Courtroom, Communicating with Juries*, 68 IND. L.J. 1101, 1114 (1993) (noting that "[d]espite the impact of these visual technologies, they are still the exception rather than the rule in most American courtrooms").

19. Two reasons that a time lag exists between the introduction of new technology and its adoption by the public are the fear of adopting a changing, unproven technology and the desire to get the best system at the lowest price when the price continues to decline. *See* Carole Schweitzer, *Leveraging Technology to Lead and Serve*, ASS'N MGMT., Feb. 1, 1998, at 50, *available in* 1998 WL10414679.

20. According to a survey by Dell Computer Corporation, 55% of the population harbors some fear or hesitation about technology, be it the personal computer or the car stereo. Of these people, up to one third experience actual physical symptoms of a phobia: nausea, sweating and dizziness. *See* Kevin Hogan, *Technophobia*, FORBES, Feb. 28, 1994 at 116, 116; *cf.* Tom Halligan, *Technophobia — The Designers' Fault?*, ELEC. DESIGN, Oct. 1, 1997, at 16, 16 ("'Technophobia,' I believe is a combination of three

and psychological fear of change in general.[21] Moreover, attorneys have been practicing with paper and photo enlargements in court for years — without computer images — and therefore many lawyers adhere to the old adage that "if it ain't broke, don't fix it." While paper and words are not necessarily inadequate modes of communication, CGEs make the attorney's job of communication easier, giving attorneys another tool in executing their professional role as advocates.

In addition to the resistance of some on a *personal* level, there is also some resistance to using computer technology to its fullest potential in the courtroom at an *institutional* level.[22] For example, the Federal Rules of Evidence, and particularly Rule 403, give a trial judge broad discretion to exclude "unfairly prejudicial" evidence.[23] Among other things, the rules can stand as formidable barriers to the admissibility of CGEs, especially when coupled with a judge's fear or unfamiliarity with using CGEs such as computer simulations and

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factors: overly complicated and confusing front-ends; poorly written and edited user manuals and documentation; and the end-user who refuses to set aside the large chunk of time it takes to fully understand and program his/her computer, phone, VCR, or stereo." (quoting Akio Morita, chairman and CEO of Sony Corp.)).

21. According to Dr. Paul Kazmierski, an industrial psychologist and professor at Rochester Institute of Technology in Rochester, New York: "The majority of people have low tolerance for any change . . . . If employees don't understand a reason for change and they aren't involved in planning for it, they're going to resist it." Shari Caudron, *The Human Side of a Technology Launch*, TRAINING & DEV., Feb. 1, 1997, at 20, 22, *available in* 1997 WL 10176033, at *2.

22. By "institutional," I mean the rule structure in federal courts consisting of the Federal Rules of Evidence and the Federal Rules of Civil Procedure, as well as the convention of federal practice. I would distinguish this from judges' and attorneys' *personal* psychological preferences and proclivities regarding the usage of computer technology.

23. *See* Van Houten-Maynard v. ANR Pipeline Co., No. 89-C0377, 1995 WL 317056, at *12 (N.D. Ill. 1995) ("[C]omputer animation evidence, by reasons of its being in a format that represents the latest rage and wrinkle in video communications and entertainment, may well have an undue detrimental effect on other more reliable and trustworthy direct-type evidence . . . . We also find this evidence as being excusable under Fed. R. Evid. 403 by reasons of its great potential for being misleading and prejudicial."). *But see In re* Air Crash Disaster, 86 F.3d 498, 538–40 (6th Cir. 1996) (holding that the probative value of a computer-animated videotape was not substantially outweighed by its prejudicial effect); Robinson v. Missouri Pac. R. Co., 16 F.3d 1083, 1086 (10th Cir. 1994) (finding that a videotape illustration of results of a train and car collision to explain expert opinion on final position of the car was within the lower court's discretion to allow in evidence). Rule 403 states: "Although 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." FED. R. EVID. 403.

animations. That barrier should not be surprising when one considers that most of the current Federal Rules of Evidence were written well before computer technology proliferated in the 1980s and 1990s,[24] and therefore are not as "computer friendly" as they could and perhaps should be.[25] In addition to the rules themselves standing as barriers, it must be kept in mind that most judges ruling on the admissibility of CGEs spent most of their former careers as attorneys using chalkboards, butcher block paper, magic markers, and "blow-up" placards as physical, visual aid exhibits to make their points rather than employing computer technology.[26]

Instead of operating as outdated barriers, our federal evidentiary and procedural rules and their interpretation and application by the federal judiciary, which together govern the application and implementation of justice in federal courts, should *at least catch up* with the rest of society in adapting to the changing realities wrought by the proliferation of computer technology throughout society.[27] Moreover, our courthouses

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24. *See* J. Owen Forrester, *The History of the Federal Judiciary's Automation Program*, 44 AM. U. L. REV. 1483, 1487–88 (1995) (discussing the explosion of automation uses in the courtroom in the late '80s and early '90s). The Federal Rules of Evidence were adopted by Order of the Supreme Court on Nov. 20, 1972. Since 1980, 34 of 67 Rules of Evidence have been amended. None of the Rules or Amendments, however, specifically mention CGEs.

25. This is not to say that the current Federal Rules of Evidence make it *impossible* to use CGEs. *See infra* Part III (demonstrating how to lay the foundation for and get CGEs admitted into evidence over common objections under the current institutional rule systems). However, the current rule systems and certain interpretations of those rules make it more difficult than is necessary to protect the search for the truth in the courtroom and therefore should be revised to make trials better forums of communication and offer more predictability in the legal calculus of admissibility of evidence. *See infra* Part IV (calling for the reform and reinterpretation of both the Federal Rules of Evidence and Civil Procedure in certain respects).

26. *See* Forrester, *supra* note 24, at 1483 ("The mid-1970's were the predawn hours for automation in the federal courts."). While there are no recent studies of the federal judiciary that include the subject of age, a recently published study by the 8th Circuit calculated the average age of federal judges who responded to their survey to be 59.84 years of age for men and 49.79 years for women. *See Final Report & Recommendations of the Eighth Circuit Gender Fairness Task Force*, 31 CREIGHTON L. REV. 9, 40 (1997).

27. *See, e.g.*, J. Gavin Howe et al., *Computer Analysis in the Automotive Industry*, AUTO. ENGINEERING, Nov. 1, 1997, at 49 (describing Ford Motor Company's use of simulations in solving design problems); *Scandia Showcases Computing Applications*, BMD MONITOR, July 25, 1997, *available in* 1997 WL 12950876 (describing the use of simulations in engineering and science); Eric C. Schneider & John M. Eisenberg, *Strategies and Methods For Aligning Current and Best Medical Practices: The Role of Information Technologies*, W.J. MED., May 1, 1998, at 11, *available in* 1998 WL

should go further and become cutting-edge leading social institutions in the use of computer technology.[28]

To the extent that trial automation through computer technology saves money,[29] legal clients will demand that attorneys remain technologically competitive with other societal and business institutions to avoid legal bills associated with manual retrieval and storage of documents. Clients will also expect the cost savings associated with short computer animations which quickly explain fact-patterns that would take much longer to explain verbally with expert witnesses.

Because our society is growing more complex, increasing the sophistication of many of our disputes,[30] our laws and institutions

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11254091 (describing simulations used to create the sensory experience of surgery); Matt Walker, *The New Agricultural Revolution (Precision Agriculture)*, CHEM. & INDUS., Mar. 16, 1998, at 202 (listing computer simulations for pesticide and fertilizer application outcomes among other new tools for the farmer); Frank Wolfe, *Futuristic Command Center Demonstrates Evolving Technologies*, DEF. DAILY, Jan. 30, 1998, *available in* 1998 WL 7193259 (describing the use of computer simulations to train troops in combat tactics).

28. This is happening, at least in a few courts. *See* David M. Halbfinger, *State Court Turns to Technology to Speed Trials*, N.Y. TIMES, Dec. 3, 1997, at B6 (describing a sophisticated new electronic courtroom at the New York State Supreme Court and quoting Judge Judith S. Kaye, Chief Judge of the Court of Appeals for the State of New York: "This [commercial] division made us equal with the Federal courts . . . . This technology put us ahead."). New York's experimental high-technology courtroom, known as "Courtroom 2000," includes 16 video monitors placed in key locations, such as the judge's bench, jury box, attorneys' tables and clerk's desk, PC docking stations, an electronic whiteboard, VCRs, and a touch screen monitor at the witness box. "Realtime" translation of the court reporters transcription is immediately viewable on the monitors for the judge and attorneys. The heart of the system is the Digital Evidence Presentation system, controlled at the attorney's podium via a touch-screen LCD remote control, allows counsel to present documentary evidence or actual exhibits to the judge and jury via television display and allowing counsel to annotate or draw on an overlay of the documents, similar to the system seen in televised sports commentary. *See* Herb Landman, *Courtroom 2000 — With Realtime — A Success in NYC*, TRANSCRIPT, Winter 1998, at 13; *see also* Alan Cohen, *Commercial Division Unveils New High-Tech Integrated Courtroom*, N.Y. L.J., Dec. 9, 1997, at 5 (stating how the integrated courtroom represented by "Courtroom 2000" eliminates the problem of incompatible technologies that frequently results when counsel for each side brings in their own equipment). Part V of this Article calls for a more formalized educational program in the use of such legal computer technology for both judges and law students so that justice in our courtrooms will be conducted by future attorneys in an exemplary manner.

29. *See infra* Part VI.A.3 (discussing certain cost savings and time efficiencies of using computer technology in the practice of law).

30. Disputes over newer inventions require the need to convey more technical and complex material and information to non-expert juries, which means that advocates must become even more skilled in their explanations of the facts and issues in dispute

should celebrate and welcome effective, enhanced communication in the search for justice and truth, or at least in the search for an acceptable result in a dispute in our courtrooms. Accordingly, the bench and the bar should not retreat in fear of enhanced and effective communication by allowing antiquated legal practice conventions and the temporary comfort of trying to hold on to the status quo to keep us from fully embracing the future. We should do more to adapt fully, both institutionally and individually, to the progress currently being made in communication and advocacy through computer technology.

B. The Organizational Structure of the Article

Part II of this article examines the use of CGEs and case management technology as facets of the practice of law which no longer can be ignored or written off as a new and novel form of legal practice. It describes, defines, and even demonstrates — through "hyper-linked" examples on CD-ROM for the reader to access — CGEs and analyzes their inherent communicative power, while considering the various visual and audio methods of information transfer, focusing primarily on computer animations. It also describes the benefits of computerized case management technology behind the scenes and before trial.

Part III demonstrates how CGEs currently fit into existing evidentiary foundations under the Federal Rules of Evidence and Civil Procedure, which are geared toward more traditional visual aid exhibits such as photographs, maps, video tapes, charts, etc. It also addresses common objections to CGEs, helpful responses to those objections, and how the courts generally rule and why. This Part also critiques selected exemplary rulings which have interpreted and applied the rules to deny the admittance of CGEs and suggests an interpretation of the rules that would make it easier for them to be admitted.

Part IV reviews a helpful model for reform: a recent change to the Maryland Rules of Procedure for the benefit of preparing and ultimately

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and do so in a way that is understandable to a lay jury. For example, Dolly the "cloned" sheep, DNA "fingerprints," genetic engineering, lasers, and computer chip innovations represent a growing list of modern complex technology. When disputes involving such technology arise, how can the average juror understand it? *See Development in the Law — Confronting the New Challenges of Scientific Evidence*, 108 HARV. L. REV. 1481, 1584 (1995) ("[E]conomic, statistical, technological, and natural and social scientific data are becoming increasingly important in both routine and complex litigation." (quoting JUDICIAL CONFERENCE OF THE U.S., REPORT OF THE FEDERAL COURTS STUDY COMMITTEE 97 (1990))).

admitting computerized exhibits at trial. It examines what impact there would be if similar changes were made to the Federal Rules of Evidence and Rules of Civil Procedure.[31] Although technically they cannot be amended post-adoption, this Part also suggests the addition of various *model* Advisory Committee Notes to both the Federal Rules of Evidence and Rules of Civil Procedure which would encourage the admission and use of CGEs at trial as an interpretative matter.[32]

Because change and acceptance must occur at the human level, in addition to the official statutory level, Part V calls for a formal judicial conference in which federal courthouses would be automated, and judges along with their court clerks taught how to use computer hardware and software, not only in their courtrooms but in their administration of justice in general.[33] Once our courthouses begin to expect, and even to require, attorneys to use computer technology in

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31. Under congressional statutory directive, the Judicial Conference of the United States is authorized to "carry on a continuous study of the operation and effect of the general rules of practice and procedure." 28 U.S.C. § 331 (1994). The Conference may recommend amendments and additions to the rules "to promote simplicity in procedure, fairness in administration, just determination of litigation and the elimination of unjustifiable expense and delay." *Id.* The Judicial Conference's responsibilities are coordinated by its Committee on Rules of Practice and Procedure, commonly referred to as the "Standing Committee." 28 U.S.C. § 2073(b) (1994).

32. The ABA already has declared its support of CGEs and computerized evidence. *See* A.B.A. CIVIL TRIAL PRACTICE STANDARDS 23 (1998) (declaring that judges should be receptive to using technology in managing the trial and the presentation of evidence); *see also* A.B.A. TRIAL MANAGEMENT STANDARDS 9 (1993).

33. Such a formalized judicial conference, which would include judicial clerks, would provide the impetus for many judges to become more familiar with the mode of presenting CGEs in a formalized and comprehensive setting rather than haphazardly encountering them in random cases. Just as it would have been unrealistic to expect a judge unfamiliar with fingerprint evidence, photographs, videotape, cassette recordings, and the like to admit such evidence and be comfortable with it unless the judge was first educated in this type of evidence and its reliability, so too is it unrealistic to expect full judicial acceptance of CGEs as reliable evidence if judges have neither formal knowledge of CGEs nor any comprehensive exposure to the underlying technology. Such judicial programs are happening already on an ad hoc basis. *See* C. Sue Willoughby, *Automating and Linking Pennsylvania's District Courts: A Success Story*, 3 JUDGES' J. 30 (1993) (discussing the success of technological innovations in the courtroom and with judges in Pennsylvania); *see also* Ted Brousseau, *Training to Use Technology: As Important as What You Buy*, 3 JUDGES' J. 67, 69–71 (1993) (examining the importance of, and problems with, training in the judicial system); Jack B. Weinstein, *Limits on Judges Learning, Speaking and Acting — Part I — Tentative First Thoughts: How Many Judges Learn?*, 36 ARIZ. L. REV. 539, 548–49 (1994) (discussing the Carnegie Commission on Science, Technology and Government's effort to study and propose improvements in the education of the judiciary regarding science and technology). However, this development of judicial education is too important to leave to individual happenstance.

preparing for trial as well as in the courtroom, CGEs will become as integral a part of the practice of law as using telephones, fax machines, and word processing programs are now. This Part also calls for a required legal computer course in all American Bar Association accredited law schools, which would help to cure the problem of a lack of knowledge regarding CGEs in the practice at a fundamental level. Just as law students are currently taught some computerized legal research during the first year,[34] so too should they be taught (or at the very least exposed to) how to use CGE display technology and computerized document management systems.[35]

Finally, Part VI addresses two significant cautionary warnings regarding the usage of computer technology in the law. First, there are crucial cost issues pitting rich litigants who have the economic means to use very expensive computer graphics against opponents with lesser economic means who cannot afford CGEs. To the extent that there are already cost inequities in litigation, the increased usage of CGEs might have the effect of exacerbating such inequities at a time when we should be trying to minimize economic disparities in litigation.[36] This Part explores some alternative solutions to the cost inequities relating to CGEs. A second cautionary warning regarding CGEs is that there are very real trial strategy issues as to whether the decision to use "dazzling" computer graphics might "backfire" with a more provincial jury because counsel might be perceived as trying to "trick" the jury with "fancy cartoons" or "slick infomercials"[37] instead of relating to the

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34. Many students are taught to use computer assisted legal research ("CALR") by representatives of the companies that provide the service — LEXIS and Westlaw, for example. Often, much of the training beyond the initial few hours is provided by fellow students trained by these companies. Others are taught and can receive assistance by trained legal librarians. *See* Marilyn R. Walter, *Retaking Control Over Teaching Research*, 43 J. LEGAL EDUC. 569, 580 (1993) (examining the existence of CALR training provided to students while in law school and critiquing the current lack of such training on a more systematic basis).

35. Legal process courses and/or legal writing courses would appear to be a natural venue in which to teach and learn these basic computer skills, rather than as a part of the "core" first-year courses. However, a course devoted entirely to this issue also should be offered as an upper-level elective course by every law school.

36. *See* James Podgers, *Chasing the Ideal: As More Americans Find Themselves Priced Out of the System, the Struggle Goes On to Fulfill the Promise of Equal Justice For All*, A.B.A. J., Aug. 1994, at 56, 56 (stating that the most implacable barrier to equal justice in the United States is economics. "The justice system has always been class-based . . . . Justice has always been more available to those who can pay for it." (quoting Carrie Menkel-Meadow, a professor at U.C.L.A. School of Law and the Georgetown University Law Center in Washington, D.C.)).

37. *See, e.g.*, WRIGHT & GRAHAM, *supra* note 8, § 5174.1 (setting forth various

jury with substance and actual facts. CGEs are tools; they are not a substitute for good lawyering or for having a good case.

In sum, as computers become more prevalent in society, as jurors obtain more and more information from television images,[38] the Internet,[39] e-mail,[40] and computer programs,[41] and as clients, businesses, and attorneys store, retrieve, and display more and more information on computers,[42] both at home and work, our evidentiary and procedural rules, as well as our actual courtroom practice, will need to keep step with the communication changes brought by time and scientific progress. We can resist the way of the future (either intentionally or by simply failing to adapt to it), or, as set forth herein, we can attempt to recognize all that the future will bring and choose to embrace it.

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disparaging remarks against CGEs such as "computerized razzle-dazzle," and referring to them as "the cartoon[s]," "forensic illusions," and "this latest threat to justice").

38. It has been estimated and often quoted that the average high school student, upon graduation, has completed 11,000 hours of classroom education compared to 15,000 hours of television viewing. *See* R. Dennis Donoghue, *Demonstrative Exhibits: A Key to Effective Jury Presentations*, *in* PATENT LITIGATION 1992 (PLI Patents, Copyrights, Trademarks & Literary Property Course Handbook Series No. G4-3892, 1992), *available in* WL 349 PLI/Pat 369, at 371.

39. It has been estimated that 61% of teens spend time on the Internet, researching information or chatting with friends in electronic chat rooms. *See Teenagers and Technology: A Newsweek Poll Shows Familiarity and Optimism*, NEWSWEEK, Apr. 28, 1997, at 86; *see also* Paul Taylor, *Dawning of the Information Age*, FIN. TIMES, Nov. 5, 1997, at III, *available in* 1997 WL 14791149 (quoting a recent study that found that adults in the United States between the ages of 18 and 35 are watching less televison in order to devote an hour a day to the Internet).

40. The average worker with a computer receives 25–50 e-mails per day and spends one to two hours deciphering them. *See* John Shors, *The Peril of E-mail*, BUS. REC., Mar. 2, 1998, at 10.

41. *See* Catherine McGrath, *Mature and Wired*, AM. DEMOGRAPHICS, June 1, 1998, at 30, *available in* 1998 WL 13694150 (giving a breakdown of home computer usage by age bracket, and reporting that the average use of home computers is 24 hours per month, with a high of 38 hours per month of usage by Americans age 55 and older). This home usage is in addition to the number of hours people use their computers at work.

42. *See* Robert Mallett, *Computer Simulation in Court — Visual Images Communicate More Effectively*, N.Y. L.J., May 6, 1996, at S1 (explaining how pervasive computer technology is in our society, from business records and the military to education and medicine).

II. THE COMPUTER — AN EFFICIENT VEHICLE OF COMMUNICATION AND ORGANIZATION

A. An Overview of Computer-Generated Exhibits ("CGEs")

Increasingly, computers are being used for both in-court performance[43] as well as behind-the-scenes case management.[44] The first capacity yields efficient communication in court or settlement negotiations; the latter provides organization of, and easy reference to, thousands of pieces of information from discovery up through trial. With respect to the first capacity, there are generally three types of CGEs that are available to attorneys for use in the courtroom.

1. Static CGEs: The "Glorified" Chalkboard/Easel

The first type of CGE is very simple and non-controversial in terms of admissibility as "exemplary" or "demonstrative" evidence[45] —

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43. *See* CD-ROM Example #1, *supra* note 16 (containing computer animations and other demonstrative CGEs).

44. "Case management systems" are the pre-trial means by which attorneys store and organize case files and documents via computer storage and retrieval programs. *See generally* Paul Mitchell, *Development of a Case Management System: One Firm's Approach*, LAW. PC, Feb. 1, 1991, at 7 (describing the conversion of one law firm's practice from using manila envelopes as a case management system to computerized case management). *See also* Margaret H. Warner, *Case Management Software Eases Burden in Complex Litigation*, N.Y. L.J., May 18, 1998, at S6 (describing how computerized case management has helped significantly in tracking and retrieval of paperwork for complex litigation). Such automation allows documents to be stored and organized more efficiently and inexpensively than what can be accomplished by document clerks who manually store "hard copies" of every document in a special file room or warehouse. *See* CD-ROM Example #2 (exhibiting a common document management support program called Summation, which allows the attorney instant access to all documents organized by "fields," such as chronology (date), by witness name, author of document, specific factual or legal issue, relation to a party, etc.).

45. Demonstrative evidence is addressed directly to the senses and is concerned with real objects that illustrate some verbal testimony, but has no independent probative value in itself. *See* BLACK'S LAW DICTIONARY 577 (7th ed. 1999). A key distinction must be made here with respect to evidence that is "admitted" and therefore goes to the jury room at the end of the trial for deliberations as admitted evidence in that case — denominated as an "admitted trial exhibit" — and "demonstrative evidence" (really, demonstrative exhibit) which typically does *not* go to the jury room because it is not itself admitted as evidence. Demonstrative evidence is merely for the in-court speaker — either the attorney during opening or closing statements or the witness during their testimony — to further enhance or clarify what they are saying or testifying. *See generally* CHRISTOPHER B. MUELLER & LAIRD C. KIRKPATRICK,

it consists of static images that are simply projected onto a large screen or computer panel or to individual monitors by a computer display system. These non-moving images are akin to a drawing of a building, a diagram of an accident scene, or a photograph of a machine in a products liability case, but they are created and/or displayed on a computer as opposed to using a writing utensil and paper.[46] These images cannot be manipulated in any way. For example, they cannot be enlarged or maneuvered sideways for emphasis. A computerized list of issues or a floor plan chart is still just a list or chart, projected from a computer onto a larger screen or to other computer monitors set up in the courtroom rather than a physical placard placed in front of the witness and jury.

2. Static CGEs: Manipulation for Emphasis and Effect

The second group still consists of static images (a letter, contract, chart, photograph, map, etc., stored and projected by computer), but special computer software adds annotation capabilities — that is, color changes, arrows, "zoom in" effects, circles, check marks, etc. This allows otherwise static images to be manipulated in various ways for

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EVIDENCE § 9.32 (1995). For example, if a document such as a letter or contract is admitted as an exhibit, it becomes an official part of the record and, as such, attorneys can refer to the exhibit during trial and the jury can examine the admitted evidence during its deliberations. Note that the letter or contract existed *before* the case came to trial and is relevant to the dispute. Demonstrative evidence, on the other hand, is something usually *created for trial*; it is not factual evidence in and of itself. It merely helps explain what is being said or testified to in court. *See id.* For example, a simple list of elements that one's opponent must prove to find liability in a civil case or guilt in a criminal case is not "proof" or "evidence" of anything. Likewise an organizational outline which highlights what an attorney might be arguing in closing arguments is not "proof." *See id.* § 9.34. There is sometimes confusion because an admitted exhibit — say a map or a diagram of a crime scene — can also be used "demonstratively" to help explain a witness's testimony. For example, a witness can trace the path she walked on the diagram showing where she was at the time of the incident. So a witness's testimony may be admitted evidence but not necessarily a demonstrative exhibit which merely assists the witness to explain visually their testimony. Of course, a CGE can be used to show either a demonstrative exhibit (e.g., a list of elements) or substantive evidence (the actual contract at issue). In contrast, "real evidence" consists of admitted tangible evidence such as a murder weapon, a tire valve, a safety switch, etc. It is commonly understood that the thing itself has substantive significance in the case because it is the object that played a pivotal role in the crucial events giving rise to the case. *See id.* § 9.32.

46. *See* CD-ROM Example #3 (showing a simple digital photograph of a hay baling machine).

emphasis or persuasive effect. For example, a certain portion of a letter, contract, or diagram (an otherwise static exhibit) can be highlighted, zoomed in upon, or emphasized through colors, arrows, etc.[47] Thus, parts of the image may be emphasized while the other parts remain static or are emphasized in different ways.

This is still not such a great departure from what is done already in courtrooms across the country. Witnesses often draw their path on a diagram, point to a section of a contract, or read a certain line from a letter or deposition that the attorney then highlights on a large posterboard enlargement of the document. The computer technology here, therefore, simply makes those functions easier, quicker, and more legible and understandable. For example, in an automobile accident scene, the vehicle in the image may remain in one position at a certain interval in time, and then the position of the vehicle may change at the next key interval in time for emphasis.[48] Or, certain portions of a letter may be highlighted for emphasis or a photograph may be enlarged to view a serial number on a vehicle.[49] It really makes no difference that a computer can do these tasks better, faster, and more legibly than an attorney's or witness's handwritten marks on a chalkboard or a large chart or diagram.[50]

If the fact that evidence can be utilized more proficiently by a computer rather than by a manual hand seems "overly manipulative" or "unfairly prejudicial," consider that such communication emphasis for strategic purposes is nothing new in oral advocacy. First, it happens now — attorneys can underline text on a chalkboard for emphasis. But to the extent that computer proficiency adds to the overall persuasiveness of evidence, such an advantage is really no different than being more persuasive or compelling in oral argument, like the skilled attorney who takes a dramatic pause for emphasis, raises or lowers her voice at key points, waves her arms, narrows her eyes, or shakes her

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47. *See* CD-ROM Example #4 (showing a diagram of a building highlighting key rooms and areas and indicating critical air flow patterns and circulation with color, and emphasized with moving arrows for dramatic and persuasive effect).

48. *See* CD-ROM Example #5 (showing a pickup truck rollover accident where the truck is highlighted at different points in time to emphasize physical changes and stress to the vehicle at each specific time interval, with actual photographic insets of the truck for realism and comparison).

49. *See* CD-ROM Example #6 (showing the same photograph of the hay baling machine in CD-ROM Example #3 being "morphed" and enlarged to reveal a key portion of the photograph).

50. *See, e.g.*, People v. McHugh, 476 N.Y.S.2d 721, 722 (Sup. Ct. 1984) ("Whether a diagram is hand drawn or mechanically drawn by means of a computer is of no importance.").

head to convey meaning. Certainly no one should fault an attorney for being concise and to the point instead of long-winded and boring, so why should it not be the same for the graphic presentation of evidence that is simply better with a computer rather than with a chalkboard? Indeed, lawyers and witnesses are no strangers to expressing emotions such as anger or sorrow in the courtroom with dramatic effect. If that is not so illegitimate as to amount to improper manipulation, then drawing a line for emphasis with a computer, rather than by hand, should not raise any such evidentiary concern. Just as the invention of the microphone made it easier for attorneys and witnesses to *tell* their stories in large courtrooms with no evidentiary admissibility concerns, the invention of computers to display images to make it easier for attorneys and witnesses to *show and tell* their stories at trial should similarly pose no evidentiary admissibility concerns.[51]

3. Full Motion CGEs: Making the Testimony Come Alive

The third category, and perhaps the most powerful and therefore most controversial category of CGEs, consists of "animations," "re-creations," and "simulations," each of which presents actual movement through images. These images are not filmed or videotaped captures of actual events that transpired in the past. Rather, they are dynamic representations of those events. For example, a person can be depicted falling backwards off a porch,[52] even though the depiction is not an actual recording from the time the event transpired but is made afterwards based on testimony of an eyewitness and/or scientific variables ("input data"). The similarities and differences between animations, re-creations, and simulations are explained below.

a. Animations

Animations are 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

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51. For a full treatment of this issue as a matter of evidence law, see *infra* Part III. For example, a microphone could be abused — turned up too loudly for example — but such abuse would not be sufficient to disallow microphones altogether.

52. *See* CD-ROM Example #7 (showing a computer generated animation of a moving image — not a videotape or film — of an arrested suspect being handcuffed, then head-butting and kicking the arresting officers before falling over backwards off a porch).

a speed of 24 or 30 frames per second.[53] The image is merely a graphic representation — a series of pictures "drawn" by a computer operator with a computer — depicting a witness's testimony. Thus, the input data is nothing more than a witness who (1) has personal knowledge of the scene depicted in the animation and (2) witnessed the event depicted in the animation as it actually transpired.[54] Although one cannot cross-examine the animation itself, one can still cross-examine the witness upon whose testimony the animation was created, just as one cannot cross-examine a photograph, but can cross-examine a witness who testifies that the photo is a fair and accurate representation of the pertinent scene on the day in question.

Although computerized animations are new and their imagery is better than traditional non-computerized demonstrative exhibits, the underlying reliability issues supporting animations are the same as those for more familiar types of exhibits. For example, suppose a police artist sketches a picture of a criminal suspect based on the witness's description. The witness describes the defendant as clean shaven. The suspect is apprehended but now has a beard.[55] That particular sketch, or series of sketches, would not be direct evidence itself (for example, it is not an actual photograph of the suspect *without* a beard), but it would serve the very important trial function of helping the witness to *describe* to someone else (a judge or jury) what, at the time of the incident, the witness believed the suspect looked like.[56] A computer animation is the same thing as a police sketch except that the computer operator, using the computer as a tool, is the "artist" as opposed to the

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53. *See* Michael J. Farley & Bradford S. Moyer, *Effectively Utilizing Computer Animation in Environmental Litigation*, 76 MICH. B.J. 190, 190 (1997) (explaining that a "computer animation is a sequence of still frames generated by a computer that, when viewed in rapid succession (usually 24 or 30 frames per second), 'move' or become animated to tell a story"); *see also* Debra Kaufman, *Seeing Spots: A Roundup of Animated Commercials*, HOLLYWOOD REP., Jan. 14, 1997, at 40, *available in* 1997 WL 8589271 (describing the animation techniques used in producing several popular commercial advertisements).

54. *See infra* Part III.B.3 (setting forth the legal requirements to authenticate a computer animation under the Federal Rules of Evidence, Article IX).

55. *See* CD-ROM Example #8 (showing a computer animator's conception of the suspect based on the witness's testimony as to how the suspect looked completely clean shaven with short hair, and later compared to an actual photograph taken when the suspect had a beard and long hair; the actual photograph is then "morphed" into a partial animation to show how the suspect would appear without the hair and beard according to eyewitness testimony).

56. In effect, this is no different than when a witness testifies as to what the suspect looked like and the resulting police sketch simply assists the witness's testimony.

police sketch artist who does everything by hand with a pencil. Most significantly for our purposes, the reliability of the animation as evidence still depends completely on the witness's testimony and credibility. The witness can be fully cross-examined regarding the animation which, again, is simply the graphic depiction of the witness's testimony.

This remains true in the context of an animation, even though it goes one step further than a still sketch by adding motion. However, this does not change the reliability issue. For example, computer-generated motion is similar to a police sketch artist drawing a *series* of sketches, with each one showing the suspect in a minutely different position. When run together, these sketches would produce an image of motion showing how the suspect allegedly ran away.[57] Again, the animation would not be direct evidence in and of itself (not actual videotape of the suspect running away), but it still would graphically represent what the *witness says he or she actually saw* — the suspect running away and how he appeared as he did so.[58]

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57. This of course is how cartoon animations were first made. The principle is the same but a computer animation just does it better and faster. Opponents of animation often point this out in an attempt to discredit CGEs. *See* WRIGHT & GRAHAM, *supra* note 8, § 5174.1 (referring to a computer animation as a "cartoon").

58. The collection and creation of an animation is extremely detailed. An animation firm must be selected, a budget established, and meticulous factual research performed to support what will be shown. Story boards — initial frame drawings — must be formed, reviewed, and revised as necessary to assure their total accuracy. From the story boards the animator will create the animation, which must also be constantly analyzed for even the slightest of errors. Seemingly minor changes may require the computer to re-calculate the entire animation. In post production, labels, special effects, and final touches are added, and the animation is copied onto a videotape, laser disc, or more recently CD-ROM or even DVD-ROM (Digital Video Disc) to facilitate display at trial. *See* CD-ROM Example #9 (showing how EAI creates an animation). After the animation is placed on one of these display technologies, it can be retrieved through bar-coding. One can use "bar-codes" — the same technology used in grocery store check-out stands to read bar-codes on the side of food items — by using a bar-code reader in the court room to "launch" or "run" an animation or segment of an animation and thus have instant access to the exhibit. The bar coding system saves the attorneys time by not requiring them to punch a computer keyboard during the trial just as it saves time for supermarket checkers by not requiring them to punch in the price of each item into the cash register. To present an animation, the size and design of the courtroom must be considered, along with, of course, any special guidelines and limitations pronounced by the judge. According to trial consultant Timothy Piganelli:

> [t]he attorneys and the judge must decide where to place the display screen or monitors so that all court personnel, witnesses, and jurors can view the CGEs, at the appropriate time, clearly without any obstructions or difficulty. Moreover, monitor or

In addition to the image of motion, animations also allow in-depth descriptions that an actual videotape would not allow, making animation a unique and invaluable tool of communication in certain circumstances. For example, the image of a handgun can be shown beneath its surface, revealing the inner chambers of the gun and its mechanical devices, by gradually making the gun's outer casing appear "transparent."[59] Again, this is not direct evidence of what has actually transpired because the creator of the animation has not captured an event on film or videotape as it happened. Nonetheless, it can help to show what a witness saw or, in the example above, help an expert witness to explain the mechanical workings of a gun below the surface of the outer casing, which would otherwise be very difficult to explain only verbally.

b. Re-Creation Animations

Re-creations are just animations in the technical sense — images generated by a computer that when run together produce the image of motion — but the source of the input data is different and more involved. Instead of eyewitness testimony, as with animations, scientific data is entered into a computer and processed by a computer program. Thus, re-creations are derived from a series of images

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> screen placement is a very sensitive subject and should be carefully planned to take into account strategic, as well as logistical, concerns. Control of the monitors is also critical — who sees what and when, so the judge should have an "on/off" switch to all of the monitors so a judge can decide exactly when a witness or the jury should see the exhibit. Finally, the judge's approval usually is, and should be, the last "blessing" of the placement of each screen and monitor, and even cables and extension cords in the courtroom. In sum, you're a guest in the courtroom, so remember to mind your manners and ask permission.

Piganelli telephone interview, *supra* note 15. There must be at least one display device (screen, monitor, projector, etc.) for viewing the animation, but many attorneys opt to have several to accommodate the different vantage points of the jury, the judge, the witness stand, and the attorneys. *See* Farley & Moyer, *supra* note 53, at 193.

59. *See* CD-ROM Example #10 (showing at first an outside view of the gun with the outer casing, then a transparent view revealing the inner workings of the triggering mechanism beneath the outer covering). Note that this would be difficult, if not impossible, to show to a jury examining "real" evidence, such as the actual gun itself. Although a gun could be taken apart to expose the inner chambers, it could not function when taken apart and thus would fail to reveal the workings of the inner chambers in action.

generated on a computer (like an animation), but they rely upon data collected and, usually, agreed upon by counsel *beforehand.*[60]

For example, if information is entered into the computer regarding the measurements, size, shape, mass, and other necessary data of a truck, the computer can process it through a designated program to accurately "re-create" how the truck must have skidded down a highway and crashed according to the scientific input data variables.[61] The input data is not merely a witness's description of an event that has been witnessed and is now described better through animation (although it certainly could be used that way as a demonstrative exhibit). Instead, the input data must be independently determined and confirmed and then "fed into" the computer. The computer program must then process that input data to generate an image or a result of what "must have happened" given the input data and the scientific assumptions underlying the computer program — such as the laws of physics. The general image must rely on the validity of that input data, the assumptions made by the computer program, the reliability of the computer programmer to correctly input the information, and the computer program to correctly process that information so that the end result can be characterized as a "re-creation" of what *must* have happened according to the computer program and the input data. A re-creation is circumstantial evidence, whereas an animation is what happened *according to the witness* and is direct evidence.

The difference between this and a demonstrative animation, therefore, is that this type of re-creation can be performed even if there were no eyewitnesses who had personal knowledge of what is being depicted in the re-creation. The reliability stems not from eyewitness accounts of past events but from the input data itself (skid marks, for example, or other measurements and scientific readings — circumstantial evidence), along with the reliability of the computer programmer, the assumptions made by the computer program to generate the correct result, and how it depicts via computer imagery what must have actually happened.[62] Both animations and re-creations

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60. For an example of a case in which the parties agreed beforehand on the data collected, see State v. Clark, 655 N.E.2d 795, 813 (Ohio Ct. App. 1995).

61. *See* CD-ROM Example #11 (showing a vehicular collision involving a pickup truck and a telephone pole, driver skids across highway, hits telephone pole and flips over). Note that this is shown from three different angles including an aerial view — something that would be difficult if not impossible to show to a jury visiting the accident scene.

62. *See* CD-ROM Example #12 (showing operation of a complex printing machine based on input data and assumptions about physical mechanics, even though no

are backward-looking in that they always depict an event that has occurred in the past.[63]

c. Simulation Animations

The final type of CGE is predictive. This is called a computer model or "simulation" because 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. Computer models are often used by experts to test their hypotheses. They simulate what will happen if certain underlying assumptions are made. For example, if a plaintiff has a theory of the case, a defendant can simulate what would happen, given the laws of physics, if that plaintiff's theory actually occurred. Instead of guessing or hypothesizing about what a witness says, this allows the advocate to model or simulate events as described by a witness to see if those events are even possible.[64] It is a powerful way to "test" an opponent's theory of the case while demonstrating the plausibility of one's own.[65]

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eyewitness has actually ever been inside the press machine as it was running to see it operating as depicted by the re-creation).

63. A specific example is a "Computer Generated Accident Reenactment," which is an in-court computer demonstration of an accident that, unlike demonstrations of general physical principles, must be nearly identical to the accident to be admitted into evidence. *See generally* James T. Clancy, Jr., *Computer Generated Accident Reenactments: The Case for Their Admissibility and Use*, 15 REV. LITIG. 203 (1996); *see also, infra* Part III (setting forth admissibility requirements).

64. *See* CD-ROM Example #13 (showing a simulation of the Oklahoma City Bombing incident based on a certain amount of explosives, which could be used to prove (or disprove) a litigant's entire theory of the case — assuming the defendant had argued that it would have taken much more than one truck of explosives to cause the damage — even though there was no actual eyewitness to recount or authenticate that the actual explosion occurred *exactly* as depicted in the CGE.

65. For example, according to trial consultant Timothy Piganelli, to test a litigant's theory of how a car accident must have occurred by creating a simulation, a "motion table" must be created giving various coordinate positions for the center of gravity at every frame of the simulation animation measured against six key coordinates: the three-dimensional x, y, and z positions, along with the roll angle, pitch angle, and yaw angle. *See* Piganelli telephone interview, *supra* note 15; *see also* CD-ROM Example #14. After creating a motion table, each frame must be graphed against time. Finally, the positions and timing must be measured against an actual test of similar or nearly similar conditions and the laws of physics to see if the litigant's theory of the case is even possible as a matter of physical science. In other words, the simulation must "confirm" the real graphs of position versus time; if not, the events depicted in the

B. CGEs as Aids to Communication

1. "Controlled" Communication and Persuasion

After defining and demonstrating the various types of CGEs, the question remains whether they are really all that valuable at trial, especially in the context of a specific case. There is an enormous communication value in all CGEs, and for that matter, in any kind of visual aid. Generally, "[c]ourts look favorably upon the use of demonstrative evidence, because it helps the jury understand the issues raised at trial."[66] This is true because verbal conversation is not the primary method by which human beings gather information[67] — sight is.[68] Indeed, good verbal communication, especially when describing past events, often is the ability to create for the decision-maker a *mental image* of what is being communicated. But mere words are a very indirect way to convey the desired mental image in the mind of the decision-maker, and certainly are not as accurate or as detailed as an actual picture that the decision-maker perceives directly through sight. Thus, in terms of accurate, controlled communication by an attorney or witness, an actual picture, especially with motion, is far better than the attempt to create that very same image in the minds of jurors through the indirect and ephemeral medium of mere words.[69]

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simulation are impossible, and the litigant's theory of the case would be implausible — a significant issue about which the jury should be made aware.

66. People v. Burrows, 592 N.E.2d 997, 1002 (Ill. 1992).

67. *See* Symposium, *Demonstration and Discussion of Technological Advances in the Courtroom*, 68 IND. L.J. 1081, 1085 (1993) ("[U]p front you have to explain all of the mechanical devices, the jargon, and the characters in the litigation. You do this by taking a novel and reducing it to a screenplay — a 500 page novel to a two-hour screenplay." (quoting attorney Robert F. Ruyak)); *see also* Robert Mallet, *Computer Simulation in Court*, N.Y. L.J., May 6, 1996, at S10 (pointing out that for people who are not great storytellers, verbal explanations can seem to the jury to be "lengthy, incomprehensible, confusing and thus ineffective.").

68. *See* Mark Kolber, *Just Picture It: Advocacy and Computer-Generated Presentations*, COLO. LAW., Dec. 1997, at 29, 29 (stating that while attorneys are usually trying to reach the jury through their ears, most of what people learn is through their eyes); *cf*, Paul J. Feltovich et al., *The Reductive Bias and the Crisis of Text in the Law*, 6 J. CONTEMP. LEGAL ISSUES 187 (arguing that when particular ideas or concepts are put into words, they are necessarily reduced in the process; then the audience must reconstitute the words back into concepts in their minds, leading to multiple interpretations resulting from the reconstitution process).

69. This is not to say that in certain circumstances there may be countervailing strategic reasons why an indirect mental picture created solely with words might not be more persuasive or powerful in the long run than an actual graphic image provided by

For example, in response to the word "dog," the decision-maker immediately will conjure up her own mental image of some type of canine dog. There is a lack of control, however, as to what specific image the decision-maker might create in response to hearing the word "dog" — one juror might imagine a collie, while another imagines a poodle, and yet another a cocker spaniel. But if the attorney says the word "dog" and simultaneously displays an image of a vicious pit bull, then all of the jurors and the judge immediately know to which type of dog the attorney is referring and each of their own personal mental images of various types of dogs vanishes. Indeed, these incorrect or undesirable images often never even have the time to be created since jurors and the judge instantly experience exactly what the attorney is trying to communicate. This is done without having to spend the time and energy — both the attorney's and the jury's — further explaining that this dog is a pit bull, not a collie or a poodle.

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a CGE. Sometimes people, in having to create their own mental images, personalize those visualizations such that the image in their mind is more moving to them than an actual image presented to them would be. One need only note the familiar critique that "the book was better than the movie" to understand this concern. An effective advocate must therefore recognize that often a writer or speaker can create more powerful and vivid images through words alone than a television or movie director can through controlled images. This can be true when the reader or listener becomes a much more active receiver of information by creating her own mental images sparked by words, in contrast to a passive moviegoer or television watcher who has all of the critical mental images directly provided through the director's vision of the story. *See* Part VI.B (addressing trial strategy concerns regarding the use of CGEs at trial). Although in certain circumstances, the medium of words may be a more powerful way to present one's case, it is still generally true that information can be more accurately and directly conveyed to the juror through CGEs precisely because the communicator has more control over what image is conveyed to the juror. Thus, CGEs should be considered a very powerful communication *option* that should be readily available to the advocate to aid in the presentation of his case, not necessarily to replace verbal communication in every conceivable instance. Powerful oratory and powerful computerized imagery should not be considered mutually exclusive, competing means of communication available to the advocate. Rather, they should be accepted as strategic communication options available to the advocate because, in most instances, the visual will complement the verbal.

Consider Johnnie Cochran's trial strategy in the O.J. Simpson case. Although he was equipped with state of the art technology (donated free of charge by the InVzn Trial Link system), his most effective advocacy was not through CGEs but with verbiage, such as "if the glove don't fit, you must acquit" and "genocidal racist Mark Fuhrman." *See* Piganelli telephone interview, *supra* note 15. Such rhetoric, of course, was effective in persuading the jury to render a not-guilty verdict in a trial in which it often appeared as though the technology just got in the way.

Research indicates that visual information aids juries in three specific ways that are extremely useful, if not essential.[70] The first is that information must be *imaginable* to be assimilated and believed, which means that it must prompt sensory imagery.[71] Oral testimony using abstract, technical, or nebulous terms such as, "a flat test body connected to the second end portions of said blades so as to be suspended from the fixed part and to be able to move in translation in the said plane along a sensitive axis, said flat test body extending at least partially into said space"[72] is not exactly the most easily conveyed or most concrete explanatory language and therefore usually fails to convey sufficient information to the jury.[73] Concrete data is far more persuasive, as has been shown in studies where opinions were more easily changed when concrete rather than abstract data was used.[74]

The second way visual information aids juries is *proximity*. Proximity indicates how close the information and data is to the jury; that is, how many mental steps the jury must take to understand the

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70. *See generally* Clancy, supra 63 (describing the effect of vivid information in making the case for the admission into evidence of animations that depict accidents).

71. *See* RICHARD NISBETT & LEE ROSS, HUMAN INFERENCE: STRATEGIES AND SHORTCOMINGS OF SOCIAL JUDGMENT 47 (1980) (describing factors that influence the vividness of information through enhancement of emotional impact, including degree of detail and specificity about actors, actions, and situational context that contribute to imaginability of information and its tendency to prompt sensory imagery.). "The information that 'Jack was killed by a semitrailer that rolled over his car and crushed his skull' has more impact than the information that 'Jack sustained fatal injuries in an auto accident.' The concreteness of the first statement and resulting involuntary imagery contribute substantially to its emotional impact." *Id.*

72. Although these words may not convey a powerful or clear image, the actual imagery displaces any incorrect assumptions and makes the description more compelling and understandable. *See* CD-ROM Example #15 (depicting "a flat test body connected to the second end portions of said blades so as to be suspended from the fixed part and to be able to move in translation in the said plane along a sensitive axis, said flat test body extending at least partially into said space" so that it is more easily understandable).

73. *See* NISBETT & ROSS, *supra* note 71, at 47 (contrasting the effect on a jury of a vivid description using concrete descriptors with the effect of a description without concrete descriptors; in the first instance the jury thinks "[w]hen semitrailers roll over on people and crush their skulls it is time to take action . . ."; however, in the second instance, it thinks "when someone sustains fatal injuries in an auto accident, it seems to be one of those unfortunate things that sometimes happen").

74. *See* Craig A. Anderson, *Abstract and Concrete Data in the Perseverance of Social Theories: When Weak Data Lead to Unshakable Beliefs*, 19 J. EXPERIMENTAL SOC. PSYCHOL. 93, 107 (1983) (finding it was much harder to change a belief with abstract data than with concrete data both right after a belief was formed and one week later).

information being presented. The same information perceived visually is more easily believed and has a greater impact than when gathered from an indirect, second-hand source — the words of another — because visual information is direct (an actual image) instead of indirect and abstract (words (step #1) used to create a mental image (step #2) in the mind of the jury).[75]

Finally, visual information is easier for the human mind to *remember*.[76] Research has indicated that picture recall is significantly better than either word or sentence recall.[77] This is particularly important because a jury will not, and really cannot, consider that which they cannot remember. Consequently, they will make a decision using only that part of the evidence that they readily recall. Using visual information is not illegitimate manipulation of the jury; instead it is merely getting them to do their very legitimate function better — remembering what happened at trial in order to render the best verdict possible.

2. Efficient Communication with the Jury

CGEs also have an advantage over words alone because they are often more *efficient* tools of communication. Humans assimilate information mentally at a much faster rate than it is verbally expressed.[78]

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75. *See, e.g.*, Brandt v. French, 638 F.2d 209 (10th Cir. 1981) (describing a situation where counsel could have described the leaning of a motorcycle in transit to the jury, but instead chose to let them see it for themselves on film).

76. *See* NISBETT & ROSS, *supra* note 71, at 51 (describing that the memory of pictures is astonishingly good and markedly better than the memory of either words or sentences). Studies show that recognition and recall of concrete words, such as "boat," are substantially better than of abstract words, such as "justice." Researchers posit that perhaps "concrete words are coded [by the brain] both as *images* and in verbal forms whereas abstract words may be coded only in verbal forms." *Id.* (emphasis added).

77. *See* Jeffery R. Boyll, *Psychological, Cognitive, Personality and Interpersonal Factors in Jury Verdicts*, 15 LAW & PSYCHOL. REV. 163, 173 (1991) (noting that as much as two-thirds of what is heard may be immediately forgotten and that one of the consequences of this poor memory retention may be that a juror might associate some facts or witnesses from one side of the case with the wrong party); *see also* Windle Turley, *Effective Use of Demonstrative Evidence — Capturing Attention and Clarifying Issues*, TRIAL, Sept. 1989, at 62 (citing a study showing that when jurors given visual presentations retained 100% more information than those given oral presentations, and when oral and visual presentations were combined, jurors retained 650% more than those given oral presentations alone).

78. *See Active Listening*, PUB. MGMT., Dec. 1, 1997, at 25, 25 (noting that boredom is a barrier to active listening). "Our minds can process information at a rate of about 600 words per minute, while we speak an average of between 100 and 140

Thus, even the most articulate and rapid orator will, on some level, dull a jury. CGEs, as communication tools, are simply more efficient than the spoken word. If a "picture is worth a thousand words," then a computer-generated animation says a thousand words, sings a thousand songs, and paints with a thousand colors all at once. Since the human mind can easily handle such rapidly incoming data, these exhibits do not overly bombard the senses of the members of the jury, but actually keep them alert by utilizing a greater amount of their capacity to receive information in a way in which they are accustomed, assuming they watch television or go to movies more often than they listen to speeches or sermons.[79]

3. The Best Type of Visual Aids

Not only are visual aids with words better than words alone, but CGEs are the *best type* of visual aids. CGEs can portray a picture or event much more clearly than verbal expression or rudimentary visual depiction, such as a drawing on an easel.[80] This may be due to simultaneous causes. On the message-sending side (the attorney or witness), human speech cannot generate the amount of information that a computer can generate and display. On the message-receiving side (the jury or judge), the increase in the amount of information that is absorbed by the average person through visual graphics, especially given the effects of television,[81] enables them to more clearly understand

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words per minute." *Id.*

79. For years psychologists have known that different children learn differently; some by seeing information, some by hearing information, and some by feeling or experiencing information. *See* Sheryl Riechmann-Hruska, *Differences in Learning*, 24 EQUITY & EXCELLENCE, Fall 1989, at 25, 25–26. In recent years studies have focused on learning styles using the Myers-Briggs Type Indicator to classify people as to how they best solve problems and learn. People combine preferences for extroversion/introversion and sensing/intuitive to make four basic combinations. Seventy-five percent of the general public prefers the sensing, or concrete, learning pattern, either extrovert or introvert. This learning pattern type strongly prefers to have their senses actively engaged when they learn or problem solve. They learn best with tools such as simulations. *See* Charles C. Schroeder, *New Students — New Learning Styles; College Students*, CHANGE, Sept. 1993, at 21.

80. *See* Wesley R. Iversen, *Animation Takes the Stand; Judging the Effectiveness of Computer Animations in the Courtroom*, COMPUTER GRAPHICS WORLD, Nov. 1991, at 48, 48 (arguing that computer animation can captivate and hold a jury while making complex technical issues understandable. "If you bring in [computer animation] that's done well, and the production end of it is run smoothly, you've got everybody's undivided attention, no question about it." (quoting attorney Thomas E. Liptak)).

81. *See* Robert F. Seltzer, *Computer Animated Evidence Has Its Day in Court*,

complex concepts because the information is perceived with two senses (sight and hearing) instead of only one sense (hearing).

A simple reason to use CGEs in advocacy, then, is their ability to grab a jury's attention more firmly, and for a longer period of time, than conventional static exhibits or mere words. This also may be attributable to both the human mind's rapid reception[82] of visual stimuli such as television.[83] An attorney can either ignore the fact that jurors get most of their information from television (sight and hearing) rather than just the spoken word (hearing) or even the written word (sight), or the attorney can choose to connect with the jurors in a way that the juror is comfortable and in a manner that the juror is accustomed to before ever stepping into a courtroom.[84]

In addition to benefits that relate to the raw, efficient transmission and reception of information, CGEs are more conducive to how jurors reason with the information they receive. Often, evidence in a case is presented only witness by witness, or issue by issue — a methodology which assumes that the jury is using inductive reasoning. But empirical research[85] indicates that when given a heavy load of information over a relatively short period of time, juries abandon the inductive approach, relying instead on the development of a story.[86] Jurors tend to construct a story out of the information they are given and then to choose the verdict that is most similar to their story.[87] Upon being questioned as to why they made certain decisions about a case, jurors

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MICH. L. WKLY., Apr. 20, 1992, at S2 (arguing that television has made visual learning comfortable for jurors). In fact, the average American spends 4 hours per day watching television, and the television set is turned on more than 7 hours per day. *See* Ben Boychuk, *Is TV Hurting Kids' Education?*, INVESTOR'S BUS. DAILY, Dec. 19, 1997, at A1.

82. *See Active Listening, supra* note 78.

83. *See* Seltzer, *supra* note 81.

84. *See id.*

85. *See generally* Deanna Kuhn et al., *How Well Do Jurors Reason?*, 5 PSYCHOL. SCI. 289 (1994) (showing that some jurors draw on evidence selectively to construct a single story of what happened, disregarding any evidence that doesn't fit their constructed story, while others weigh the evidence against a framework of alternative verdicts, realizing that no one verdict theory fits all of the evidence). Kuhn hypothesizes that the retention by individual jurors of evidence presented during testimony may help to counterbalance other jurors who exclude from memory evidence not consistent with their adopted story of the events. *See id.*

86. *See* REID HASTIE ET. AL., INSIDE THE JUROR 192–218 (Reid Hastie ed., 1993) (explaining how jurors reason using a story model).

87. *See id.* at 24.

often relate the story they constructed in their minds, seeming to regard it as the truth.[88]

Thus, if jurors are using the evidence presented to them to develop a story that they will later bring into deliberations, attorneys must present their cases in a manner that will be amenable to incorporation into the story being constructed. With complex issues involving, inter alia, moving objects and accidents, inundating the jury with oral, abstract evidence will not aid in their production of a story for the jury. CGEs offer compact information in clear, ordered sequence, and can therefore be easily adapted to the story form of reasoning most jurors use.

One commentator has recommended that CGEs should be considered in the following situations:[89]

(1) the visualization of an event, object, or condition is complicated by dynamic factors that may be difficult to explain verbally;[90]
(2) the 'real time' of the event is important, such as the timing of an automobile accident;[91]
(3) physical re-creation of the event or condition is impossible or impractical;[92]
(4) the event or principal to be explained depends on many, related, and dependent factors that render the subject too complex for mere verbal presentations;[93] or
(5) other visual presentations may not be sufficiently flexible to yield a complete and clear explanation — for example, a video may not

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88. *See* Kuhn, *supra* note 85, at 289.

89. *See* Hannan, *supra* note 10, at 356

90. *See* CD-ROM Example #16 (showing the scientific principles that make it possible for a jet airplane to fly, with several critical measurements on important aerodynamic information and what circumstances are necessary to cause a mid-air stall causing the jet wings to lose "lift").

91. *See* CD-ROM Example #17 (showing a forklift worker pulling a trailer and getting out of the forklift, walking back to the trailer to make some adjustments, while the forklift and trailer begin to roll backwards and pin the worker in between the forklift and trailer, and showing the pertinent time intervals involved to address the issue of whether he had enough time to get out of the way as it rolled in reverse and pinned him).

92. *See* CD-ROM Example #18 (showing an environmental spill and contamination over and underneath a large parcel of land, infiltrating many acres of land and ground water over time).

93. *See* CD-ROM Example #19 (showing the projected medical effects on the human skeleton over twenty years due to osteoporosis as it will affect a plaintiff who was misdiagnosed in a medical malpractice case).

allow viewing from a different perspective to enable the jury to perceive events happening simultaneously beyond the camera's eye.

The key is to tell a simple story to the jury. For example, as one trial consultant tells his clients:

> Explain the subject, set forth the basic scenario or scene in question, map out the key players in the story and how they relate to one another, show what went wrong (or did not go wrong), and why, illustrate how the various events fit together chronologically, and, finally, let the jury know why it is there in the first place — to mete out justice, that is, to make sure the story that has just been told to the jury has the right and proper ending: a fair and just verdict for your client.[94]

C. Computers as Aids in Litigation Case Management

Although computers are avid performers in the courtroom,[95] less than one out of every ten cases actually goes to trial,[96] so it is important to note how their additional value actually begins long before trial. Computer case management involves the use of computers in all stages of a dispute prior to the trial. There are many different software programs that are categorized as "litigation support software," where

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94. Piganelli telephone interview, *supra* note 15. Piganelli advocates the use of this basic story board by attorneys and suggests how each of these critical steps in the telling of the story can be shown to the jury with the use of CGEs. *See id.* He also suggests that during trial preparation, attorneys should use flow charts or logic charts for opening statements and for each witness to help them decide what CGEs they will use at each juncture of the trial. *See id.*

95. As courtrooms are becoming computerized, one breakthrough that is beyond the scope of this Article but which should be noted here is called "real time" reporting. A computer translates the court reporter's stenography as he or she enters the keystrokes. The court record is displayed on monitors or computers in front of the judge and counsel, who can then be much more efficient in spotting issues and noting points of the testimony. By using various programs, an attorney could, for example, record how many times a witness answered "I don't remember," and immediately address the issue on cross-examination. Real time reporting also allows the hearing-impaired to participate more fully in a trial.

96. *See* George L. Priest, *Private Litigants and the Court Congestion Problem*, 69 B.U. L. REV. 527, 541 (1989) (noting that "[t]he conventional wisdom is that roughly four to five percent of suits are ultimately tried to a verdict," though the exact percentage varies by type of suit).

thousands of documents are stored and can be accessed instantaneously. These programs are becoming saviors to attorneys with document-intensive cases.[97]

The first benefit of these programs is that the information need not be manually typed into the computer by a secretary or other data entry personnel to become part of the retrievable database. With the use of a "scanner,"[98] the documents can be "scanned" into the computer and stored in a computer hard drive. There are two processes to enter the documents into the computer: (1) imaging and (2) Optical Character Recognition ("OCR").

1. Computer Imaging

Imaging is simply copying a document into the computer. A contract, for example, would appear on the computer screen exactly how the contract appears in document "hard-copy" form. Although the computer has the ability to zoom into, highlight, and enlarge certain parts of imaged documents, the document itself — and the critical text contained therein — cannot be changed, altered, or manipulated. This technology is useful for documents that would never be altered in a trial, such as actual trial exhibits or discovery, including contracts, receipts, letters, photographs, or X-rays. Indeed, the fact that the imaged documents are "encrypted"[99] — so that they cannot be

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97. An example of document management technology is Summation Blaze® by Summation® Legal Technologies, Inc.

98. A scanner is a piece of computer equipment that works somewhat like a copy machine or fax machine. It takes a paper document or photograph, bounces a beam of light off the image and measures the light reflected back from the face of the document. The scanner divides the image into a grid of boxes (anywhere from 70 to 600 boxes per inch, or bpi, depending on the scanner) in which each box is represented by a 0 (zero) or a 1 (one), depending on if the box area is filled in with image. This process is called digitizing (converting an image to digits) and results in a "bit map" of 0's and 1's. *See* STEVEN L. MANDELL, DR. MANDELL'S PERSONAL COMPUTER DESK REFERENCE 50–52 (1993).

99. Specialized software such as SearchExpress/Legal Document Imaging® removes the ability to edit electronic evidence by encrypting the image or text document. *See SearchExpress/Legal* (visited Mar. 1, 2000) <http://www.searchexpress.com/ legal.htm>. Encryption is a method of encoding a message so that it cannot be understood by anyone who might intercept it. The encoded message can only be decoded by someone who has the key to the code. In sending encrypted e-mail of the Internet, encryption, computer software encodes a message as it is sent and the recipient's software can decode the transmission so that the designated recipient can read the message. The key to encoding/decoding is an algorithm the software uses to scramble a message. *See generally* Stewart A. Baker, *Government Regulation of Encryption Technology:*

electronically altered — is precisely why it is important to allow computer imaged documents to be admissible, authenticated evidence, even more than traditional hard copies that can be physically altered with "white-out," "cut and paste," or other various forgery or alteration techniques.[100]

2. Optical Character Recognition ("OCR")

When there are hundreds of documents that contain useful information that must not only be accessed by word or phrase within the document, but also updated, reorganized, or manipulated in other ways, optical character recognition ("OCR") technology is required to search for and *change* the information contained therein. The OCR process translates the digital bitmap[101] — the result of the scanning process, to digital text.[102] Thus, the symbols on the document (the letters or "characters") will be viewed by the computer ("optical") and analyzed and interpreted ("recognized") so that the document can be stored in a full-text file[103] that can now be revised and manipulated like a word-processing document.

For example, the OCR software "knows" how to optically recognize the characters — the dots that make up letters and numbers — in numerous different fonts, so that it "realizes" that "H," "H" and "H" are all the letter "H." It therefore enters that letter into a text file, just as a person would punch the letter "H" on the keyboard. This speedy process is valuable for information that exists in written

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Frequently Asked Questions, *in* DOING BUSINESS ON THE INTERNET 1996 (PLI Patents, Copyright, Trademarks & Property Course Handbook Series No. G4-3988, 1996), *available in* WL 452 PLI/Pat 287 (describing encryption, how it works, and the government's role in its regulation).

100. *See infra* Part III (suggesting the need to interpret the Federal Rules of Evidence and Civil Procedure to more readily allow electronically scanned and imaged documents in evidence and to encourage their use at trial and during discovery).

101. *See* MANDELL, *supra* note 98, at 51.

102. *See id.* (describing how OCR software examines the portion of the digitized bitmap that corresponds to a scanned character, like a comma or an "A," and compares the result of the scan to alphabet characters). When the software finds a match it translates that portion of the bitmap to a standard ASCII character (American Standard Code for Information Interchange, a kind of universal computer code) that word processing software can recognize and convert into whatever computer code it uses. Depending on the resolution of the scanner and the abilities of the software, many types of scanned document fonts can be successfully recognized. *See id.*

103. *See id.* at 12 (describing how many types of programs can use information stored in an ASCII format).

form but not on disk, so that there is no other way of entering it into the computer other than re-typing it in its entirety. A computer recognizes and processes individual characters much faster and more accurately than a human at a keyboard can recognize and type them.[104]

Since those cases that demand litigation support software are voluminous in documentation, the resulting computer files must have massive storage capability, and the system accessing the information must be able to sift through all of it and retrieve designated pieces at lightning speed. In choosing the software, ease of use, storage,[105] and access capability are essential considerations. Because most programs are designed to handle enormous amounts of information; it therefore becomes mainly a matter of program preference.[106]

For storage, CD-ROMs (Compact Disc Read Only Memory) have become extremely popular.[107] They hold 15,000–20,000 scanned

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104. *See* James E. Powell, *Try Omnipage Pro 8.0*, WINDOWS MAG., Dec. 1, 1997, at 194, 194 (describing one software package available in 1997 and comparing it to other OCR programs). Using a 856 word story, the author was able to scan the document, perform OCR, and manually check 5 questionable words — all in 45 seconds. *See id.* He estimated that a typist would need 23 times as much time to type the same article into Microsoft Word at a typing speed of 50 words per minute and 100 percent accuracy. *See id.* Still, OCR has its limitations, as a human must still review what the OCR has entered for any transmission mistakes, such as the letter "P" being mistaken for an "R." In other words, every time the OCR system makes a "typo," a human being must be available to fix it. In technical terms, after the OCR has read and entered the characters from the document, it produces what is referred to as "dirty ASCII." In a process aptly known as "clean up," a technician proofreader must go through each page and fix any mis-read character errors in order for the resulting file to be 100% accurate and therefore useful when searching for specific text. Clean up is necessary because a computer will search only for requested text — spelled correctly — and therefore will not find and retrieve a reference if one of the characters is misspelled.

105. It is estimated that up to 30% of the data stored on computers is never reduced to printed form. *See* Joan E. Feldman & Rodger I. Kohn, *Collecting Computer Based Evidence*, N.Y. L.J., Jan. 26, 1998, at S5.

106. Some windows-based litigation support programs that have proven effective include Paradox, Dbase (although not just litigation-support specific), FoxPro, ZyIndex and ZyImage, DB/TextWorks, Intellect, Summation Blaze, Concordance, Discovery Pro, JFS Litigator's Notebook, and Excalibur EFS.

107. Another litigation use found for CD-ROM technology is the CD-ROM brief, which stores a traditional brief with hyperlinks to other text. For example, a brief on paper contains case cites for authority, but a CD-ROM brief not only displays the case cite, but a hyperlink where the judge is just a mouse "click" away from the entire case. Anything can be hyperlinked, including transcripts, pleadings, video files, and depositions; the CD-ROM may also store any accompanying sounds as well. *See* CD-ROM Example #20 (showing an example of text with hyperlinks from an actual CD-ROM brief). CD-Rom Example #20 is an "e-brief" provided by RealLegal.com, a developer of new applications and services for law firms, courts, and court reporting

document pages, or approximately the contents of five to eight banker's boxes.[108] Although "re-writable" CD-ROMs are gaining popularity, data and scanned images on a standard CD-ROM cannot be changed or erased. A CD-ROM can move from displaying a document to playing a videotaped deposition to running a CGE. The newest storage device is DVD (Digital Video Disc or Digital Versatile Disc). DVDs offer the best quality in displaying video, data, and sound and can hold the contents of seven CD-ROMs using the most advanced data compression and laser technology.[109]

D. Putting It All Together: The Paperless Trial

When both the plaintiff and defense utilize litigation support software, they have the ability to conduct a "paperless trial." The late Judge Carl B. Rubin, United States District Judge for the Southern District of Ohio, was one of the first judges to conduct paperless trials. He asserts that paperless trials are "less expensive, more understandable and proceed faster," and that jurors "pay more attention."[110] His most enlightening personal experience was after a trial in which one side utilized the support software, and the other side did not. He reports that a juror asked him after the trial about the side who did *not* use the software. The juror asked what is soon to become a critical question: "What did [the side that did *not* use the computer technology] have to hide?"[111] Thus, perhaps the concern about CGEs will be turned on its head: instead of worrying about the high cost and possible prejudicial

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firms.

108. *See* Misko & Ames, *supra* note 3, at 9.

109. *See* Richard Egan, *Hardware User* (visited Jan. 15, 2000) <http:// www.zdnet.com/ products/special/current/dvd.html> (hard copy on file with the *Harvard Journal of Law & Technology*).

110. Misko & Ames, *supra* note 3, at 17. When asked why a judge would choose to have a paperless trial, Judge Rubin responded:

> Instead of lawyers being required to prepare elaborate exhibits, jury books, overhead transparencies or blow ups, all they have to do is scan their exhibits into the computer . . . . In the old days, [if] there was [sic] an exhibit the lawyers wanted the jury to look at, the jury would pass it from hand to hand . . . . [It] would take about twenty minutes and the rest of us just sat there. Now you don't have to do that. Now [the exhibit] is put on the monitor and [the jury members] see it at the same time . . . . [It] is the greatest advance in trial techniques that I have seen in over twenty-one years as a federal judge.

Id. at 16–17.

111. *Id.* at 17.

effect of using CGEs, the worry may become a concern for what negative inferences fact-finders may make when an advocate *fails* to use CGEs — exhibits which juries seem to find so helpful.

III. COMPUTER-GENERATED EXHIBITS AND ADMISSIBILITY CONCERNS

Once we recognize that CGEs are the powerful and valuable tools of communication as set forth in Part II, the general question then becomes: how much of that value is diminished by the chance that the judge will not allow the jury to see or experience CGEs at trial because they are deemed inadmissible? To answer the question, we must determine, first, the extent to which the Federal Rules of Evidence and Civil Procedure stand as obstacles to the admission of CGEs at trial; second, how attorneys can overcome those obstacles; and third, whether, as a policy matter, those obstacles should be lowered.

Although it should not be the case, CGEs sometimes appear to fit awkwardly into the current rule structure as defined by the Federal Rules of Evidence[112] and the Federal Rules of Civil Procedure.[113] Most attorneys and judges are performing to the best of their ability under the circumstances, and because the rule structure is somewhat flexible, CGEs often can be produced in discovery or admitted in evidence at trial without many problems simply by likening CGEs to more traditional, non-computerized exhibits (such as charts, photographs, maps, or images displayed on an overhead projector, etc.). However, the growing prevalence of computerized exhibits in the legal world suggests that (1) CGEs should be specifically mentioned in the explicit text of the rules themselves (especially because CGEs, although similar to, are still not exactly the same as non-computerized exhibits), and (2) more judges should fully accept, as an interpretive matter, the legitimate place of CGEs as helpful and admissible exhibits in the

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112. This article primarily addresses the Federal Rules of Evidence, which govern the admissibility of offered exhibits in federal court cases and serve as a model for various state rules of evidence. To the extent that state cases are cited herein, it is because the applicable state rule of evidence is either identical or substantially similar to its federal rule counterpart.

113. This article also addresses, to a lesser extent, the Federal Rules of Civil Procedure, which govern the procedural requirements of the parties and the various maneuvers they can make during litigation in federal court cases, and which serve as a model for various state rules of procedure. To the extent that state cases are cited herein, it is because the applicable state rule of civil procedure is either identical or substantially similar to its federal rule counterpart.

courtroom.[114] However, until this is accomplished, attorneys and litigants seeking to use CGEs must work within an existing rule structure that, for all its functionality and utility, is beset with certain obstacles and unnecessary limitations on the use of CGEs in court.

A. Pre-Trial Disclosure of CGEs

To ensure admissibility, the attorney cannot wait until the eve of trial (or during the trial itself) to decide to inform the judge and opposing counsel that the attorney would like to introduce CGEs as evidentiary exhibits in the trial.[115] The failure to disclose the intention to use CGEs to opposing counsel and to the court much earlier on in the case will most likely result in outright exclusion.[116] The necessity for pre-trial disclosure of CGEs as a policy and as a strategic matter is justified for many reasons.

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114. Amending the rules in certain areas, interpreting the Advisory Committee's Notes to the Rules, advising trial and appellate judges to be more accepting of CGEs, and imposing a more stringent standard of appellate review on trial judges' rulings on the discretionary admissibility of CGEs will remove some of the current guesswork and inconsistent rulings regarding the admission of CGEs. This would provide for all involved — attorneys, judges, litigants, and witnesses — a more predictable and modern rule structure that is more in step with the reality of technologically advanced methods of communication. *See infra* Part IV (suggesting reforms to the Federal Rules of Evidence and of Civil Procedure and the interpretation of those rules as they relate to CGEs).

115. *See, e.g.*, MANUAL FOR COMPLEX LITIGATION § 21.466 (3d ed. 1995) (providing that discovery into the reliability of computerized evidence, especially recreations and simulations, should be conducted well in advance of trial so that one's opponent and the court have ample time to consider any evidentiary issues long before trial). Discovery includes inquiry into the accuracy of the underlying source materials, the reliability of procedures for storing and processing, and the reliability of the results obtained. *See infra* notes 136–147 and accompanying text (discussing generally the evidentiary foundation for CGEs).

116. *See, e.g.*, Shu-Tao Lin v. McDonnell Douglas Corp., 574 F. Supp. 1407, 1412 (S.D.N.Y. 1983) (excluding CGEs because they were not adequately disclosed during discovery so as to give the defendants an adequate opportunity to prepare a defense of the case); Baugh v. Gulf Air Transp., 526 So. 2d 1239, 1240 (La. Ct. App. 1988) (excluding computer animation at trial due to a lack of notice); Miss. Pub. Serv. Comm'n v. Miss. Valley Gas, 358 So. 2d 418, 420–21 (Miss. 1978) (excluding computer simulations at trial because the proponent of the exhibit refused their opponent's timely request for discovery of the simulation program and underlying data).

1. Eliminating "Unfair Surprise"

First, pre-trial disclosure minimizes any claims of Rule 403 danger of unfair prejudice based on unfair surprise because opposing counsel will have the necessary time to investigate all of the underlying facts and theories supporting the CGEs. Of course, mere pre-trial disclosure does not ensure admission, as the exhibit intrinsically may be unfairly prejudicial;[117] but, at least the easier attack on the exhibit based on unfair prejudice due to *a lack of meaningful notice* or "unfair surprise" will be eliminated if pre-trial disclosure has taken place.[118]

2. Mandatory Disclosure

Next, pre-trial disclosure provides sufficient time for the opponent to conduct appropriate discovery of the exhibit itself and affords a meaningful opportunity to depose and cross-examine persons creating the exhibit. However, given the mandatory disclosure requirements under Federal Rule of Civil Procedure 26(a)(1) ("Initial Disclosures"),[119] (a)(2) ("Disclosure of Expert Testimony"),[120] and (a)(3) ("Pretrial

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117. *See infra* Part III.B.2 (addressing Rule 403 directly).

118. *See* Symposium, *supra* note 67, at 1085 (discussing the lack of resistance to non-computerized demonstrative evidence provided proper disclosure was made before trial so that there was no unfair surprise, and suggesting the same liberal allowance should be made for CGEs when timely disclosure is made).

119. Rule 26(a)(1)(B) provides that parties shall provide to the other side — without waiting for a discovery request: "a copy of, or a description by category and location of, *all documents, data compilations, and tangible things* in the possession, custody or control of the party that are relevant to disputed facts alleged with particularity in the pleadings . . . ." FED. R. CIV. P. 26(a)(1)(B) (emphasis added). A computer animation, and certainly a simulation or recreation, would appear to fall within the literal definition of "data compilations," and might fall within the definitions of "documents" or "other tangible things" and would be "relevant to disputed facts alleged with particularity" (the proponent will have to conclude they are relevant if she wants them to be admitted at trial). If they fall within the rule, then they must be submitted "at or within 10 days" of the Rule 26(f) discovery planning meeting, which is to be held "as soon as practicable and in any event at least 14 days before a scheduling conference is held or a scheduling order is due under Rule 16(b) . . .," FED. R. CIV. P. 26(f), which is to be held, according to Rule 16(b), "as soon as practicable but in any event within 90 days after the appearance of defendant and within 120 days after the complaint has been served on the defendant." FED. R. CIV. P. 16(b). This ends up being very early in the case, relatively speaking, and is the first discovery that takes place.

120. Rule 26(a)(2) provides that parties shall provide to the other side the identity of any expert trial witness, and a written report of the expert witness containing "a complete statement of all opinions to be expressed and the *basis and reasons therefor*; the *data or other information considered by the witness in forming the opinions; any*

Disclosures"),[121] pre-trial disclosures relating to CGEs are not just recommended practice but arguably are required — provided that the judicial district has not opted out by local rule or contrary order or stipulation.

There is, of course, room for argument that CGEs would not fall within the literal definitions of the Rule 26(a)(1), (2), or (3) mandatory disclosures. With respect to Rule 26(a)(1)(B) (initial disclosure of relevant documents), it can be argued that CGEs are not "relevant to disputed facts alleged with particularity." An attorney can build the argument that CGEs are simply a reflection of a particular witness's testimony (demonstrative evidence), and in that sense do not necessitate disclosure at this early juncture as a "document, data compilation, or tangible thing." The argument would follow that, at most, the parts of the CGE — such as the documents containing the underlying data that comprise it — may require disclosure, but the synthesized sum of those parts — the CGE itself — does not. Still, to the extent that the proponent of the CGE is going to argue that it is exactly the manifestation of the CGE itself and not merely the data composing it that is relevant at trial, then those same arguments probably will deem it relevant for purposes of Rule 26(a)(1)(B) disclosure. If it does fall within Rule 26(a)(1)(B), then attorneys may prefer to wait to create the

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exhibits to be used as a summary of or support for the opinions . . . ." FED. R. CIV. P. 26(a)(2) (emphasis added). Thus, if any expert will testify using a CGE and the CGE has data or information considered by them in forming their opinion or is a summary of or supports their opinion, that particular CGE must be disclosed as part of the expert witness's Rule 26(a)(2)(B) report. *See id.* This is significant because often an expert witness is the witness through whom a computer animation is displayed and offered at trial. The 26(a)(2)(B) report is due "at least 90 days before the trial date" or if used to rebut the other party's 26(a)(2)(B) report, then "within 30 days" after the disclosure of the other party's Rule 26(a)(2)(B) report. *Id.* This comes much later in the discovery process (three months before trial) than the Rule 26(a)(1) initial disclosures, which take place at the very beginning of the discovery process.

121. Rule 26(a)(3)(C) provides that parties shall provide to the other side "an appropriate identification of each document or other exhibit, including summaries of other evidence . . . ." FED. R. CIV. P. 26(a)(3)(C). It is clear that all CGEs must be identified and summarized under this rule. If not already produced and submitted pursuant to previous rules, court order, or other discovery, the rule requires submission at least 30 days before trial. *See id.* The rule also requires any objections to the admissibility of such exhibits to be filed 14 days thereafter, unless they are 402 (irrelevant) or 403 (unfair prejudice, confusion, waste of time, etc.) objections. *See id.* These objections come two months later (30 days before trial), after the expert witness reports under 26(a)(2)(B) (90 days before trial), presumably because it usually does not take as much time to analyze and consider non-expert exhibits.

animation or re-creation so it does not have to be revealed during the initial disclosure.

Less room for argument exists under Rule 26(a)(2), which requires disclosure of "the data or other information considered by the [expert] witness in forming the opinions; any exhibit to be used as a summary of or support for the opinions."[122] Here, an expert's use of a CGE only as demonstrative evidence (such as an animation) not formally admitted as a substantive exhibit (such as a re-creation or simulation) bypasses the first part of Rule 26(a)(2) because it was not considered in *forming* the expert's opinions, but was made *after* his opinion was formed. However, the second part of the rule still requires disclosure if the CGE is being utilized as a "summary of or support for the opinion," which seems to clearly encompass a relevant CGE (including animations, re-creations, and simulations) because, as demonstrative evidence, its very purpose is to support, clarify, and summarize the expert's opinion.

If a CGE is entered or used during the testimony of an expert, Rule 26(a)(2) demands disclosure at least 90 days before trial. But a tempting loophole exists whereby the CGE may be entered into court through a lay witness because such an avenue requires disclosure only 30 days prior to trial under Rule 26(a)(3) — if the judge has not required earlier disclosure pursuant to a pre-trial order. Once admitted as an exhibit via the lay witness, however, the expert witness also may attempt to use the CGE at trial to answer inquiries and describe facts and opinions — just as if the exhibit had been created and disclosed for purposes surrounding the expert's testimony, except that the opposition had 60 fewer days to review it. Such a circumvention of the rule should not be tolerated.[123]

Rule 26(a)(3) requires *all* exhibits (not just expert witness exhibits) to be identified and summarized at least 30 days before trial. However, in meeting this rule, attorneys may liken CGEs more to witnesses than to photographs. Identifying and summarizing a photograph requires production of the photograph itself, where the same for a witness calls only for a name and description of what the witness will convey. Since an exact transcript of an attorney's question and answer examination of a witness is not necessary for this rule to be satisfied, displaying an entire animation, simulation, or re-creation before the trial might not be either. A lawyer could argue she need only summarize the contents of a CGE — "it will show the accident from the driver's view," for

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122. FED. R. CIV. P. 26(a)(2)(B).

123. *See infra* Part IV.B.1 (discussing changes to Rule 26(a) so as to not allow its circumvention because bypassing the rule would be unfair and disingenuous).

example — leaving the opposition to be blind-sided by its impact in court. Such a strategy to avoid production of an entire CGE — offering only a verbal summary of it — would probably amount to its exclusion at trial. This rule should clearly state that the CGE itself, not just a summary, must be disclosed at this stage.[124]

If an attorney faces opposition using CGEs in a jurisdiction that has opted out of the mandatory disclosure scheme in Rule 26(a) and does not have such mandatory disclosure rules as part of the Local Rules,[125] she should definitely request disclosure of CGEs using traditional forms of discovery, such as Rule 33 "Interrogatories," Rule 30 "Depositions," or Rule 34 "Request for Production of Documents and Things." Indeed, requests for any CGE to be used or made should become a standard interrogatory, deposition question, or document request if there are no applicable mandatory disclosure rules that would otherwise require their automatic disclosure.

3. Judicial Economy and Early Disclosure

Beyond fairness and notice concerns, there are many efficiencies to be gained with early pre-trial disclosures of CGEs. Early discovery affords an opportunity to obtain stipulations or court rulings on admissibility long *before* trial, thereby eliminating interruptions during the trial to resolve disputes through the time-consuming processes of objections, sidebar exchanges,[126] and legal argument. Early pre-trial disclosure also enhances the flow of the trial because many additional trial inefficiencies can be eliminated, such as the marking of every single

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124. *See id.*

125. The Federal Rules give federal courts the latitude to opt out of using the federal rules in some instances, replacing them with local rules. *See* FED. R. CIV. P. 26(a)(1) (allowing federal courts to choose to follow local disclosure rules). In California, three of the four federal districts have chosen not to follow the mandatory early disclosure requirements listed in Rule 26(a)(1). *See, e.g.*, CAL. E. DIST. R. 26-252(a)–(b) (no automatic disclosure as in Federal Rule 26(a)). This puts the burden back on the litigants to ensure that they submit documents early enough in the discovery process to get a ruling on their admissibility.

126. To the extent that there are inevitable arguments over exhibits or parts of exhibits, one should not argue over the admissibility of CGEs in front of the jury. It is unfair to leave the impression with the jury that the proponent had some computerized information that the other side does not want them to see — "what's that tricky lawyer trying to hide?" Federal Rules of Evidence 403 (unfair prejudice) and 103(c) (which instructs judges to keep proceedings on admissibility of an exhibit outside the hearing of the jury) are strong reasons for a judge to disallow argument on an exhibit's admissibility in the hearing of the jury. *See* FED. R. EVID. 403, 103(c).

exhibit during trial. To the extent that stipulations are made because there was ample time before trial to consider such stipulations, courts can also forego the painstaking process of "laying the foundation"[127] for every exhibit, even for complicated CGEs.[128]

4. Strategic Reasons for Early Disclosure

In addition to bringing greater efficiency to trials so that the jury's time and attention is focused on resolving the core factual disputes in the trial, there are certain tactical advantages to arriving at a stipulation or receiving a ruling from the judge in advance on the admissibility of exhibits, especially CGEs. The first is that a case is more easily prepared if the attorney using a CGE knows in advance whether or not that CGE will be admitted. Valuable resources — most prominently time and money — are spent in the development of CGEs for trial;[129] thus, attorneys presenting CGEs often will make them the centerpiece of their advocacy, relying heavily upon them to communicate much of their trial message and what they believe is the most critical information to the jury. As such, attorneys' strategic decisions with respect to the drama of the trial, the clarity of presentation, and jury perception are all intricately involved with, and dependent on, the usage of the CGE they have created. However, without assurances long before trial that their CGE will be allowed in evidence at trial, counsel will, in effect, have to prepare *two* cases — (1) the case she would put on *with* CGEs, and (2) the case she would put on *without* CGEs (a case which undoubtedly would have to rely more on the verbal testimony of witnesses and "traditional" non-computerized exhibits to paint a non-confusing, but still compelling mental picture). Preparation for two cases is too large a burden to carry for attorneys and their clients.

Also, in the event that witnesses and attorneys prepare for trial using CGEs that are subsequently excluded immediately preceding the trial, then the witnesses, attorneys, and clients will be unnecessarily burdened at trial, even more so than if they had never generated the

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127. *See infra* Part III.B.3 (discussing Rule 901 "authentication" of exhibits — a process referred to as "laying the foundation" of the exhibit).

128. Strategically, however, an attorney still has an incentive to lay the foundation in front of the jury at trial in order to gain the jury's trust and confidence in the integrity of the CGE. As a result, laying a strong foundation at trial (not just a stipulation) might have that desired effect — at least at first when the jury is deciding whether to trust the exhibit.

129. *See* Micheletti, *supra* note 14, at 12 (explaining that the cost of animation support varies from a few thousand to a few hundred thousand dollars).

CGEs at all. Witnesses who have prepared for trial for weeks or even months with helpful and compelling CGEs might lose confidence or appear less comfortable on the witness stand if at the last minute the judge rules that they must testify without referring to the familiar CGEs that help them explain their testimony. Similarly, although attorneys are paid to be professional advocates and spokespersons, it is still possible for an attorney to feel very uncomfortable right before trial if significant CGEs central to the case are determined to be inadmissible and therefore unusable during their opening statement. Also, clients who ultimately have to pay for CGEs may appear frustrated or angry without explanation in front of the jury, thus harming their overall credibility and demeanor simply because they are upset over the recent news that a large part of the time and money spent on their case, the cost of the CGEs, was for naught.

Knowing earlier whether or not a CGE is admissible can save a client's money and his attorney's time and effort because there is more time to alter strategies and focus on preparation of the case. This is especially true if only *part* of the CGE is deemed inadmissible. Early disclosure would give the proponent of the exhibit the time to make any necessary adjustments or redactions to the CGE so that it still might be used, even if revised, to meet any evidentiary concern. Note, however, that it often takes longer to edit or redact and reformulate a CGE than a posterboard or overhead transparency.[130]

5. Disadvantages of Early Disclosure

Despite the advantages, there is a strategic cost or disadvantage associated with early disclosure of CGEs where one attorney is using them while her opposition is not: the attorney may, in effect, be revealing unnecessarily much more of her trial strategy weeks or even months before the trial and in a *much more detailed* fashion than her opponent. Further, a phenomenon exists where details in exhibits, while adding clarity and persuasion to the case, simultaneously cement one specific story in place. Thus, the very thing that makes an animation so valuable at trial — that it communicates so much information, so efficiently and graphically — also makes it difficult to disavow any portion of that detailed story later. To the extent that an animation or re-creation is produced and submitted early in the case, the client and witnesses — now essentially "locked" into every minute detail set forth

130. *See* Piganelli telephone interview, *supra* note 15.

in the animation — become disadvantaged in relation to their opponent who is utilizing non-computerized, non-detailed exhibits that, for example, simply list the elements of the cause of action or place critical events on a time-line. This disadvantage in lost flexibility or adaptability to changing trial circumstances occurs because such non-detailed exhibits (a poster board simply listing a time-line of events as opposed to a computer animation detailing those events) offer the flexibility and malleability of an outline during trial. Thus, non-complicated exhibits can sometimes provide a true benefit over the confinement of an explicitly detailed, completely computerized story submitted weeks or months before the opening statements.

6. Advantages of Early Disclosure Outweigh Any Disadvantages

Whatever downside there is to early disclosure, it is outweighed by the fact that CGEs are useless unless they are utilized at trial by the fact-finder. Therefore, the attorney needs to confirm that decision as early as possible. If the "bad news" is going to be that a party's CGE will not be admitted, the sooner the lawyer for that party gains that knowledge, the sooner she can adjust her trial strategy and trial preparation accordingly (and save any further costs in additional CGE preparation before trial).

Moreover, early disclosure requires the judge to take a position on the admissibility of specific CGEs for the trial. This provides the parties a sense early on in the case of where the judge stands on the usage of CGEs at trial. Although judges are free to change their initial rulings, they are not very likely to use their judicial discretion to make an adverse last minute ruling against a CGE on "technophobic"[131] grounds.

One final benefit of early disclosure of CGEs is that it can greatly increase a party's bargaining position early in the case. For example, in a case involving a large amount of complicated facts, a CGE clarifying those facts into a concise digestible story can demonstrate the strength of the case or, at the very least, the client's and lawyer's apparent belief in the strength of their case as evidenced by the fact that the party is seriously preparing for trial by spending the time and money for powerful (and expensive) CGEs. The adversary is then given time to develop their own CGEs to "fight fire with fire," or possibly to avoid a poor showing in front of the jury for failure to take the time and

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131. A "technophobe" has "an abnormal fear of or anxiety about the effects of advanced technology." RANDOM HOUSE UNABRIDGED DICTIONARY 1950 (2d ed. 1993).

energy to show the jury their theory of the case.[132] The opposition is at least better informed to make the decision to settle rather than to spend precious resources to continue the case.[133]

Whether a CGE overwhelms the other side due to its compelling nature or unwittingly reveals a weak case, CGEs remain desirable because they have the effect of defining the strength or weakness of the case, and therefore tend to promote some kind of settlement — the very policy goals of discovery. In terms of judicial economy, settlement is helpful for our crowded federal dockets.[134] Although settlement through coercion should not be a goal of the system, CGEs, especially at an early stage in the litigation process, help to crystallize critical facts and issues for the attorneys and litigants and therefore can serve as a legitimate means of facilitating settlement. As such, the rules themselves, and judges interpreting those rules, should not only encourage the use of CGEs, but should do so *earlier* in a case, rather than later.[135]

B. General Admissibility Standards for CGEs

Although computerized exhibits emanate from new technology, CGEs are still just *trial exhibits* offered by one side or the other. Therefore, as offered exhibits, the same general rules of admissibility should, and do, apply.[136] Thus, whether an exhibit is displayed by using

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132. *See* Ronald J. Rychlak & Claire L. Rychlak, *Real and Demonstrative Evidence Away From Trial*, 17 AM. J. TRIAL ADVOC. 509, 509–10 (1993) (explaining that attorneys are like teachers and must instruct the judge and the jury effectively so that they can relate to the attorney's arguments; prepared photos and drawings put people on notice that the attorney is on top of the case and intends to litigate fully).

133. *See infra* Part VI.A.2 (discussing the cost inequity issues and whether CGEs can be used to enhance one's bargaining position simply by showing a willingness to outspend an opponent). By 1992, it was estimated that computer-generated displays had been used in 858 cases in the United States where litigation took place between major companies. In these, all but fifteen settled out of court and in all fifteen cases that went to trial, the side using CGEs was successful. *See* Marion McKeone, *Making or Breaking the Case: Computers in Court*, L. SOC. GAZETTE, Apr. 29, 1992, at 5.

134. A recent report from the Administrative Office of the United States Courts states: "The major trend emerging from the last five years of bankruptcy, civil, criminal, and appeals data is that the federal courts' caseload has increased." ADMINISTRATIVE OFFICE OF THE UNITED STATES COURTS, JUDICIAL CASELOAD: A FIVE YEAR PERSPECTIVE 1 (1998), *available at* <http://www.uscourts.gov/caseload.pdf>.

135. *See infra* Part IV (suggesting certain explicit changes to the Federal Rules of Civil Procedure and Advisory Committee's Notes so as to encourage judges to act early on CGE use).

136. There are no special evidentiary rules that apply only to specific types of

a computer or some other traditional non-computerized display technique, that exhibit must satisfy certain evidentiary concerns before a court can formally admit it as evidence, or even allow it to be referred to in court as mere "demonstrative evidence."[137]

It should be noted that some CGEs simply do not present any *special* admissibility problems. A static image, for example, can be described as a traditional diagram or picture that is merely projected with a computer and as such presents no more admissibility problems than a traditional non-computerized exhibit. For example, whether a photograph is displayed on an easel, projected by an overhead projector, or projected by a computer makes no difference in terms of admissibility. Static images manipulated with animation effects, like highlighting or zooming, are also relatively benign since they enable, for example, all four sides of a static image of a building to be viewed in one image by "rotating around the building," instead of being viewed in four disjointed pictures taken from different angles. Assuming the basic dimensions are correct, the most important issue here might be whether the emphasis provided by the animation effects are unfairly prejudicial under Rule 403 because they are not themselves evidence. This is no different, however, than an attorney underlining a portion of a contract as emphasized by a witness.

Where the debate really begins to stir regarding CGEs is around very detailed animations, re-creations, and simulations. Although these CGEs are merely graphic, moving depictions of the witness's testimony, they are not the real events captured on film or video. They are reconstructed images of what happened *according to a witness*

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exhibits. Instead, the Federal Rules of Evidence simply state that they "govern proceedings in the courts of the United States . . . ." FED. R. EVID. 101. Although different types of exhibits may raise different concerns set forth in specific Rules of Evidence, there are no wholly separate evidentiary rule systems.

137. "Demonstrative evidence" is not specifically mentioned in the Federal Rules of Evidence, which is understandable since, by definition, it is not evidence itself: it is simply a visual aid that helps explain admitted evidence, witness testimony, or attorney argument. *See supra* note 45. However, the Advisory Committee's Notes for Rule 611(a)(1) shed some light on the subject. First, Rule 611(a)(1) itself states: "Control by court. The 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 . . . ." FED. R. EVID. 611(a). According to the Advisory Committee's Notes to 611(a), this is applicable to "the use of demonstrative evidence . . . and the many other questions arising during the course of a trial which can be solved only by the judge's common sense and fairness in view of the particular circumstances." FED. R. EVID. 611 advisory committee's note (citation omitted).

(animations) or *according to input data* (re-creations and simulations), which, like any testimony or data in court, may or may not be credible.

Generally, in order to gain admissibility as evidence: (1) the offered exhibit must be "relevant," that is, tend to prove something that legally matters in the case;[138] (2) the probative value of the exhibit must not be substantially outweighed by the dangers of "unfair prejudice," to mislead or confuse the jury, waste time, or be unnecessarily cumulative;[139] (3) it must be what it purports to be — i.e., it must be identified and "authenticated";[140] (4) it must not contain hearsay,[141] or if it does, there must be an exception to the hearsay rule that would allow it in;[142] (5) if proving the contents of a writing or recording, it must meet the "best evidence" or "original document" rule;[143] (6) to the extent that it contains *opinion* testimony, rather than *fact* testimony — be it expert or lay opinion testimony — it must conform to certain requirements regarding opinion testimony;[144] (7) if it is offered as "scientific" evidence, then it must satisfy certain criteria to qualify as scientific evidence;[145] (8) it cannot violate any other rule of evidence pertaining to the general admission of exhibits;[146] and, finally, (9) if used

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138. FED. R. EVID. 401–402 (allowing only evidence logically and legally relevant to the dispute).

139. FED. R. EVID. 403 (excluding otherwise relevant evidence if its probative value is substantially outweighed by the danger of its unfair prejudicial effect, is misleading, confusing, wastes time, or is overly redundant).

140. FED. R. EVID. 901–902 (requiring some type of evidentiary basis that would support a finding that the exhibit is actually what it purports to be).

141. *See* FED. R. EVID. 801–802 (excluding out-of-court assertions being relayed by a witness offered to prove the truth of the out-of-court assertion, which is inadmissible "hearsay").

142. *See* FED. R. EVID. 803–804 (setting forth an elaborate labyrinth of exceptions to the hearsay rule).

143. FED. R. EVID. 1001–1004 (excluding certain documentary evidence if it is not the original or an acceptable duplicate of the original or there is no good reason why the original is missing, commonly referred to as the "Best Evidence Rule").

144. *See* FED. R. EVID. 701 (excluding mere opinions of witnesses, as opposed to their factual assertions, unless these opinions are helpful to the jury).

145. FED. R. EVID. 703, 705 (allowing scientific expert opinion); *see also* Daubert v. Merrell Dow Pharms., 509 U.S. 579 (1993) (interpreting Rule 703 to require "scientific validity" by considering a particular scientific discipline's testing, falsifiability, peer review, publication, potential rate of error, and acceptance within the scientific community). Note that there are current proposed changes to the Rules by the Advisory Committee that would codify *Daubert* into the text of the rule. *See* JUDICIAL CONFERENCE OF THE U.S., PROPOSED AMENDMENTS TO THE FEDERAL RULES OF EVIDENCE 44 (September 1999), *available at* <http://www.uscourts.gov/rules/propevid.pdf>.

146. Other such rules include Federal Rules of Evidence 101–106 (setting forth

solely as demonstrative evidence in court to accompany and explain live testimony or attorney argument, then it may be allowed only at the trial judge's discretion.[147] Each of these rules is discussed separately below.

1. Relevance — Rules 401 and 402

Rule 401 and Rule 402 of the Federal Rules of Evidence work in conjunction such that Rule 401[148] defines "relevant evidence" while Rule

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general provisions), 201 (allowing "judicial notice" — the acceptance of a statement as true without formal proof, e.g., the law of gravity), 301–302 (regarding presumptions, for example, if Fact A exists, then fact B also exists), 404–406 (addressing admissibility of character and habit evidence) 407–415 (listing types of evidence that, although relevant, are excluded by category), 501 (referring to privileges, excluding certain types of confidential communications), 601–615 (limiting the method and mode of testimony, such as competency of witnesses, attacking a witness's character for truthfulness, and use of prior inconsistent statements), and 1101–1103 (containing miscellaneous rules).

147. *See supra* note 137. The general standard for reviewing the admission of demonstrative evidence, or determining what is actually a "demonstrative exhibit" such as a CGE, is abuse of judicial discretion. *See* Strock v. Southern Farm Bureau Cas. Ins. Co., 998 F.2d 1010 (4th Cir. 1993) (affirming that the judicial discretion standard is applied to the allowance of demonstrative CGEs). This standard entrusts the trial judge with the decision to apply the rules in the context of the trial, and therefore tends to result in that decision being reversed less often than not. *See* WRIGHT & GRAHAM, *supra* note 8, § 5223 (arguing that the abuse of discretion standard amounts to an unhealthy grant of unfettered discretion to the trial judge). Conceivably, two different trial judges could rule exactly opposite to one another with respect to the same evidentiary issue, and the same appellate court could uphold both of them, provided that neither were so wrong that they abused their discretion. As a result of this deferential standard, the decisions of trial judges are often upheld on appeal, even if the appellate court thinks the judge may have been wrong on the application of the law to the facts in the case, because the appellate court can only reverse when it believes the trial judge was so far off the mark, or entirely out-of-bounds, that the discretion given to the judge was abused. *See id.* § 5223, n.2 (Supp. 1998).

> After reading hundreds of cases on Rule 403, one becomes uneasy with the sense that more often than they should courts are using Rule 403 in an unfair fashion, excluding evidence that is routinely admitted at the behest of others. But this is difficult to document because appellate courts seem not to take the question of fairness very seriously so their opinions do not provide enough facts to confirm or dispel this suspicion.

Id.

148. Rule 401 provides: "'Relevant 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." FED. R. EVID. 401.

402[149] requires evidence to be relevant in order to be admissible in court.[150] To determine whether a CGE, or any exhibit for that matter, is relevant, it must be established that the exhibit "helps persuade the trier of the existence (or non-existence) of some fact that is germane to the dispute between the parties."[151] This is a fairly easy showing when the CGE is an animation being used for demonstrative purposes because the animation is merely illustrating testimony which already is presumably relevant — for example, a summary of an expert witness's opinion or the descriptive testimony of an eyewitness to the event being depicted in the animation.[152] In such circumstances, all that must be shown to establish the relevancy of the CGE is that, like a photograph of a crime scene, it is a "fair and accurate" illustration of the testimony.[153] Courts should require no more of a demonstrative CGE than they do of a non-computer generated exhibit. In other words, the interpretation of Rule 401 should not discriminate against CGEs.

However, with respect to re-creation and simulation CGEs — where the reliability of the CGE rests on the accuracy of the input data, its correct entry, and the computer program's ability to generate an accurate result based on those data, rather than just on a sponsoring

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149. Rule 402 provides: "All relevant evidence is admissible, except as otherwise provided for by the Constitution of the United States, by Act of Congress, by these rules, or by other rules prescribed by the Supreme Court pursuant to statutory authority. Evidence which is not relevant is not admissible." FED. R. EVID. 402.

150. Of course, not all relevant evidence is necessarily admissible as it may be excluded for any other number of reasons set forth in the Federal Rules of Evidence. For example, relevant evidence may contain inadmissible hearsay (Rules 801, 802), inadmissible character evidence (Rule 404(a)), may not be authenticated (Rule 901), or may be inadmissible opinion testimony (Rule 701).

151. GRAHAM C. LILLY, INTRODUCTION TO THE LAW OF EVIDENCE 24 (3d ed. 1996).

152. *See* Roland v. Langlois, 945 F.2d 956, 963 (7th Cir. 1991) (holding that the helpfulness (relevance) of the model was not substantially outweighed by the danger of unfair prejudice). Thus, a demonstrative exhibit is relevant in and of itself to the extent that it *helps explain* what is already deemed to be relevant testimony. This is clear once one considers that if the exhibit did not help to explain relevant testimony, then by definition, the exhibit would be irrelevant. A demonstrative exhibit that explains *irrelevant* testimony would, of course, also be irrelevant.

153. *See, e.g.*, Nachtsheim v. Beech Aircraft, 847 F.2d 1261 (7th Cir. 1988) (requiring only that the exhibit is a "fair and accurate" representation of the underlying testimony); *In re* Estate of Burack, 607 N.Y.S.2d 711, 712 (App. Div. 1994) (ruling there was no error in admitting a videotape demonstrating the decedent's testamentary capacity and was a "fair and accurate" depiction of the events filmed); Hodosh v. Ford Motor Co., 477 A.2d 77, 80 (R.I. 1984) (finding no abuse of discretion on the part of the trial court judge in allowing into evidence a video that was a "fair and accurate" representation of the test performed). This is the same standard for a photograph. *See* Duckett v. Godinez, 67 F.3d 734, 740 (9th Cir. 1995).

witness's credibility as with demonstrative animations — the relevancy standard, like the authentication standard under Rule 901,[154] should be, and is, more involved. To accomplish this, many courts apply the "substantially similar" test, where, for example, in an automobile accident re-creation, the conditions depicted in the re-creation must be "substantially similar" to those that existed at the time of the accident in order to be deemed relevant.[155] This is necessary because the trier of fact must be able to *relate* the offered CGE re-creation or simulation to the actual incident that is the basis of the lawsuit. With a demonstrative animation, that necessary relationship link — its relevancy — can be made by the jury's acceptance of eyewitness testimony by the sponsoring witness who links the animation to their witnessing of the actual event. But with re-creations or simulations, there needs to be some evidence showing that this particular CGE re-creation is *substantially similar* to what actually happened — what the CGE is supposedly recreating or simulating — for it to be considered

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154. *See infra* Part III.B.3 (explaining authentication requirements under Rule 901).

155. At least one state court has declared that requirements for admissibility for computer simulations are the same as for admissibility of experimental evidence: it must be made under "substantially similar" conditions. *See* Richardson v. State Highway & Transp. Comm'n, 863 S.W.2d 876, 882 (Mo. 1993) (en banc). Most courts have not explicitly decided the issue as to whether computer re-creations must meet the same standards as a real life re-creation. *See* Hinkle v. City of Clarksburg, 81 F.3d 416, 425 (4th Cir. 1996) (though not explicitly deciding the issue, the court "fail[ed] to see a practical distinction . . . between a real-life recreation and one generated through computer animation."). However, the standards for non-computer generated evidence are clear. *See* Brandt v. French, 638 F. 2d 209, 212 (10th Cir. 1981) (holding that "[a]dmissions of evidence of experiments must be established by showing background proof that the experiments were conducted under conditions that were at least similar to those which existed at the time of the accident"); *see also* Four Corners Helicopters, Inc. v. Turbomeca, S.A., 979 F.2d 1434, 1442 (10th Cir. 1992).

> Experiments purporting to simulate actual events may be admissible if made under conditions which are substantially similar to those which are the subject of the litigation. . . . [F]ilmed evidence which is not meant to depict the actual event may be admitted to show mechanical principles, upon a showing that 'the experiment [was] conducted under conditions that were at least similar to those which existed at the time of the accident.' However, if the evidence is offered to merely show physical principles, the experiment should be conducted without suggesting that it simulates actual events. Experiments used to simply demonstrate the principles used in forming expert opinion need not strictly adhere to the facts.

Id. (citations omitted).

relevant.[156] Since there is no eyewitness to the original event, the relevancy link must be made through means other than eyewitness testimony.

But this leaves the question of just *how* similar a re-creation or simulation must be to the original event to be considered "substantially" similar and therefore relevant. Too stringent a requirement for substantial similarity would mean such exhibits would seldom, if ever, be considered relevant. This is true because unless there were a clear videotape of the incident in question, which captured each and every relevant detail as it actually transpired (in which case, there would no longer be any need for a re-creation or simulation), we can never know for sure if the re-creation or simulation of the event would be exactly identical to the actual event. But that should not disallow the re-creation or animation as an effective evidence tool to help us arrive at the truth.[157] Moreover, eyewitness accounts are notorious for their unreliability in many instances,[158] yet we leave it up to a jury to assess whether an eyewitness should be believed, taking into account that the eyewitness testimony may be incorrect or exaggerated.

Although absolute perfection in similarity is not the standard, it is unclear just exactly how close to it courts require the CGE to be in

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156. *See Richardson*, 863 S.W.2d at 882.

157. Such metaphysical uncertainty is no stranger to the law of evidence. Indeed, to the extent that we never really know to a scientific certainty what has actually transpired in the past, we accept the testimony of witnesses and the submission of exhibits as proxies for the truth and simply do the best we can with imperfect information. *See generally* Charles Nesson, *The Evidence or the Event? On Judicial Proof and the Acceptability of Verdicts*, 98 HARV. L. REV. 1357 (1985) (arguing that since we can never really know what happened in the past, at least to an absolute scientific certainty, the trial process — which is an attempt to reconstruct various competing versions of the truth culminating with a jury ultimately accepting one of the competing versions of the truth by rendering a verdict — is an acceptable proxy as our official, legal explanation of what happened).

158. *See* Watkins v. Sowders, 449 U.S. 341, 349–50 (1981) (Brennan, J., dissenting) (reminding the Court of its history of recognizing the inherently suspect qualities of eyewitness identification evidence); United States v. Amador-Galvan, 9 F.3d 1414, 1417–18 (9th Cir. 1993) (Ferguson, J., dissenting) (discussing the unreliability of eyewitness testimony); United States v. Langford, 802 F.2d 1176, 1182 (9th Cir. 1986) (stating that expert testimony can and should be used to explain to a jury the problems inherent in eyewitness identification and citing a long series of cases recognizing the problem of unreliable eyewitness testimony). *See generally* E. LOFTUS, EYEWITNESS TESTIMONY 237–47 (1979) (bibliography of literature concerning eyewitness identification). *See also* Gary L. Wells, *What Do We Know About Eyewitness Identification?*, 48 AM. PSYCHOLOGIST 553, 554 (1993) (documenting that eyewitness error was the leading single reason for false convictions).

order to be considered "substantially similar." One court has held that a re-construction must be "nearly identical" to be relevant.[159] If *substantially similar* actually ends up meaning *nearly identical*, then in practice, a court effectively has virtually unlimited discretion to disallow re-creations and simulations because they can always argue that the re-creation or simulation, although *similar* to the actual original event, is not *substantially* so.[160]

As a result, courts should require the proponent of a re-creation or simulation CGE to make only a basic showing that it is *generally similar* to the conditions surrounding the original event, but not apply *substantial similarity* so stringently, especially when that interpretation can approach a requirement of "nearly identical." That decision should instead be left to the jury to weigh just how similar and therefore how believable and credible the exhibit is. This would allow the jury to assess the weight of the CGE, along with the argument that the CGE is not substantially similar to every exact detail if that is the case. In other words, because substantial similarity determinations should go to the weight, rather than to the admissibility, of the CGE,[161] it is something

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159. *See* Sommervold v. Grevlos, 518 N.W.2d 733, 737 (S.D. 1994) (stating that a litigant who wants to use computer generated evidence must show that the animation is "relevant, probative and nearly identical").

160. *See* Guillory v. Domtar Indus. Inc., 95 F.3d 1320, 1330 (5th Cir. 1996) (affirming the district court's decision to prohibit the use of a video tape showing a forklift model that was not sufficiently similar to the forklift that caused the accident); Leonard v. Nichols Homeshield, Inc., 557 A.2d 743, 747 (Pa. Super. Ct. 1989) (finding reversible error to admit into evidence a video tape of experiments to show how much force it would take to disengage a latched screen from the window). In *Leornard*, the court ruled that the tests shown on the video constituted a re-enactment of the accident, not a demonstration of the general operation, and was not similar enough to the original to allow it to be admitted as a re-enactment. *See id.*

161. *See infra* notes 355–56 and accompanying text (arguing for a more liberal interpretation of Rule 401 and advising trial court judges not to apply the "substantially similar" standard so stringently that it approaches a "nearly identical" requirement and instead leave much of the substantially similar argument to be made on direct and cross-examination of sponsoring witnesses — much like courts do when it comes to CGEs that are used for purely demonstrative purposes); *see also* Gilbert v. Cosco, Inc., 989 F.2d 399, 402–03 (10th Cir. 1993) (ruling there was no abuse of discretion by the trial court judge in allowing the admission of tests that were intended to illustrate scientific principles only where the opposing side was given ample opportunity in front of the jury to attack the credibility of the conclusions drawn and to point out inconsistencies and shortcomings in the test design); Champeau v. Fruehauf Corp., 814 F.2d 1271, 1278 (8th Cir. 1987) (finding no error in admitting a videotape of experiments designed to illustrate scientific principles when the conditions of the experiments were far from identical but the district court submitted to the jury lists compiled by the attorneys of differences and similarities between the test conditions and the accident conditions).

for the parties to establish or challenge at trial in front of the jury.[162] Relevance is not that high of an admissibility hurdle for all other types of exhibits and testimony,[163] and therefore, it should not be any higher simply because the exhibit is generated by a computer rather than by less technologically advanced means.

2. Exclusion of Relevant Evidence — Rule 403

Rule 403[164] is the first of the categorical rules of exclusion[165] of what might otherwise be considered relevant evidence. It is used to exclude evidence that is relevant but which *also* contains an inherent danger of distracting the members of a jury with unfair considerations that may cloud what otherwise would be a rational decision based only on the relevant facts of the case.[166]

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162. *See* Persian Galleries, Inc. v. Transcontinental Ins. Co., 38 F.3d 253, 258 (6th Cir. 1994) (finding no error in admitting a videotape of a reconstructed crime scene that the appellant claimed did not substantially recreate the conditions on the night of the burglary). The *Persian Galleries* court ruled that the alleged discrepancies "reflect, not upon the admissibility of the evidence, but rather upon its credibility, an assessment assigned exclusively to the discretion of the jury." *Id.*

163. *See* Douglass v. Eaton Corp., 956 F.2d 1339, 1345 (6th Cir. 1992) ("[T]he test of relevance is very liberal and does not entail a determination of the sufficiency of the evidence.").

164. "Although 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." FED. R. EVID. 403. Note that exclusion under Rule 403 is really only meaningful in *jury* trials because in a bench trial, the judge can be expected not to be swayed by, or give any weight to, such unfair distractions. *See, e.g.*, Schultz v. Butcher, 24 F.3d 626 (4th Cir. 1994).

165. The "Categorical Rules of Exclusion" are located in Article IV of the Federal Rules of Evidence. Some examples are Rule 404, which excludes character evidence which otherwise may be relevant so as to ensure that the jury does not convict or find liability based on the *type* of person the defendant is, rather than on whether he *is actually guilty of, or liable for*, this particular crime or violation of a legal duty; Rule 407, which excludes evidence of subsequent remedial measures which otherwise may be relevant so as to ensure that the jury does not find that defendant's taking of subsequent remedial measures necessarily means the defendant was liable since she decided to "fix" the condition in question; and Rule 411, which excludes evidence of liability insurance that otherwise may be relevant so as to ensure the jury does not determine the defendant acted negligently merely because there was insurance to cover her loss, etc. The various exceptions to these particular exemplary rules, as well as the remaining rules of categorical exclusion, are not summarized here.

166. A seminal case applying Rule 403 is United States v. Robinson, 544 F.2d 611 (2d Cir. 1976), *rev'd en banc*, 560 F. 2d 507 (2d Cir. 1977), *cert. denied*, 435 U.S. 905 (1978), where the appellate court held that the trial court erred by admitting in evidence

With respect to how Rule 403 may exclude a proposed trial exhibit, consider a photograph of dead victims at a crime scene in a murder case. Although such a photograph would contain some probative value because it would show where and how the bodies were situated, such a photograph *also* would display the graphic and bloody image of the actual bodies of the murder victims as they were found. Thus, the photograph, although relevant, would present a danger of horrifying the members of the jury or inflaming their passions so that they might be more likely to convict this, or any, defendant, based more on emotion and hostility rather than on fact and logic. In such circumstances, at least one court has held that the probative value of such a "bloody crime scene" photograph is substantially outweighed by the danger of unfair prejudice pursuant to Rule 403.[167] The same concern for unfair prejudice is present when the trial exhibit is a CGE, rather than just a photograph or a chart, because the CGE itself, especially an animation or re-creation, may be so powerful or overly suggestive that it might pose a danger that its probative value is substantially outweighed by the danger of unfair prejudice.

a. From Telling to Showing "Too Much"

If CGEs are such powerful aids in enhancing communication and persuasion at trial as extolled in this article, then one might well ask: when is too much of a good thing not so good? In other words, at what point — and it might be from the very beginning according to some[168] — should we exclude CGEs under Rule 403 for being such effective aids to communication that they unfairly overwhelm, prejudice, or mislead juries?[169]

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the fact that the accused bank robber defendant had a .38 caliber revolver on his person when arrested. The appellate court ruled that the unfair prejudicial effect (revealing to the jury that he was carrying a concealed weapon) was enough to substantially outweigh the probative value (that it may be more likely that he robbed the bank because he was carrying a weapon at the time).

167. *See* Commonwealth v. Garrison, 331 A.2d 186, 187–88 (Pa. 1975) (ruling that the admission into evidence of 11 color slides of the victim's body was reversible error; the pathologist's verbal description should have been sufficient); Commonwealth v. Scaramuzzino, 317 A.2d 225, 227 (Pa. 1974) (ruling that admission into evidence of 14 color slides showing graphic and bloody scenes was error; the probative value was outweighed by the "likelihood of inflaming the minds and passions of the jurors"). *But see* United States v. McRae, 593 F.2d 700, 707 (5th Cir.), *cert. denied,* 444 U.S. 862 (1979) (overruling a 403 objection to photographs of deceased and death scene).

168. *See* WRIGHT & GRAHAM, *supra* note 8, § 5174.1 (criticizing CGEs).

169. *See id.* § 5174.1, at 140 (arguing that "jurors are ill-equipped to judge how much

Such a concern was presented in *Racz v. R.T. Merryman Trucking, Inc.*,[170] in which a computer simulation was offered to assist defendant's expert in showing that the accident could not have transpired the way plaintiff's witness testified. The court excluded the computer exhibit, finding that "[i]t would be an inordinately difficult task for the plaintiff to counter, by cross-examination or otherwise, the impression that a computerized depiction of the accident is necessarily more accurate than an oral description of how the accident occurred."[171] The court further held that, with respect to CGEs, jurors might fall victim to the old adage that "'seeing is believing'" and therefore might "give undue weight" to the CGE depicting the incident.[172] Similarly, another court granted a motion to exclude a computer simulation under Rule 403 due to its "great potential for being misleading and prejudicial."[173] That court went on to point out that "computer animation evidence, by reasons of its being in a format that represents the latest rage and wrinkle in video communications and entertainment, may well have an undue detrimental effect on other more reliable and trustworthy direct-type of evidence."[174]

These two cases represent a huge problem with Rule 403 and its generous grant of discretion to trial judges to exclude relevant evidence, including CGEs.[175] The apparent concern that jurors lose all sense of reality and simply believe anything and everything they see depicted on a television or computer screen presupposes a certain naiveté and basic lack of intelligence on the part of juries that is not only unwarranted as a matter of psychological research,[176] but is also offensive and even

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the probative worth of an expert's testimony is enhanced by this computerized 'razzle-dazzle'").

170. No. Civ.A.92-3404, 1994 WL 124857 (E.D. Pa. Apr. 4, 1994).

171. *Id.* at *5.

172. *Id.*

173. *See* Van Houten-Maynard v. ANR Pipeline Co., No. 89-C0377, 1995 WL 317056, at *12 (N.D. Ill. May 23, 1995).

174. *Id.*

175. "The standard for appellate review of the trial court's [Rule 403] balancing is articulated in various ways, including 'arbitrary or irrational,' 'clearly erroneous,' and 'plain error,' but the usual standard is abuse of discretion." LILLY, *supra* note 151, at 36 n.4 (1996) (citation omitted). This means that whenever it is a fairly "close call," the trial judge will never be reversed because the appellate court will affirm either a decision admitting or excluding the exhibit since, in either case, it would be impossible to show an abuse of discretion.

176. *See* Edward J. Imwinkelried, *The Standard for Admitting Scientific Evidence: A Critique from the Perspective of Juror Psychology*, 28 VILL. L. REV. 554, 566 (1983) (finding "little or no objective support for the assertion" that jurors attach too much weight to scientific evidence; in fact, "almost all the available data points to the

elitist.[177] Although "the masses" — which would include all potential jurors[178] — watch television and go to movies, most are able to distinguish reality from fantasy, and those who cannot do so can and should be identified and excused during the voir dire process.[179]

Simply because Hollywood can produce special effects showing, for example, present-day dinosaurs walking through fields or pod-racers zipping through high-walled canyons,[180] does not mean that most people exposed to such images are so unsophisticated that they will say to themselves: "I saw it on a screen, so it must be true, and now I am incapable of even considering a contrary argument." Such a reaction is highly unlikely, especially once potential jurors actually get into a

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contrary conclusion"); *see also* Michael S. Jacobs, *Testing the Assumptions Underlying the Debate About Scientific Evidence: A Closer Look at Juror "Incompetence" and Scientific "Objectivity,"* 25 CONN. L. REV. 1083, 1097–98 (1993) (revealing that where there are gaps in understanding among jurors, they may actually be attributed, "in whole or in part, to the peculiar environment of the trial process or to shortcomings in advocacy or explanatory skills of lawyers and scientific experts"). This evidence tends to support the use of CGEs in court, at least for their clarity in communication.

177. By "offensive," I mean offensive to the intelligence of all past, present, and potential jurors who do not necessarily believe anything and everything they see just because they may have seen it on a television or computer screen. By "elitist," I mean to attack the belief that only judges or others properly educated in the law are intelligent and worldly enough not to necessarily believe anything and everything they see simply because it appears on a television or computer screen.

178. In all criminal prosecutions, the accused is guaranteed a jury trial "by an impartial jury." U.S. CONST. amend. VI. In civil trials, "the right of trial by jury shall be preserved." U.S. CONST. amend. VII. Congress mandated that the policy of the United States regarding jury trials is to provide for a randomly selected group representing a "fair cross section of the community in the district or division wherein the court convenes." 28 U.S.C. § 1861 (1994). Names of prospective jurors are selected from either voter registration lists or lists of actual voters within the district. In order to provide for a fair cross section of the community, other sources, such as city directories, shall be used "where necessary." 28 U.S.C. § 1863 (b)(2) (1994). No citizen can be excluded from jury service in a district court on the basis of race, color, religion, sex, national origin or economic status. *See* 28 U.S.C. § 1862 (1994).

179. "Voir dire" is a phrase describing the preliminary examination of prospective jurors to determine their qualifications and suitability to serve as jurors. *See* BLACK'S LAW DICTIONARY 1575 (6th ed. 1990).

180. Although these two particular examples come from the motion pictures *Jurassic Park* and *Star Wars: Episode One*, Hollywood films using computer-animated special effects to create fantasies are legion. *See* Jon Hill, *High End Graphics Cards: We Test Nine OpenGL Cards for Professional 3-D Graphics*, PC MAG., June 30, 1998, at 191 (listing the movies *Jurassic Park* and *Titanic* and the TV weather map as some computer generated graphics created with these cards). The "dancing baby" in the Blockbuster ads and the television show *Ally McBeal* and the Brooklyn Bridge and taxicab scene in the climax of the movie *Godzilla* are all computer-generated graphics. *See* Martin Plaehn, *A Web Strategy with Real Bite*, NATION'S BUS., July 1998, at 6.

courtroom and begin to appreciate the seriousness of their task as jurors to choose between competing versions of the truth.[181] Thus, to the extent that a typical juror has ever seen a movie or television program with special effects, and therefore probably understands that not all of the images displayed therein are *necessarily* portraying actual events, such a juror presumably would also understand that images can be manipulated at trial to depict things, such as a witness's testimony, which ultimately may or may not be true. We should respect the ability of jurors to make up their own minds.

Interestingly, courts assume that jurors possess the intelligence and ability to process competing witnesses' *verbal* testimony and do not find it necessary to exclude witnesses with different stories from testifying under Rule 403 because "hearing is believing." That is to say, we do not fear any danger that a jury will automatically believe that what witnesses are saying *necessarily must be true* because, after all, the witnesses swore that they would "tell the truth, the whole truth and nothing but the truth."[182] Instead, we leave it to the fact-finding ability of the jury to make credibility determinations and choose between the competing testimony of various witnesses and their respective exhibits. We should do the same even when a juror "sees" the testimony through a witness-authenticated CGE instead of "hearing" it through the witness's words.

For instance, if a defense witness displayed a CGE depicting a space alien (the alleged "real culprit" instead of the defendant on trial) who arrived in a UFO and supposedly was the one who actually caused the accident which harmed plaintiff, jurors probably would not need a judge to "protect them" from the "computerized razzle-dazzle" of the CGE by excluding it. The jurors could make a credibility determination based solely upon what the defense attorney and defense witness would be postulating in open court — CGE or no CGE. A jury could make a fair determination based on the competing presentations and versions of

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181. *See* Ralph Adam Fine, *Object at Your Own Risk*, 58 OR. ST. B. BULL. 19, 19 (1998) ("Jurors want to do what is right; they are looking for the 'truth' of the dispute — what really happened. According to a 1992 Brookings Institution report, 'Jurors take their responsibilities very seriously and attempt to reach fair and just results.'").

182. This is a typical phrase designed to comply with Rule 603. Rule 603 provides: "Before testifying, every witness shall be required to declare that the witness will testify truthfully, by oath or affirmation, administered in a form calculated to awaken the witness's conscience and impress the witness's mind with the duty to do so." *See* United States v. Hawkins, 76 F.3d 545, 551 (4th Cir. 1996) (holding that the failure to take an oath or affirmation renders the testimony inadmissible).

the truth, regardless of possibly being swayed by a CGE, even though it may have been generated and displayed by a computer and purportedly represents "science."

But, in fairness, space aliens represent more easily detectable fantasy. The *Racz* suit involved not a CGE that was such obvious fiction, but the very serious defense testimony of a state trooper witness and accident reconstruction expert witness.[183] The case involved a decedent who lost control of her automobile while passing defendant's truck. The decedent's husband sued the truck company asserting that the rear wheels of the truck entered the passing lane, causing his wife to swerve out of control in an attempt to avoid the truck's rear wheels. Plaintiff's eyewitness said the rear wheels entered the passing lane, but defendant's witnesses — the state trooper investigator and an expert witness/accident re-constructionist — concluded that this was physically impossible and provided a computer-generated accident reconstruction/re-creation demonstrating their testimony. Should the exhibit have been excluded under Rule 403 as the court held?

It is important to note at the outset that the defendant's expert witness/accident re-constructionist was still able to testify, just verbally, without the CGE, as was the state trooper, and it was the testimony of both of them that the defendant's rear tires did not enter and could not have entered into decedent's passing lane. But if that *verbal* testimony of an expert witness was deemed relevant and not unfairly prejudicial, then it is difficult to understand why merely explaining/showing that very same admissible testimony with the visual aid of a CGE was so objectionable.

The court excluded the CGE, finding that "[i]t would be inordinately difficult for the plaintiff to counter, by cross-examination or otherwise, the impression that a computerized depiction of the accident is necessarily more accurate than an oral description of how the accident occurred."[184] This is akin to saying that because one witness *says* the light was green, and the other witness *says* that the light was red, but the first of those witnesses also has a computer generated image *showing* the light had to be green based on the timing sequence of the computer operating the light signal, that the members of the jury suddenly would lose their fact-finding ability to make credibility determinations between the two and would now necessarily find for the witness with the CGE because "it must be true if the

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

184. *Id.* at *5.

computer shows it that way." Moreover, if a non-computerized visual aid depicting the light as being green, as opposed to red, should not be excluded under Rule 403 as unfair prejudice substantially outweighing the probative value of the exhibit, so too should witnesses be allowed to use a similar visual aid that provides motion and is generated by a computer.

This is true because there is no rule that an attorney is prohibited from being "too illustrative," or an expert witness "too credible" in his or her presentation, so long as what is being presented has met the foundational requirement of being a fair and accurate portrayal of the expert's testimony. To combat an objection on these grounds, it must be pointed out that it is the expert's testimony behind the animation that should be the issue, not merely the means by which that testimony is portrayed. Simply because one side uses sophisticated graphics to help explain its case while the other side uses amateur crayon drawings or, worse yet, no visual aids at all for its exhibits, does not render the sophisticated graphics unfairly prejudicial.

Instead, judges should be encouraged to admit CGEs, and, rather than exclude them due to Rule 403 concerns, give limiting instructions[185] to the jury so that it remains cognizant of the fact that it should not "overvalue" images generated by a computer as opposed to images generated by some other means (if that is really even an appreciable danger). Although there is evidence to suggest that juries sometimes do not follow a judge's instructions in such circumstances,[186] warning the jury of the danger of any unfair prejudice associated with the powerful influence of a CGE would get the jury to focus solely on the facts of the case rather than on the methodology of the argument being employed, as well as afford the jury the proper respect for its intelligence to engage in the fact-finding process.

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185. Judges could do this pursuant to Rule 105 ("Limited Admissibility"): "When 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.*" FED. R. EVID. 105 (emphasis added).

186. *See* Evelyn G. Schaefer & Kristine L. Hansen, *Similar Fact Evidence and Limited Use Instructions: An Empirical Investigation*, 14 CRIM. L.J. 157, 179 (1990) ("[T]he available empirical evidence strongly challenges the legal presumption that jurors are willing and able to ignore or make limited use of testimony when judicial instructions tell them to do so."). The problem with this argument, however, is that it suggests that judges should not instruct juries at all. It is therefore a much larger problem beyond the scope of the article which certainly is not limited to or unique to CGEs.

Note, however, that judges do not find such limiting instructions necessary for similar mistakes an unsophisticated jury might make in assessing evidence. For instance, jury members usually do not receive instructions advising them not to be swayed by: (1) a slick-talking, charismatic attorney, as opposed to a boring, inarticulate attorney; or (2) the fact that one attorney has many paralegals and co-counsel helping her, as opposed to the other attorney going solo; or, (3) perhaps most appropriate to CGEs, the fact that one attorney has large, professionally printed and very clear and legible (but non-computerized) demonstrative exhibits, while opposing counsel has semi-illegible handwritten notes up on a small, dirty chalkboard. Even though there may be real dangers of unfair prejudice in these examples — that the jury might overvalue the lawyers' personalities, shows of force, or professionally printed exhibits — judges usually do not find juries so naive or lacking in basic intelligence that such cautionary instructions are necessary. However, to the extent such instructions would be necessary when CGEs are involved, Rule 105 limiting instructions (as opposed to outright exclusion) would remove enough of the unfair prejudice — to the extent it may exist — so that the unfair prejudice associated with a CGE would not substantially outweigh the CGE's probative value.

b. Is the "Danger" Exaggerated?

Judges need to be reminded that Rule 403 should be employed "sparingly"[187] because the rule favors admission, not exclusion.[188] Also, there are two key adjectives in the rule that should not be ignored — "*unfair* prejudice" and "*substantially* outweigh." First, "*unfair* prejudice" means that prejudice by itself is fine. Indeed, during the trial, creating prejudice is exactly what an advocate is doing when she is advocating for her client or when a witness is testifying on behalf of one of the litigants — getting the jury to believe her side of the case and her version of the facts. It is therefore only *unfair* prejudice that is to be excluded. Rule 403, then, is not a call for the judge to keep the

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187. United States v. Meester, 762 F.2d 867, 875 (11th Cir. 1985) ("Courts have characterized Rule 403 as an extraordinary remedy to be used *sparingly* because it permits the trial court to exclude otherwise relevant evidence." (emphasis added)).

188. *See* United States v. Dennis, 625 F.2d 782, 797 (8th Cir. 1980) ("In weighing the probative value of evidence against the dangers and considerations enumerated in Rule 403, the general rule is that the balance should be struck *in favor of admission*." (emphasis added)).

dispute a "close fight" by excluding exhibits that are extremely powerful and compelling.[189]

Second, even when the prejudice inherent in the relevant exhibit is admittedly unfair to a certain degree, it may still be admissible. Thus, a judge's detection of *some* unfair prejudice is not the end of the inquiry. Unfair prejudice in an exhibit still may be admissible, and this is true even if the unfair prejudice *outweighs* the probative value of the exhibit. This point is critical — the prejudice can outweigh the probative value and it could still be error for a judge to exclude it under Rule 403, which prohibits relevant information only when the unfair prejudice *substantially* outweighs the probative value.

The correct interpretation and application of Rule 403 suggests that (1) any prejudice must be *unfair*, and (2) it must *substantially* outweigh the probative value (not simply be present or barely outweigh the probative value). This means that even unfair prejudice inherent in relevant evidence is admissible, unless substantially more of the exhibit contains unfair prejudice, while much less of the exhibit contains probative value. As the Fifth circuit acknowledged in *U.S. v. McRae* when overruling a Rule 403 objection to photographs of murder victims at the crime scene:

> Relevant evidence is inherently prejudicial; but it is only *unfair* prejudice, *substantially* outweighing probative value, which permits exclusion of relevant matter under Rule 403 .... [T]he application of Rule 403 must be cautious and sparing. Its major function is limited to excluding matter of scant or cumulative probative force, dragged in by the heels for the sake of its [unfair] prejudicial effect. As to such, Rule 403 is meant to relax the iron rule of relevance, to permit the trial judge to preserve the fairness of the proceedings by exclusion despite its relevance.[190]

It is against this definitional background that any rational discussion of the correct interpretation and application of Rule 403, especially as it applies to CGEs, must proceed. Given that foundation, judges must find *very little* probative value in a CGE, and determine that they *mostly*

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189. *See* United States v. McRae, 593 F.2d 700, 707 (5th Cir. 1979) (holding that Rule 403 "is not designed to permit the court to 'even out' the weight of the evidence, to mitigate a crime, or to make a contest where there is little or none").

190. *Id.*

consist of unfair prejudice,[191] in order to exclude them pursuant to a correct interpretation of Rule 403.

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 *unfair* prejudice.[192] 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[193] 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. Trial judges need to understand this when they are asked to invoke Rule 403.

Another method of objecting to the use of an animation is to assert its lack of fair and accurate portrayal of events or witness opinions because it only includes *one side's version* of the event. But this is the same as arguing that since one lawyer has successfully pursued a line of questioning while the other lawyer failed to do so, the first lawyer's successful line of questioning should not be allowed as evidence. Although poor legal representation may be unfortunate, and even malpractice, good legal representation should not be punished to remedy the problem. Moreover, in the United States, we subscribe to the

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191. *See infra* Part IV(B)(3) (recommending that judges be reminded of this specifically when it comes to CGEs and that Rule 403 should not be used as a means of excluding exhibits simply because they are displayed by using computer technology in an effective and persuasive manner).

192. "Rule 403 does not offer protection against evidence that is merely prejudicial in the sense of being detrimental to a party's case; protection is only offered against evidence that is unfairly prejudicial by tending to suggest decision on improper basis." FED. R. EVID. 403 advisory committee's note. Unfair prejudice "means an undue tendency to suggest decision on an improper basis . . . ." *Id. See also* STEPHEN A. SALTZBURG ET AL., FEDERAL RULES OF EVIDENCE MANUAL 243 (7th ed. 1998) (explaining that Rule 403 refers to "unfair" prejudice, prejudice that "could lead the jury to make an emotional or irrational decision, or to use the evidence in a manner not permitted" rather than prejudice which is merely harmful to the adversary).

193. Clarence Darrow is known for his great oratory skill and persuasiveness in court. *See* Alan M. Dershowitz, *Introduction* to CLARENCE DARROW, THE STORY OF MY LIFE v, v–xi (De Capo Press 1996) (1932).

adversary system; a party's attorney does not have to make the opponent's arguments to the jury before being allowed to make his own arguments. Of course, the "work product doctrine" generally prohibits this.[194]

Another Rule 403 objection that should be overruled every time it is raised is that the "animation cannot be cross-examined" like a live witness. Non-computer-generated evidence, such as charts, cannot be cross-examined either, but that does not mean that they should be excluded under Rule 403. Even though a computer animation is more technologically advanced than a pie-chart on an easel, both are illustrations of a sponsoring witness's testimony, which *can be cross-examined*, as can, with a re-creation or simulation, the witnesses who collected and entered the data, the software designer who produced a simulation, and the expert witness. True, the computer program generates an "answer," but so does a calculator. We do not disallow damage calculations or X-ray pictures simply because we cannot cross-examine these machines.

A CGE also may draw Rule 403 "misleading" objections if given too much weight by the jury.[195] Again, the jury should be instructed to weigh the evidence fairly and properly and the parties should be allowed to argue against any infirmities in the CGE without excluding it altogether.[196]

Another objection under Rule 403 might be that a CGE produces a danger of "confusion of the issues," such that the jury will likely make an incorrect finding based upon a "smoke screen" which diverts the jury's attention away from relevant factual issues that need to be resolved. This is a curious objection because an animation is made precisely because the proponent is trying to clarify complicated facts, not obscure them. Judges should be advised to provide limiting

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194. *See* FED. R. CIV. P. 26(b)(3) (codifying the work product doctrine first elucidated in Hickman v. Taylor, 329 U.S. 495 (1947)).

195. *See* Bolstridge v. Central Maine Power Co., 621 F.Supp. 1202, 1204 (D. Me. 1985). In finding error in the admission of a computer simulation, one court has stated, "'the extreme vividness and verisimilitude of pictorial evidence is truly a two-edged sword. For not only is the danger that the jury may confuse art with reality particularly great, but the impressions generated by the evidence may prove particularly difficult to limit . . . .'" Bledsoe v. Salt River Valley Water User's Assoc., 880 P.2d 689, 693 (Ariz. Ct. App. 1994) (quoting 2 MCCORMICK ON EVIDENCE § 214, at 19 (John W. Strong ed., 4th ed. 1992)).

196. *See infra* Part IV.B.3 (arguing for an interpretation of Rule 403 that advises judges to refrain from determining the weight of evidence itself in order to exclude it from the jury, but instead to allow the parties to make their respective cases without interference).

instructions and allow juries to weigh this evidence rather than prohibiting it altogether. If the animation is confusing, opposing counsel should point this out in closing argument. Of course, if the information contained in the CGE is inherently confusing, then it can properly be excluded, but that is because it has an inherent problem, not because the presentation is made by a computer rather than on a chalkboard.

Finally, as with other forms of evidence, if computerized exhibits serve to be unduly cumulative they will be ruled inadmissible. However, it is important that judges know that this does not mean that a party should be robbed of its right to present a persuasive case. For example, in *Towner v. State*, the court held that evidence *corroborative* of a defendant's testimony should not be excluded as cumulative.[197] Thus, a CGE should not automatically be deemed cumulative if it simply bolsters a witness's testimony and helps a witness to explain that testimony to the jury. Showing the CGE over and over again might be cumulative, but a CGE that is shown only once and simply helps a witness explain his testimony to the jury is not.

3. Authentication — Rule 901(a), (b)(1), and (b)(9)

a. Requiring a "Foundation" for the Exhibit

Rule 901(a),[198] can be thought of as an extension or component of the relevancy requirement under Rule 401[199] because, in order for an offered exhibit even to be considered relevant,[200] there must be some

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197. *See* 685 P.2d 45, 49–50 (Wyo. 1984).

198. "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." FED. R. EVID. 901(a).

199. *See* LILLY, *supra* note 151 § 13.6.

> The requirement of authentication can be viewed simply as a function of the principle of relevance: a writing must be linked to its source by sufficient evidence whenever the relevance of the written matter depends upon its source. Evidence of a written contractual acceptance, for example, will be irrelevant unless it came from the defendant now charged with the breach; an acceptance not traceable to the defendant will not support liability.

Id. See also 2 MCCORMICK ON EVIDENCE §§ 179, 185 (John W. Strong ed., 5th ed. 1999); WIGMORE ON EVIDENCE § 2129, at 703 (Chadbourne rev. 1970); FED. R. EVID. 401 advisory committee's note.

200. *See also* FED. R. EVID. 104(b):

> When the relevancy of evidence depends upon the fulfillment of

threshold evidence supporting a finding that the exhibit is what it purports to be. Assume a simple automobile accident takes place at an intersection and plaintiff says his light was green while defendant says the plaintiff's light was red. Suppose the offered exhibit is a photograph of the intersection and a witness can testify that the photograph is a fair and accurate representation of the intersection at the time and place where the accident occurred.[201] Given this evidence, the photograph would be *authenticated* (or identified) under Rule 901(a).

Whether the photograph would be inadmissible for other reasons (e.g., the photo contains unfairly prejudicial images under Rule 403) or whether the jury ultimately does not believe that the photograph proves that the defendant could have seen the plaintiff coming toward the intersection are different factual and evidentiary issues to be determined separately. The only question being answered in determining authentication is whether the fact finder has any "foundation" or factual reason to believe that the exhibit is what it appears or purports to be. If so, then the evidence has been authenticated because there is something to support a finding that the exhibit is what it purports to be.

For purposes of a CGE, the proponent of the CGE must show, as a preliminary matter, that there is some evidence to authenticate or identify the CGE as containing the purported information or data in question, such as a sponsoring witness who is sufficiently familiar with the information contained in the CGE. If the proponent cannot make such a showing, then the CGE is inadmissible because, as a threshold matter, the proponent cannot provide evidence that could support a finding that the CGE is what it purports to be.

b. The Type and Purpose of the CGE

In general, animations used for demonstrative purposes should be and often are the easiest to authenticate because they are merely illustrative of a witness's related testimony.[202] If a witness with

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> a condition of fact [here, that the exhibit is what it purports to be], the court shall admit it upon, or subject to, the introduction of evidence sufficient to support a finding of the fulfillment of the condition [here, testimony or other evidence supporting a finding that the exhibit is what it purports to be].

Id.

201. For example, testimony can establish that it was approximately the same time of day, same lighting conditions, same visual landmarks, no new obstructions to view, same weather conditions, etc.

202. *See* Irish v. Mountain States Tel., 500 P.2d 151, 154 (Colo. App. 1972);

personal knowledge testifies that a graph, chart, diagram, or other demonstrative exhibit produced by a computer portrays its subject matter fairly and accurately, then the exhibit is likely to be authenticated under the "fair and accurate portrayal" test within the trial judge's discretion, much like videos or photographs have been for some time[203]. Requiring a higher standard should be considered error because the Rule 901 standard for demonstrative exhibits is fairly low.

Re-creations and simulations, on the other hand, are the most difficult to authenticate, since they are based on mathematical models and therefore go beyond the mere pictorial depiction of a witness's testimony. Although demonstrative animations use programs in design, the substantive result they create is based on the witness's testimony rather than numerical calculations and other underlying input data. For re-creations that are used substantively (more than just as a "demonstrative exhibit"), it is an arduous task to prove that a re-creation contains all or enough of the relevant data, that such data is accurate, and that the information includes all relevant interactions of the data that occur in the real world to create a specific event. For simulations, the difficulty lies in showing that a certain set of assumptions would transpire under a certain set of circumstances as portrayed by a computer model.

For example, the input information must be shown to be substantially similar to the complete, exact ingredients that created the event in the first place. If the output is a simulation, the underlying data must be proven accurate *and* the program creating the result must also be shown to be capable of receiving information and accurately predicting the outcome based on the interplay of the input information.

Often, however, not all of the data is available, or some is disputed. In an airplane crash, for example, perhaps the speed at which the plane hit the ground can only be estimated to within 100 miles per hour of the actual velocity. The results from a CGE based on a speed of 450 mph will differ drastically from the results of a CGE using a speed of 550 mph or one using 350 mph. Contrast this with a demonstrative

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McGovern v. Board of County Comm'rs, 173 P.2d 880, 881 (Colo. 1946).

203. *Compare* Rockwell Graphics Sys., Inc. v. DEV Indus., Inc., No. 84-C6746, 1992 WL 330356, at *1 (N.D. Ill. Nov. 4, 1992) (admitting an animation) *with* Sommervold v. Grevlos, 518 N.W.2d 733, 738 (S.D. 1994) (excluding an animation). *See also, e.g.*, United States v. Behrens, 689 F.2d 154, 161–62 (10th Cir. 1982) (ruling that the introduction of a summary evidence chart was permissive because a proper foundation was laid through the testimony of the witness who supervised preparation of the exhibit).

animation: if the point to be illustrated is how a plane, according to witness testimony, crashed nose-first, perhaps the estimation of the speed is of no consequence. However, if the output is a re-creation, possibly being 100 mph off the mark on velocity makes the re-creation too imprecise to be what it purports to be — that is, a re-creation of what must have happened. Similarly, if the output is a simulation, the output could not purport to be accurate if it is only one of many different simulated results that would occur within a wide range of differing crash speeds.

Thus, the accuracy and completeness of the data play a much larger role in authenticating substantive CGEs (re-creations and simulations) than they do for demonstrative CGEs (animations). Other factors play significant roles as well, such as the level at which the computer is conducting the manipulation. For example, simple mathematics are easier to scrutinize than a program having to complete complex formulas to determine precise weather patterns. Further, whether or not the result can be verified by another means can affect the ability to authenticate it; for instance, determining what someone owes in back taxes may be done without the use of a computer, and is a task that has been performed regularly for many years, whereas showing how the wind lifted an airborne pesticide and redeposited it at several sites may be completely untestable by other means.

Perhaps the most important element in distinguishing between authentication requirements for demonstrative animations and substantive re-creations or simulations should be whether or not an eyewitness or expert witness can be cross-examined about the actual event. This is because much of the concern for reliably linking the actual event to the exhibit can be satisfied if there is an eyewitness to cross-examine. Because no exhibit, not even a simple, non-computerized exhibit can itself be cross-examined, the reliability of the exhibit must rely on something that can be tested. If an eye witness verifies that the animation is a fair and accurate representation of what she saw and heard, then the opponent can cross-examine that witness to test the exhibit's demonstrative reliability. However, as with a re-creation or simulation, if the substantive reliability relies upon (1) the existence of input data (circumstantial evidence of the event, skid marks, impact analysis, etc.) instead of eye-witness testimony, (2) the correct gathering and inputting of those data, (3) the accuracy of the data, (4) the accuracy of the underlying assumptions being made about those data, and (5) the accuracy of the process to manipulate the data to produce a result, given the assumptions, then the reliability of the exhibit can be tested and, if accurate, will provide sufficient

authentication evidence under Rule 901 that the re-creation or simulation is what it purports to be.[204]

c. Rule 901(b) "Illustrations" and CGEs

Rule 901 continues with subpart (b) ("Illustrations"), which contains ten specific examples of authentication or identification "conforming with the requirements of the rule."[205] One example is Rule 901(b)(9) ("Example (9)"), which provides: "Evidence describing a process or system used to produce a result and showing that the process or system produces an accurate result." According to the literal language of the rule, CGEs appear to fit in this illustration. As a result, courts often will demand an exact showing under Rule 901(b)(9) to authenticate CGEs, sometimes without regard to whether they are used demonstratively or substantively.[206] In *Monarch Federal Savings & Loan Ass'n v. Gesner*,[207] the court held that the following stringent showing was necessary to deem the records authenticated under 901(b)(9):

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204. *See infra* Part III.B.3.c (discussing authentication requirements and citing cases)

205. FED. R. EVID. 901(b). Ten examples are listed for such items as handwriting, voice identification, telephone calls, etc. *See id.*

206. *See* Monarch Fed. Sav. & Loan Ass'n v. Gesner, 383 A.2d 475 (N.J. Super. Ch. Div. 1977) (finding computer-generated records inadmissible). Fortunately, recent cases have begun to disapprove of the ruling in *Monarch*. *See* Hahnemann Univ. Hosp. v. Dudnick, 678 A.2d 266, 268–69 (N.J. Super. App. Div. 1996) (criticizing *Monarch* as setting forth "an outdated six-prong test to be satisfied with respect to admission of computer printouts," and asserting that "significant advancements . . . in computer technology since 1977 . . . [have] relaxed the *Monarch* requirements," so that "[a] witness is competent to lay the foundation for systematically prepared computer records if the witness (1) can demonstrate that the computer record is what the proponent claims and (2) is sufficiently familiar with the record system used and (3) can establish that it was the regular practice of that business to make the record"); *see also* People v. Lugashi, 252 Cal. Rptr. 434 (Cal. Ct. App. 1988) (rejecting the argument that the court should adopt a test whereby testimony would be necessary on the acceptability and reliability of the particular hardware and software of a computer, as well as internal maintenance and accuracy checks). A 1984 case used a test for admissibility that had nothing to do with the competency or reliability of computer hardware or software, calling for "an adequate foundation showing that: (1) the computer entries were made by a business in the regular course of its business; (2) those participating in the record making were acting in the routine of business; (3) the input procedures were accurate; (4) the entries were made within a reasonable time after the occurrence; and (5) the information was transmitted by a reliable person with knowledge of the event reported." Palmer v. A.H. Robins Co., Inc., 684 P.2d 187, 201 (Colo. 1984).

207. 383 A.2d at 487–88.

(1) the competency of computer operators;
(2) the type of computer used and its acceptance in the field as standard and efficient equipment;
(3) the procedure for input and output of information, including controls, tests, and checks for accuracy and reliability;
(4) the mechanical operations of the machine; and,
(5) the meaning of records themselves.[208]

With respect to CGEs, one practitioner has recommended that counsel should take the following appropriate steps to satisfy these concerns:[209]

(1) the sources of the input data are accurate, reliable, and trustworthy in their own right — for example, physical measurements;
(2) the assumptions used to quantify non-measured items are reasonable, consistent with the laws of nature and are bracketed at the upper and lower ends;
(3) commercially recognized hardware is employed;
(4) commercially recognized software was employed that has the capacity of executing those applications it was intended to perform and is subject to appropriate input controls, processing controls and output controls;
(5) no relevant data have been overlooked; and,
(6) the data were "inputted," processed, and retrieved by properly trained and supervised technicians.[210]

This is not to say that all CGEs must or even should go through this rigorous authentication gauntlet. Indeed, the Advisory Committee's Note to Example 9 states that "Example (9) does not, of course, foreclose taking judicial notice of the accuracy of the process or system."[211] Thus, if, for example, a videotape camera records an

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208. *See also* Dep't of Envtl. Resources v. Al Hamilton Contracting Co., 665 A.2d 849, 853 (Pa. Commw. Ct. 1995) (excluding a computer-generated contour map because the expert witness hydrogeologist was unfamiliar with how the computer generated it).

209. *See* Hannan, *supra* note 10, at 358.

210. *See id.* For much more detailed "authentication checklists" suggested by a practitioner, see Gregory P. Joseph, *Getting Computer-Generated Material into Evidence (with Checklists)*, PRAC. LITIGATOR, March 1997, at 31 (providing various checklists in appendices: (1) Input Authentication Checklist; (2) Processing Authentication Checklist; (3) Output Authentication Checklist).

211. FED. R. EVID. 901(b)(9) advisory committee's note. *See also* JACK B. WIENSTEIN & MARGARET A. BERGER, WIENSTEINS'S FEDERAL EVIDENCE § 901.11[2],

intersection where an accident took place, many courts do not require counsel to lay an elaborate foundation relating to how videotape cameras actually work because they often simply take judicial notice of the fact that the "process or system produces an accurate result."[212] So instead of requiring elaborate foundations as to the process or system producing an accurate result in terms of mechanics, courts are often concerned with whether a witness can testify regarding the identity and accuracy of the exhibit as it may relate to the substance of their testimony in order to have it authenticated.[213]

This type of less-detailed authentication should be the case with CGEs as well — especially for computer animations, which simply help explain the testimony of a witness in graphic fashion,[214] as opposed to re-creations and simulations, which produce a result based on certain input data along with the underlying assumptions of the computer program. Thus, re-creations and simulations used substantively — as opposed to animations, especially mere demonstrative evidence animations — should be the only types of CGEs that require the laying of such an exacting authentication foundation.[215]

To help clarify why demonstrative animation exhibits differ from simulations and re-creations in their authentication requirements, consider the following example. Suppose a defendant business supervisor has his secretary type a letter using a computer and word processing computer program,[216] and at trial plaintiff wants to enter the

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at 901-59 (Joseph M. McLaughlin ed., 2d ed. 1999) (noting that in explaining Rule 901(b)(9), the Advisory Committee "relied on cases holding that the witness who provides the foundation for the admission of electronically produced data need not be the person who actually operated the computer" (footnote omitted)).

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

213. *See infra* Part IV.B.4 (suggesting textual changes to Rule 901(b) to include explicit references to CGEs, advocating wider acceptance of CGEs and advising judges to take greater Rule 201 judicial notice of computer hardware and software systems that generate CGEs).

214. *See* Joseph, *supra* note 210, at 31; *see also* Ladeburg v. Ray, 508 N.W.2d 694, 695–96 (Iowa 1993) (affirming admission of diagrams drawn by a computer on the basis of testimony that the computer was used merely as a drafting tool and the opportunity for cross-examination of the expert who had prepared them); People v. McHugh, 476 N.Y.S.2d 721, 722 (Sup. Ct. 1984) ("Whether a diagram is hand drawn or mechanically drawn by means of a computer is of no importance.").

215. For more on this point, see the discussion below, arguing that only re-creations and simulations require stringent authentication of the process used because the input data are the source of the reliability of the result, rather than an eyewitness or expert witness who simply uses the animation to help explain their testimony and therefore can be cross-examined on it.

216. Microsoft Word and Corel WordPerfect are examples of common word

letter in evidence because the letter purportedly contains certain admissions of defendant. With respect to Rule 901 authentication, we require only that a witness authenticate the "results" of the letter, such as identification of defendant's signature or defendant's letterhead. However, we do not require that someone also has to: (1) explain exactly how a secretary used a word processing computer; (2) vouch for the accuracy and reliability of the software program used; (3) explain how that process of entering keystrokes results in letters being electronically stored in code in the computer; (4) verify that the typed words were accurately transferred from defendant to the secretary (shorthand or scribbled on notes, or by dictaphone); and (5) confirm that the secretary is a competent typist and operator of word processing programs.[217] It therefore follows that courts should focus more on the CGE itself, especially when it is merely being used as demonstrative evidence or an animation, and focus less on how the CGE was technically created — unless it is a re-creation or simulation being used as substantive evidence. In that case, the reliability is not the sponsoring eyewitness's testimony, but the accuracy of the input data, as retrieved, entered, and stored, and the accuracy of the process of analyzing and generating output results. Courts need to be cognizant of this difference and should not apply such exacting authentication standards for mere demonstrative CGEs.

4. Narrative Testimony and Leading Questions — Rule 611

a. Improper Usage

Under Rule 611,[218] an opponent of a CGE, especially a detailed animation, re-creation or simulation, might object to the usage of a CGE

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processing programs.

217. Conceivably, such authentication requirements might be necessary if there were no witnesses to authenticate the letter and the plaintiff wanted to show that this letter came from defendant through some particular process.

218. "(a) Control by Court. The court shall exercise reasonable control over the mode and order of interrogating witnesses and presenting evidence . . . (c) Leading Questions. Leading questions should not be used on direct examination of a witness except as may be necessary to develop the witness's testimony . . . ." FED. R. EVID. 611. Leading questions are discouraged on direct examination, except in special circumstances, according to the express language of Rule 611(c). The objection that the question calls for a "narrative" is not an express violation of Rule 611; however, it has been held to be within a court's discretion, presumably pursuant to the general language of Rule 611(a), to exclude such testimony. *See, e.g.*, United States v. Pless, 982 F.2d 1118, 1123 (7th Cir. 1992).

because the CGE itself may constitute what is essentially a long-running narrative, rather than the witness's answers to direct, pointed questions.[219] However, this objection misapprehends how a CGE should be used at trial and therefore is an objection to the attorney's improper usage of an exhibit, not to the CGE itself. Proper usage of a CGE when it is used to explain a witness testimony means (1) calling witnesses to the stand and asking them specific questions, and then, (2) as they are answering, (3) showing the CGE, sometimes only seconds at a time, at the precise moment when it is helpful to the witness in explaining their testimony. Of course, simply setting up a monitor and playing an animation or re-creation CGE to the jury without any foundation or pointed questions to the witness would be improper — but that would be the case with *any exhibit*, not just a CGE. Thus, such an objection really goes to an attorney's improper actions, not to the intrinsic nature of a CGE as opposed to any other type of exhibit.

As a result, failing to ask the sponsoring witness pointed questions and failing to have them respond is a violation of the rules of evidence. Moreover, this would also be a tactical mistake because showing a CGE in a controlled manner, "a little at a time" so that it "builds" as the witness's testimony proceeds, is much more effective than displaying a large static diagram, like a posterboard display that is already complete on which the witness points out different portions of the diagram as they proceed through their testimony. Indeed, a CGE that builds a complex diagram a little portion at a time is actually less of a narrative than a non-computerized exhibit of, for example, a posterboard time-line of factual events, because jurors can view or read the posterboard content before the witness gets to that portion of his testimony. A non-computerized posterboard time line of all the factual events according to a witness might be displayed in its entirety for the jury to see. The entire story would be revealed at the very beginning of the testimony — right as the witness began explaining the first item on the time line. A computerized time-line animation, on the other hand, has the benefit of revealing only one item at a time *as the witness explains it*. That way,

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219. Many judges prefer questions eliciting short, direct answers rather than long "narrative" answers because they are frequently more efficient.

> Answering short precise questions rather than providing narrative answers] also facilitates anticipation by opposing counsel, making it easier to interpose an objection between the examining counsel's question and the expected inadmissible answer. Consequently, the court often responds favorably to a request by opposing counsel that testimony be elicited by specific questions.

LILLY, *supra* note 151, at 99.

the jury cannot wander ahead of the testimony and inspect later events before the witness addresses them.[220] This is tactically more desirable because the jury's attention is exactly at the same place as the witness's testimony and the attorney has better control over what the jury is seeing as the witness is testifying.[221] The narrative objection then should be rejected when opposing a CGE, unless the CGE is simply used improperly, as any other traditional, non-computerized exhibit could be.[222]

Similarly, playing the CGE on direct examination before the witness has been asked the necessary foundational questions and has answered general questions about the nature of her testimony could conceivably be considered "leading"[223] because the CGE would be "suggest[ing] to the witness the answer desired by the examiner."[224] Again, this would be a valid objection only if the CGE were used improperly — as any exhibit might be — not an attack on the CGE itself. Accordingly, a CGE played after or along with the witness's testimony is proper so long as the witness answers first and does not look to the CGE as a "prompt" when answering questions. To the extent that the CGE suggests the answer because it already has been prepared, it is no different than any other demonstrative exhibit or piece of evidence the witness may have seen before trial containing what might be a suggested answer — a contract or letter containing key language, a photograph of a scene showing an obstructed view, a time-line of events, a list of employees, a list of complaints, etc. These objections can be addressed by reformulating questions and using the CGE in a manner that would be proper, but in no event should the CGE itself be

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220. Even if the testimony as to all events is given first and then the witness is asked to go back on a time-line, such a presentation appears overly redundant and does not help make the witness's testimony as dynamic as when that witness explains each event the first time. Also, it may draw an "asked and answered" objection generally under a Rule 611(a) or a Rule 403 "cumulative" objection.

221. Law professors can relate to this issue in terms of using a chalkboard in class. It is often more effective to write notes on the board *during class*, as issues come up and are addressed and discussed, rather than writing up on the board before class every point that the professor plans to make during class and then simply referring to those notes as class proceeds.

222. *See infra* Part IV.B.5 (suggesting that judges should interpret Rule 611 to allow CGEs without construing them as narrative or leading).

223. Leading questions are usually proper on cross-examination, when examining a hostile witness, or on direct examination as may be necessary to develop the witness's testimony. *See* FED. R. EVID. 611(c).

224. 1 MCCORMICK, *supra* note 199, § 6, at 19 (John W. Strong ed., 5th ed. 1999) (defining a question which suggests the answer as a leading question under Rule 611(c)).

held inadmissible simply because the lawyer is not doing his job correctly.

b. "Voice Over" Audio Narration

A CGE accompanied by audio narration, a "voice over," or other sound effects may be likened to a video presentation that emits sound in some form and, as such, may be objectionable as leading or constituting a narrative.[225] This is especially true of a voice over or audio narration explaining or even narrating what is being shown on the CGE — which, of course, would also raise hearsay objections.[226] Having a CGE explain itself, instead of having a witness testify with the CGE employed only to help that witness explain her testimony visually, would in essence make the CGE the witness — that is, the live witness on the stand would become superfluous because both the visual *and the verbal* explanation of events would be entirely subsumed in the CGE. It would be just as if an out-of-court declarant made a statement on videotape and then that videotape were played — an obvious example of hearsay.[227]

Demonstrative CGEs must *assist* witnesses in explaining their testimony to the jury, rather than *eliminate* the need for live testimony, unless the witness is also the narrator. Since the witness can be cross-examined, and the CGE cannot, the "voice over" portion of the CGE should be excluded. A cautious attorney can simply avoid these issues by producing animations that do not have "voice over" narrations.

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225. There would also likely be concerns of hearsay, *see* FED. R. EVID. 801, prejudice, *see* FED. R. EVID. 403, and a host of other objections.

226. *See infra* Part III(B)(6) (addressing possible hearsay objections in CGEs because "behind-the-scene" computer programmers and computer operators are making assertive out-of-court statements, often without being available for cross-examination in violation of Rule 802, which excludes hearsay if there is no exception).

227. Note, however, that live testimony from the narrator (or the author of the narrator's words) who adopts the narration as true and thereby makes the statement her own would cure the hearsay problem. *See* FED. R. EVID. 801(d)(1) advisory committee's note (providing that when the witness admits in open court that she made the statement and believes the statement to be true, she adopts the statement as her own). The statement thereby ceases to fall within the definition of hearsay because it is, in effect, no longer an out-of-court statement.

Sound effects[228] are more problematic because, unlike verbal statements, they are not obviously hearsay and do not necessarily eliminate the need for live witnesses. There is a sort of bootstrapping rationale that can justify the inclusion of certain sound effects: if a witness can use a CGE to help explain what he saw (an auto accident scene, for example) because he cannot fully recreate that scene through words, should he not also be able to use a CGE to help explain or describe a noise he heard? If the sound rendered by the CGE is a fair and accurate representation of the noise that he heard when the original event transpired, then it should be admissible just as an authenticated photograph would be admissible.[229]

The justification for sound effects, however, only applies when an eyewitness (or "ear" witness) can authenticate the CGE. A much greater problem arises with sound effects in a re-creation or simulation of an event based on input data. For example, in a re-creation showing how far a truck skidded down a freeway before it jack-knifed, it may be helpful or even necessary to include the sound caused by the friction between the truck's wheels and the pavement (a "skidding" sound). Such a simulation might be objectionable for a number of reasons, however, given the likelihood that manufacturing the sound of a skid might be inaccurate or exaggerated for effect.[230]

Yet, if the computer was programmed with the precise data — such as speed, temperature, distance, weight of the truck and its cargo, composition of the pavement, etc. — the sound of the skid might not be objectionable. In any event, it certainly gives new meaning to the old

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228. Sound effects are different from a "voice over" because they are not *words* — the statements of a narrator — but are instead *noises*, such as "an 'annoying' car horn," "a 'cracking' gun shot," "a 'loud' thumping," "a 'booming' explosion," etc. The decision to attach adjectives to the description of the sounds heard by a witness is intended to demonstrate the larger issue — a witness should perhaps be able to use sound effects in the CGE in order to help her explain her testimony if part of the testimony includes not only what she allegedly *saw* but also what she allegedly *heard*.

229. If a photo can be authenticated because the witness can testify that it is a fair and accurate portrayal of the scene in question, a sound effect should be able to be authenticated as long as the witness can testify that it is a fair and accurate reproduction of the actual sound. If Kato Kaelin (the infamous witness from the O.J. Simpson case) could bang on the witness stand to replicate the "three loud thumps" he heard, he should also have been able to authenticate an actual thumping sound made by a computer. The fact that a computer or recording can make a better sound effect than his fist on the stand should not render the computer sound effect inadmissible as long as the jury understands that the sound is not a recording of the actual event in question.

230. Authentication under Rule 901 would be a very difficult obstacle to overcome — how could we know whether the sound reproduced by the CGE was substantially similar to the sound actually emitted?

saying: "If a tree falls in the forest and no one was there to hear it, would it still make a noise [and, if so, what *exactly* would it sound like]?" A proponent of a CGE with a sound effect might argue that if the sound effect were *not* included, the re-creation would be less accurate than the original event, a fundamental critique of re-creations and simulations.[231]

5. The "Best Evidence" Rule — Rules 1001–1003 and 1006

a. An "Original" or "Duplicate"

Rule 1002[232] requires original documents, rather than copies,[233] to be used in court, but only when the proponent of the exhibit is attempting to prove the contents or terms of written documents, recordings, or photographs. The following rationale applies: "The original is preferred because its use eliminates the risk of mistranscriptions or testimonial misstatements of what the document said; inspection of the original also reduces somewhat the chance of undetected tampering."[234]

Although it appears that this rule would pertain to most situations at trial, it often does not apply because a witness may have personal knowledge of the matter to be proven. For example, if trying to prove payment of debt, a witness can testify that she paid without having to produce a written record of the payment such as a canceled check or receipt. Such personal knowledge is sufficient even if a writing, recording, or photograph of the matter also exists. Thus, it has been held that "[n]o evidentiary rule . . . prohibits a witness from testifying to a fact simply because the fact can be supported by written documentation."[235]

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231. *See supra* notes 154–63 and accompanying text (addressing relevancy and the substantially similar requirement, especially for re-creations and simulations).

232. Requirement of Original. To prove the content of a writing, recording, or photograph, the original writing, recording, or photograph is required except as otherwise provided in these rules or by Act of Congress." FED. R. EVID. 1002.

233. A duplicate is admissible to the same extent as an original unless (1) a genuine question is raised as to the authenticity of the original or (2) in the circumstances it would be unfair to admit the duplicate in lieu of the original." FED. R. EVID. 1003. "A 'duplicate' is a counterpart produced by the same impression as the original, or from the same matrix, or by means of photography, including enlargements and miniatures, or by mechanical or electronic re-recording, or by chemical reproduction, or by other equivalent techniques which accurately reproduces the original." *Id.*

234. LILLY, *supra* note 151, at 613.

235. R&R Assocs., Inc. v. Visual Scene, Inc., 726 F.2d 36, 38 (1st Cir. 1984); *see*

Some opponents of CGEs argue that original documents must be used instead of computer-generated images. This, however, is one area in which the use of computers has been explicitly acknowledged in the rules: "[i]f data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect the data accurately, *is an 'original.'*"[236] While CGE opponents may contend that a CGE is an attempt to prove the contents of a written document, recording or photograph, a CGE often actually falls outside the rule because it is itself an "original" under the definition of "original."[237]

Moreover, to the extent a CGE can be likened to a "photograph" rather than a "writing" under the rule, Rule 1002 "best evidence" concerns are inapplicable because the CGE would be considered as *original* as a "photograph." If the CGE were considered a photograph, the proponent of the CGE would be trying to admit it, not offer testimony in lieu of it. Thus, the court, if anything, should demand its production at trial rather than prohibit it in favor of unaccompanied verbal testimony.

Furthermore, to the extent that the CGE is a demonstrative exhibit used solely to illustrate the witness'ss testimony, the rule would be inapplicable since the CGE would not constitute independent "proof of its contents." In other words, the actual "proof" — the admitted evidence — would be the independent knowledge of the eyewitness. Thus, the only substantive proof is the witness's testimony, not the demonstrative exhibit being used to illustrate the witness's testimony.

Finally, Rule 1001(3) defines an "original" photograph very broadly, stating that, "[a]n 'original' of a photograph includes the negative or any print therefrom." As such, any print of a CGE would be considered an "original," and the rule would again be inapplicable.

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also D'Angelo v. United States, 456 F. Supp. 127, 131 (D. Del. 1978), *aff'd*, 605 F.2d 1194 (3rd Cir. 1979) (holding that a witness with personal knowledge of the amount paid in benefits to an employee could testify to that amount without producing the written records of the company; however, if that witness lacked independent knowledge and derived his information from the written records, then failure to produce the written records would violate the rule).

236. FED. R. EVID. 1001(3) (emphasis added).

237. *See infra* Part IV.B.6 (arguing for explicit changes to Article X of the Federal Rules of Evidence so as to specifically acknowledge CGEs as a separate category along with writings, recordings, and photographs).

b. Admissible as a "Summary"

Rule 1006[238] is another avenue for computerized exhibits to meet the "best evidence" rule. The rule allows a litigant to summarize voluminous original documents and present the summary in lieu of the original documents, provided these underlying original documents themselves would be admissible.[239] Although the rule refers to "documents," it has been applied to things such as recordings.[240] A CGE that represents either an expert witness's testimony (demonstrative) or input data (re-creation or simulation) and that summarizes voluminous underlying data can meet a "best evidence" objection by using Rule 1006.[241]

6. Inadmissible Hearsay — Rules 801–807

Hearsay, according to Rule 801(c), is defined as "a statement,[242] other than one made by the declarant[243] while testifying at the trial or

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238. This rule provides:

> The contents of voluminous writings, recordings, or photographs which cannot conveniently be examined in court may be presented in the form of a chart, summary, or calculation. The originals, or duplicates, shall be made available for examination or copying, or both, by other parties at reasonable time and place. The court may order that they be produced in court.

FED. R. EVID. 1006.

239. *See* United States v. Pelullo, 964 F.2d 193, 204 (3d Cir. 1992).

240. *See* United States v. Segines, 17 F.3d 847, 853–54 (6th Cir. 1994) (allowing edited recordings from voluminous recordings under Rule 1006).

241. *See infra* Part IV.B.6 (suggesting that Rule 1006 should expressly treat CGEs as "summaries" falling within the purview of the rule).

242. 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." FED. R. EVID. 801(a). Thus, simply because words are written or spoken does not necessarily make it an "assertion." *See, e.g.*, United States v. Lewis, 902 F.2d 1176, 1179 (5th Cir. 1990) (holding that questions asked by a declarant were not hearsay because they were not assertions of anything, just words). However, actions without words, or non-verbal conduct, can be considered a statement if it is intended as an assertion. *See, e.g.*, United States v. Caro, 569 F.2d 411, 416 n.9 (5th Cir. 1978) (finding that the act of physically pointing to a particular vehicle in answering a question as to the source of drugs is a "statement" because the non-verbal conduct was intended as an "assertion").

243. A "declarant" is "a person who makes a statement" that is being relayed by the witness on the stand in court instead of the declarant himself. FED. R. EVID. 801(b). Thus, a declarant's out-of-court statement — now being relayed by a witness on the witness stand — is hearsay, if offered to prove the truth of the matter asserted by the declarant in his statement.

hearing, offered in evidence to prove the truth of the matter asserted." The purpose of the rule is generally thought to be that "the opponent [against whom the hearsay is being used] is unable to confront and cross-examine the 'real' witness (the declarant) and to expose weaknesses in his statement."[244]

Thus, if a witness were to testify as follows, "I was at the intersection and I saw defendant run the red light," and plaintiff's attorney is using that statement to prove the truth of the matter asserted by the witness (that defendant did indeed run the red light at the intersection), it would *not* be hearsay because the witness could be cross-examined as to his personal knowledge of the accident and his possible lack of sincerity, poor memory, bias, etc. However, if the witness were to testify, "Jim said to me that he was at the intersection and he saw defendant run the red light," the statement would qualify as hearsay because the "real witness" or declarant — Jim in this case — is not on the witness stand testifying in court. Of course, there are many exceptions to the hearsay rule that might be applicable and which would allow a hearsay statement to be admitted.[245]

In addition to the possibility of a witness's testimony containing inadmissible hearsay as set forth above, exhibits offered at trial may violate the hearsay rule if they contain inadmissible hearsay.[246] For example, consider a letter written by Jim (from the previous example) and offered at trial as an exhibit, in which Jim writes to the witness, "I saw defendant run the red light." The letter would be inadmissible hearsay because it is an out-of-court statement (an assertion) made by

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244. LILLY, *supra* note 151, at 209.

245. For example, suppose that Jim was at an intersection and spoke to the witness on a cellular phone, describing the defendant running a red light as it happened. If the witness testified that Jim said the defendant ran the red light, the testimony, although hearsay, would be admitted under Rule 803(1), the "present sense impression" exception. Similarly, the 803(2) "excited utterance" exception might apply to allow Jim's statement if Jim was so startled by the act of the defendant running the red light ("the event") and spoke to the witness while "under the stress of the excitement caused by the event." Not only are there 24 exceptions under Rule 803 (declarant's unavailability is immaterial) and six such exceptions under Rule 804 (declarant's unavailability is required), but there are definitions of "non-hearsay" that operate as exceptions, but technically are categorized or are defined as "non-hearsay." *See* FED. R. EVID. 801(d)(1) ("Prior Statement by a Witness"); FED. R. EVID. 801(d)(2) ("Admission by a Party Opponent").

246. *See* Donovan v. Local 738, Int'l Union United Auto., 575 F. Supp. 52, 53 (D. Md. 1983) (denying the admission of an exhibit because it contained inadmissible hearsay); *see also* Chadwell v. Optical Radiation Corp., 902 F. Supp. 830, 834 (S.D. Ind. 1995) (finding an exhibit that was an excerpt from a document to be inadmissible hearsay).

a declarant who is not the witness in court to be cross-examined about the written assertion.

With respect to CGEs, it makes no difference whether such a letter would be displayed to the jury with an overhead projector, enlarged as a posterboard blowup, or generated by a computer and displayed on a monitor. It would still be inadmissible hearsay and should be excluded if it does not fall within an exception. The hearsay analysis remains the same whether or not a computer is used to display the exhibit.

However, some argue that CGEs are not only capable of displaying documents containing hearsay, but that they, intrinsically, violate the hearsay rule because the computer programs, which allow computer operators to create animations, re-creations, and simulations, contain what are in essence out-of-court statements by various declarants (computer operators, computer programers, or data entry personnel) that are being used to prove the truth of the matter asserted in the CGEs and for which there is no applicable exception.[247] However, whether the CGE itself should be deemed inadmissible hearsay depends upon how and for what purpose the CGE is being used.

a. Non-substantive, Demonstrative Exhibits

Assume that a computer animation displays a valve assembly in a patent infringement case. The plaintiff's expert witness testifies how the patented valve assembly is constructed and how it works. The expert then compares it to the alleged infringing valve assembly, pointing out the similarities in an effort to help the jury understand how the alleged infringement takes place. In explaining this to the jury, the expert witness refers to a computer animation to help explain the similarities and alleged infringement. Would an animation used in this way constitute inadmissible hearsay?

Recall that hearsay is an out-of-court statement made by a declarant used "to prove the truth of the matter asserted." In this example, however, the computer animation of the valve assembly is not being used to prove the truth of the matter asserted, because a mere demonstrative exhibit, by definition, is not substantive proof of anything.[248] The only substantive proof would be the witness's verbal

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247. *See* WRIGHT & GRAHAM, *supra* note 8, § 5174.1 (assailing CGEs, *intrinsically* as hearsay, not simply as a means of displaying underlying documents which might contain hearsay).

248. *See supra* notes 45, 137; *see also infra* note 249 (defining demonstrative evidence and pointing out that it has no independent proof and often does not even go

testimony — it is only what the witness is saying on the witness stand that proves truth of the matter being asserted.[249] So as long as the animation merely reflects visually what the witness is communicating verbally, it is not substantive evidence and therefore cannot be hearsay.

Most importantly, because the CGE is simply a pictorial display of verbal testimony, the witness can be cross-examined on what the CGE conveys. Obviously, if the CGE, or any demonstrative exhibit, goes beyond what the witness is saying and contains a hearsay statement, that statement should be excluded if there is no applicable exception. However, if a CGE does contain such hearsay, then, by definition, it would no longer be a demonstrative exhibit because it would be going *beyond* the witness's testimony. Thus, just as a police sketch of a suspect is not the hearsay statement of the police sketch artist as it is totally dependent on the credibility of the eyewitness, neither is a computer animation the hearsay of the computer programmer who creates the animation. Hearsay is in essence the testimony of another — the declarant, the "real witness" — who made the out-of-court assertion. Judges should never apply the hearsay rule to a CGE that is being used solely as a demonstrative exhibit, which, by definition, is nothing more than a visual portrayal of the witness's verbal testimony, which is itself subject to cross-examination.

Excluding a purely demonstrative CGE because the computer programmer is not in court to be cross-examined would be like excluding a demonstrative list of elements displayed on a posterboard because the wordprocessor programmer and the copier machine inventor who made the posterboard blow up possible are not there to be cross-examined. Thus, a hearsay objection to a demonstrative CGE based on the "assertions" of a computer programmer not in court is a red herring.[250]

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back to the jury room with other admitted substantive evidence to be considered during jury deliberations).

249. Demonstrative evidence is concerned with real objects that illustrate some verbal testimony; it has no probative value in itself. *See* BLACK'S LAW DICTIONARY 577 (7th ed. 1999); *see also* United States v. Heatherly, 21 M.J. 113, 115 n.2 (C.M.A. 1985) (contrasting demonstrative evidence — "generally that which illustrates or clarifies the testimony of a witness" — to substantive or real evidence — "introduced to prove or disprove a fact in issue" — and concluding that the admissibility of demonstrative evidence is generally "held to be within the sound discretion of the trial judge"); People v. Strader, 663 N.E.2d 511, 517 (Ill. App. Ct. 1996) (asserting that demonstrative evidence is "by definition purely explanatory and illustrative").

250. It is therefore unnecessary to have the creator of an animation testify as to the creative process and software program used in making a demonstrative animation. *See* 2 MCCORMICK, *supra* note 199, § 212. It is also why a radar gun, when read by a police

b. Substantive Evidence — Re-Creations and Simulations

Because a re-creation or simulation is not just a demonstrative exhibit, it may contain hearsay statements because it is intended to prove the truth of the matter asserted in the CGE itself. An opponent of the CGE may argue that it should be excluded as hearsay because the declarants (the "real witnesses") are the computer operators who input the data or the computer programmers who wrote the CGE program. While the witness on the stand may generally discuss the CGE and even be cross-examined on it, in this instance the CGE would be *more than* simply a visual explanation of the witness's entire testimony. It would contain substantive evidence apart from, or in addition to, the visual portrayal of the witness's verbal testimony.

As such, the only means to get the CGE admitted is either to (1) find an exception to the hearsay rule which may be applicable — especially important with respect to trying to admit the underlying input data; or (2) argue that the computer program processing the information is simply a device that produces results and, therefore, is no more hearsay than a radar gun,[251] a barometer, a pocket calculator, or any other device that produces a result based on input data.

With a simple demonstrative animation — the visual portrayal of the verbal testimony — the input data are not hearsay because it comes directly from the witness on the stand. With re-creations and simulations, however, the input data are often gathered by someone other than the witness. These data — for example, in an automobile accident, the length and weight of the automobile, the direction of skid marks, the time of the accident, the weather conditions, the pavement type, and road size — are out-of-court assertions because they were

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officer, for example, does not contain inadmissible hearsay. *See* City of Webster Groves v. Quick, 323 S.W.2d 386, 390 (Mo. Ct. App. 1959) (rejecting appellant's argument that the results of an electronic timer for speeding are hearsay).

> If appellant's contention were sound then the results of the use of a measuring device on some subject to ascertain its length would be inadmissible; a doctor could not testify as to what a fluoroscope revealed concerning the condition of his patient, and, likewise, he would not be permitted to testify as to the results heard through a stethoscope. Many other examples of the absurdity of such a rule could be cited.

Id.

251. *See* City of Bellevue v. Lightfoot, 877 P.2d 247, 252 (Wash. Ct. App. 1994) (noting that courts in the majority of jurisdictions "take judicial notice of the general reliability of radar" and finding no hearsay based on the out-of-court assertions of the individuals who invented radar guns).

gathered by someone other than the witness. The observed data — the skid marks — are not assertions, but the measurements of those skid marks and their entry into a computer are assertions. Thus, the measurement and entry of the input data constitute assertive non-verbal conduct within Rule 801(a).[252]

However, various exceptions may allow these out-of-court assertions. For instance, if input data are produced as a regularly conducted business activity,[253] or if they are produced as part of an official public record or report,[254] there is an acceptable exception to the hearsay rule under Rules 803(6) and (8), respectively. Also, input data of market reports and commercial publications would be admissible

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252. *See generally* Lawrence F. Mazer et al., *Expert Testimony Regarding the Speed of a Vehicle: The Status of North Carolina Law and the State of the Art*, 16 CAMPBELL L. REV. 191 (1994); William G. Burrill, *Vehicular Accident Reconstruction*, 323 PLI/Lit 163 (1987) (PLI Litig. & Admin. Practice Course Handbook Series No. H4-5012, 1987). Such input data in an automobile accident case may include, but are not limited to, information such as measurements of skid marks, pavement gouge marks, the physical crushing of the vehicle, friction characteristics, and the location of the final rest positions from the impact area.

253. The following is not excluded by the hearsay rule:

> A memorandum, report, record, or *data compilation, in any form*, of acts, events, conditions, opinions, or diagnoses, made at or near the time by, or from information transmitted by, a person with knowledge, if kept in the course of a regularly conducted business activity, and if it was the regular practice of that business activity to make the memorandum, report, record, or data compilation, all as shown by the testimony of the custodian or other qualified witness, unless the source of information or the method or circumstances of preparation indicate a lack of trustworthiness.

FED. R. EVID. 803(6) (emphasis added).

254. The following is not excluded by the hearsay rule:

> Records, reports, statements, or *data compilations, in any form*, of public offices or agencies, setting forth (A) the activities of the office or agency, or (B) matters observed pursuant to duty imposed by law as to which matters there was a duty to report, excluding, however, in criminal cases matters observed by police officers and other law enforcement personnel, or (C) in civil actions and proceedings and against the Government in criminal actions, factual findings resulting from an investigation made pursuant to authority granted by law, unless the sources of information or other circumstances indicate lack of trustworthiness.

FED. R. EVID. 803(8) (emphasis added).

under Rule 803(17),[255] as would present sense "impressions"[256] that are made as the declarant is describing the event, such as the recording of measurements as the declarant is perceiving the event.[257]

When a computer is fed input data to generate a result, an opponent can argue that the result generated by the computer's program is hearsay because the result is simply a computer programmer's assumption of how the event must have or would have occurred given those particular input variables. For example, if the input data are an airplane in-flight data recorder and cockpit audio recorder, and assuming these either do not constitute hearsay or there is an applicable exception, the computer program then takes all of the information — altitude, speed, flight course, wind direction, weather conditions, what the pilot and crew were saying as the plane went down, etc. — and generates a re-creation or simulation of what must have happened during the airplane crash. The simulation would be based on the assumptions or assertions that the computer programmers made when they wrote the program to evaluate the input variables. Thus, it would appear to be inadmissible hearsay with no apparent applicable exception.

However, one might argue that the program is not really an out-of-court assertion but is instead merely evidence of a device performing pre-programed tasks on admissible input data — much like a pre-programed calculator will perform tasks on admissible input data. For example, "2 + 2 = 4," is the result of an addition program. The question is this: Is the "4," which is a product of a math program written by programmers, an out-of-court assertion and ultimately inadmissible hearsay, or is it just a pre-programed result performed by a device and, therefore, admissible? If the result produced by a pocket calculator is not hearsay, then the result produced by a re-creation or simulation program should not be hearsay.

The main problem with this example, however, is that we also know that "2 + 2 = 4" as a mathematical function cannot really be disputed. Every time the input of "2 + 2" is entered, the result will

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255. The following are exceptions to the hearsay rule: "Market quotations, tabulations, lists, directories or other published compilations, generally used and relied upon by the public or by persons in particular occupations." FED. R. EVID. 803(17).

256. *See supra* note 245 (discussing the "present sense impression" exception).

257. Note that if the entries themselves contain hearsay — the report contains another person's statement that is offered for the truth of the matter asserted, or "hearsay within hearsay" — then there must be a hearsay exception available for each "level"of hearsay. *See* FED. R. EVID. 805 ("Hearsay included within hearsay is not excluded under the hearsay rule if each part of the combined statements conforms with an exception to the hearsay rule provided in these rules.").

always be "4." Similarly, a thermostat will take the same input data (the ambient temperature) and produce a reading that is always the same (32 degrees Fahrenheit if it is freezing outside). Such certainty, however, is unlikely with computer re-creation and simulation programs, which might produce different results based upon differing assumptions among computer programmers.

c. Two Possible Circumventions — Rules 703 and 801(d)(2)

If a CGE is deemed inadmissible hearsay, one should consider Rule 703[258] as a possible avenue to make the CGE admissible. Under Rule 703, an expert may base an opinion on facts or data that are inadmissible[259] — even including hearsay in some circumstances.[260] Two points are worth emphasizing with regard to seeking admission of CGEs under Rule 703. First, the inadmissible underlying data or facts (the hearsay) must be "of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject."[261] Second, the expert witness, in addition to being qualified in his field, should also be familiar with the computer program used to generate the result portrayed in the CGE.[262] An Ohio court has held that the proponent of the CGE must make two showings when an expert is testifying and is the sponsoring witness for a substantive CGE: (1) the expert is qualified in the particular field (accident reconstruction,

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258. 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.

FED. R. EVID. 703.

259. *See id.*

260. *See* Engebretsen v. Fairchild Aircraft Corp., 21 F.3d 721, 729 (6th Cir. 1994) (holding that hearsay may be admitted to explain the basis of the expert's opinion, but not as substantive evidence). *But cf.* United States v. Lundy, 809 F.2d 392, 395–96 (7th Cir. 1987) (requiring the expert to do more than merely be a guise for inadmissible hearsay to be admitted).

261. *See* Advent Sys. Ltd. v. Unysis Corp., 925 F.2d 670, 682 (3d Cir. 1991) (requiring that both the facts and data relied upon by the expert are the kind reasonably and commonly relied upon by experts in the particular field).

262. If one of the requirements under the rule is that the facts or data in the CGE (including the program itself) must be "of a type reasonably relied upon by experts in the particular field," then it would be insufficient, not to mention embarrassing, to present an expert witness unfamiliar with the very computer program the proponent is attempting to get admitted as an exhibit.

environmental spills, etc.), and (2) the expert is qualified in the field, or at least the technique, of generating a computer simulation or re-creation, based on certain input data.[263] Thus, to the extent that experts rely on input facts and data in simulations or re-creations, such CGEs should not be excluded as hearsay even if the expert relied on underlying data that fit within the definition of hearsay.

Caution in this area is advisable, however, because the Advisory Committee recently has considered amending Rule 703 in an attempt to close this inadmissible evidence "loophole."[264] The proposed amendment would add the following sentence: "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."[265] While not entirely eliminated by this addition, the loophole is much harder to use under the familiar test that the prejudicial effect[266] of such facts or data cannot substantially outweigh the probative value.

Even if a judge finds that a CGE contains inadmissible hearsay, it may be deemed admissible by re-defining it as a form of "non-hearsay" under Rule 801(d)(2) if the testifying witness adopts whatever hearsay is contained in the CGE as their own statement and can be cross-examined on it.[267] This provides an *extremely limited* loophole, however. First, the adopted statement — the hearsay contained in the CGE — would only be admissible if it is being used *against* a party, so the opposing party would have to be using a party's CGE against them, which is highly unlikely. Moreover, the witness sponsoring the CGE would have to be a party and not just a witness or, as commonly is the case, an expert witness. Thus, the adoptive admission rule is more of

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263. *See* State v. Clark, 655 N.E.2d 795, 808–12 (Ohio Ct. App. 1995).

264. The proposed Advisory Committee Note to Rule 703 states: "Rule 703 has been amended to emphasize that when an expert reasonably relies upon inadmissible information to form an opinion or inference, the underlying information is not admissible simply because the opinion or inference is admitted." PROPOSED AMENDMENTS TO THE FEDERAL RULES OF EVIDENCE 90 (Sept. 1999), *available at* <http://www.uscourts.gov/rules/propevid.pdf>.

265. *Id.*

266. The proposed Advisory Committee Note defines the prejudicial effect in this context as "the risk of prejudice resulting from the jury's potential misuse of the information for substantive purposes . . . ." *Id.* at 91.

267. Rule 801(d)(2) provides: "A statement is not hearsay if — . . . [it] is . . . a statement of which the party has manifested an adoption or belief in its truth . . . ."

a cautionary warning for a party proposing a CGE who later wants to object to part of his own CGE as containing hearsay.[268]

d. The "Catchall Exception" — Rule 807

If the argument cannot be made that the CGE neither contains hearsay nor constitutes hearsay, and if there is no recognized exception under Rules 803 or 804 or no possibility of it being considered "non-hearsay" under 801(d), the CGE may still be admitted. Rule 807,[269] "the residual exception," provides a means by which a proponent of hearsay evidence may have it admitted if it is essentially as "trustworthy" as the other enumerated exceptions, is material, has relatively strong "probative value," "the interests of justice" are being served by admitting the evidence despite the hearsay, and the opposing side receives sufficient notice. Each of these is considered below.

Regarding "trustworthiness," computer programmers of CGE software have no apparent incentive to lie because their programs are based on scientific principles such as math or physics.[270] In fact, if

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268. *See* United States v. Warren, 42 F.3d 647, 655 (D.C. Cir. 1994) (holding that a statement by a party cannot later be challenged by that party as hearsay).

269. Rule 807 incorporates old Rules 803(24) and 804(b)(5):

> A statement not specifically covered by Rules [dealing with admissible hearsay exceptions] 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.

FED. R. EVID. 807.

270. While software engineers often have to write new code for particular applications, this process is becoming less common as the same piece of code is used repeatedly in other applications. *See* Keith Stephens, *Software Patent Developments: The PTO's Examination Guidelines for Computer-Related Inventions*, COMPUTER LAW., June 1997, at 14, 17 ("Software engineers are no longer forced to 'reinvent the wheel' every time a new program is developed; rather, they can 'plug and play' with existing software objects. The modern software development process is increasingly similar to the process by which electronic components are assembled into a new device . . . .").

they were to contain any "lies" or even any "innocent mistakes," the program would lose credibility because errors in math or physics are easily detectible.[271] This is true when the program is created before any litigation and has not been especially created for a case.[272]

Accordingly, computer programmers are not likely to lie about the scientific assumptions in their programs. Indeed, there is every motivation for them to be correct, not only as scientists, but as producers of a usable and marketable product — much like programmers of a pocket calculator have an incentive to make their calculators generate correct answers.[273] Of course, if the programmer is hired for specific litigation, then the incentive changes. However, this is true of any expert witness. The discussion here is focused on out-of-court statements made by programmers who cannot be cross-examined although their program is being used. The rule requires that there be circumstantial guarantees of trustworthiness *equivalent* to the many exceptions in Rules 803 and 804. The circumstantial guarantees here are every bit as trustworthy as guarantees of trustworthiness for other exceptions, such as the present sense impression under 803(1). The present sense impression exception is justified according to the Advisory Committee because the "substantial contemporaneity of event and statement negate the likelihood of deliberate or conscious misrepresentation."[274]

Perhaps even more fitting to a hearsay exception for a CGE is the "business records exception" under Rule 803(6), in which the exception is justified because the "unusual reliability of business records is . . . supplied by systematic checking, by regularity and continuity which produce habits of precision, by actual experience of business in relying upon them, or by a duty to make an accurate record as part of a continuing job or occupation."[275]

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271. Although it is difficult to "debug" a program completely, gross errors are easily detectable and would be exposed by meaningful cross-examination.

272. Of course, to the that extent programmers are hired as expert witnesses in a specific case, they may have the "normal" incentives of expert witnesses. This, however, is true of any expert, regardless of whether they use a tool to help them explain their "biased" testimony.

273. *See* Steven J. Frank, *Tort Adjudication and the Emergence of Artificial Intelligence Software,* 21 SUFFOLK U. L. REV. 623, 662 n.157 (1987) ("Even if a program is 'smart,' i.e., can itself reason so that its author's commands are not executed mechanically, it is difficult to conceive of a motivation to lie arising spontaneously.").

274. FED. R. EVID. 803(1) advisory committee's note.

275. FED. R. EVID. 803(6) advisory committee's note (citations omitted).

Rule 807's requirement of "material fact" seems strange since it is simply redundant in view of Rules 401 and 402 regarding relevancy. Judge Weinstein has commented that the purpose of this requirement probably is to make the residual exception inapplicable to "trivial or collateral matters."[276]

Presumably, the hearsay objection would be eliminated if the computer programmers were able to testify as experts. This is practically difficult because litigants would need to find the CGE's programmers and subpoena them.[277] On their own, CGEs meet the "more probative" standard because anything else would be complete guesswork, especially if there are no eyewitnesses to the actual event. There is only the aftermath of the event, certain records that are made which, when analyzed scientifically, can reveal what happened. A re-creation or simulation CGE clearly would satisfy this criterion.

The "interests of justice served" criteria also seems redundant because Rule 102[278] already requires fair, truthful, and just determinations. The drafters of the residual exception probably included this standard because they wanted to prevent the residual exception from swallowing the rule. Thus, the drafters appear to be cautioning judges to use the exception sparingly since there are already so many exceptions to the hearsay rule.

The final requirement for the residual exception, the "notice" requirement, comes a full circle to the issue of early disclosure of the intention to use CGEs.[279] The rule states that early disclosure of the intent to use the residual hearsay exception is required "sufficiently in advance of trial" in order to "provide the adverse party with a fair opportunity to prepare to meet it."[280] One practical difficulty with using this exception, however, is that Rule 807 requires the proponent to provide "the particulars of [the statement], including the names and addresses of the declarants."[281] This often would present an

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276. United States v. Iaconetti, 406 F. Supp. 554, 559 (E.D.N.Y.), *aff'd*, 540 F.2d 574 (2d Cir. 1976).

277. *See* United States v. Scrima, 819 F.2d 996, 1001 (11th Cir. 1987) (excluding residual exception when the declarant is available as a witness).

278. "These rules shall be construed to secure fairness in administration, elimination of unjustifiable expense and delay, and promotion of growth and development of the law of evidence to the end that the truth may be ascertained and proceedings justly determined." FED. R. EVID. 102.

279. See *supra* Part III.A regarding the importance of early disclosure, regardless of this exception's special notice requirement.

280. FED. R. EVID. 807.

281. *Id.*

insurmountable problem from a practical point of view since many computer programmers are the actual "writers" of the program and are therefore the declarants. Judges should be advised to make an exception and not require this information if not readily available if this residual exception is used for a computer program used substantively in a re-creation or simulation.[282]

As set forth above, the requirements for the residual hearsay exception often will be present when using a substantive re-creation or simulation CGE. Rule 807 should be interpreted to encourage judges to apply the residual exception to re-creation and simulation CGEs.

7. "Scientific Evidence" — Rule 702 and *Daubert*

a. "Scientific Evidence" Under the Federal Rules

Before discussing expert testimony and scientific evidence, it is important to note that Rule 701 does not allow *lay* witnesses (non-experts) to offer their "opinions" or "inferences" except in certain limited circumstances relating to their direct perceptions of fact.[283] On the other hand, the opinion testimony of *qualified expert* witnesses is

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282. *Cf. infra* Part IV.B (arguing for various amendments to the Rules and/or new interpretations of them).

283. *See* Fed. R. Evid. 701.

> If the witness is not testifying as an expert, the witness testimony in the form of opinions or inferences is limited to those opinions and inferences which are (a) rationally based on the perception of the witness, and (b) helpful to a clear understanding of the witness' testimony of the determination of a fact in issue.

Id. For example, lay opinion as to whether a person "appeared drunk," or "about how fast" was a car going, etc., would be admissible under the rule. *See* Grim v. Moore, 745 F. Supp. 1280 (S.D. Ohio1988) (deeming the defendant's testimony of his opinion that the plaintiff was under the influence of alcohol was admissible because his opinion was rationally based on the defendant's perceptions of the plaintiff); State v. Hall, 353 N.W.2d 37, 43 (S.D. 1984) (permitting police officers to give lay opinion concerning defendant's intoxicated state but not more, such as, a lay witness's opinion that defendant is negligent and therefore liable to plaintiff); *see also* McGowan v. Cooper Indus., Inc. 863 F.2d 1266 (6th Cir. 1987) (since testimony regarding negligence was not based on scientific, technical, or other specialized knowledge, but rather on lay opinion, it would not assist the jury on a fact that they could decide as well as an expert). Because "the jury has the principal responsibility of deciding the facts through the inference-drawing process, it is generally deemed inappropriate for a lay witness to include in her testimony inferences in the form of an 'opinion' or 'conclusion.'" LILLY, *supra* note 151, at 113. Such testimony by a lay witness is unnecessary because the jury can draw these inferences and opinions *on its own* from the facts presented — it only needs lay witnesses to relay the facts of the case.

admissible, provided that their specialized knowledge will help the jury understand the evidence or determine a fact at issue.[284] Accordingly, an expert witness must (1) be qualified as an expert[285] (2) in a *scientific, technical or specialized knowledge* area[286] that (3) will assist the jury in understanding or determining factual issues.

The question that arises with respect to the admissibility of CGEs is whether CGEs, because they are generated using computer "science," are therefore "scientific evidence" under Rule 702, and thus must qualify as legitimate scientific evidence admissible in court. Some judges believe CGEs are too unreliable and constitute pure speculation. Judge Van Graafeiland stated: "I am not prepared to accept the product of a computer as the equivalent of Holy Writ. Neither should a District Judge . . . . Testimony that an undescribed, hypothetical . . . device can be made fail-safe in some undescribed, hypothetical manner is pure speculation . . . ."[287]

Others believe that CGEs must be treated like scientific tests. In other words, proponents must show that the computer functions correctly, that the input data and the computer program processing that input data are both accurate, and that the computer program is generally accepted in the respective scientific community.[288]

For seventy years, under *Frye v. United States*[289] (which created the "*Frye* test"), a party wanting to admit scientific evidence producing a certain result had to demonstrate that the evidence or the underlying science involved had to have "gained general acceptance in the

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284. *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.").

285. *See* MICHAEL H. GRAHAM, HANDBOOK OF FEDERAL EVIDENCE § 702.4 (3d ed. 1991) (discussing various traditional fields of expertise, such as medicine, banking, etc.). Such qualifications, however, can include "non-traditional" fields where the expert may be lacking in formal education and higher educational degrees, but has become specially knowledgeable through experience. *See, e.g.*, United States v. Harris, 28 F.3d 1487, 1496–97 (8th Cir. 1994) (qualifying a gang member as an expert in drug trafficking).

286. *See infra* notes 293–308 and accompanying text (explaining "scientific evidence" according to the requirements set forth in *Daubert*). *See generally* PAUL C. GIANNELLI & EDWARD J. IMWINKELRIED, SCIENTIFIC EVIDENCE (3d ed. 1999).

287. *See* Perma Research & Dev. v. Singer, 542 F.2d 111, 121, 123 (2d Cir. 1976) (Van Graafeiland, J., dissenting).

288. *See* Commercial Union Ins. v. Boston Edison Co., 591 N.E.2d 165 (Mass. 1992).

289. 293 F. 1013 (D.C. Cir. 1923) (setting forth the "*Frye* test" (explained below) for scientific evidence).

particular field in which it belongs."[290] *Frye*'s "generally accepted" requirement was criticized, however, because although it was designed to keep out non-established, or "junk" science,[291] it also would keep out new, innovative scientific techniques, sometimes for many years, until they became established (or "generally accepted"), necessarily placing courts one step behind society and denying them the use of helpful, cutting-edge scientific evidence.[292] In an attempt to provide lower courts with more guidance so as to allow courts to take advantage of new, innovative science without falling victim to "junk science," the United States Supreme Court overruled *Frye* in 1993 and replaced it with a more flexible standard involving the consideration of various factors.

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290. *Id.* at 1014. *Frye* rejected an attempt to admit into evidence a systolic blood pressure deception test (precursor to the modern lie detector test), and stated: "While courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have *gained general acceptance in the particular field in which it belongs*." *Id.* (emphasis added).

291. *See* PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM (1991) (providing case examples of dubious scientific theories which should have been rejected).

292. *See* CHRISTOPER B. MUELLER & LAIRD C. KIRKPATRICK, MODERN EVIDENCE § 7.8, at 1001 (1995) (criticizing *Frye* and citing courts criticizing *Frye*).

b. The *Daubert* Case

In *Daubert v. Merrell Dow Pharmaceuticals*,[293] the United States Supreme Court established a new multi-part test, in which the *Frye*-test flexibly served as only one factor, instead of rigidly constituting the entire test. Under *Daubert*, the trial judge must determine whether the expert's testimony is based on a reliable foundation and is relevant.[294] The factors to be considered are: (1) whether the evidence can be (and has been) tested,[295] (2) whether the theory or technique has been subjected to peer review and publication,[296] (3) whether the technique has a known or potential rate of error,[297] and (4) whether there has been a particular degree of acceptance within the relevant scientific community (essentially the *Frye* test).[298] Although the *Frye* test was preserved as a prong of the *Daubert* test, *Daubert* is a more flexible standard than *Frye* because the standard of "particular degree of acceptance" in *Daubert* is lower than the "general acceptance" test in

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293. 509 U.S. 579 (1993). The *Daubert* test came about in the 1993 case as follows: The plaintiffs sued a pharmaceutical company, Merrell Dow, alleging that their two children's birth defects had been caused by the mother's ingestion during pregnancy of Bendectin, an anti-nausea drug. In moving for summary judgment, Merrell Dow offered the affidavit of an expert who had reviewed thirty studies on Bendectin and human birth defects and found no correlation between use of the drug and birth defects. The plaintiffs did not dispute this assertion, but instead offered the testimony of eight experts who stated that Bendectin causes birth defects. The plaintiffs' experts based their conclusions on test tube and live animal studies that allegedly showed a link between the chemical structure of Bendectin and birth defects, pharmacological studies that allegedly found a link between the chemical structure of Bendectin and other drugs known to cause birth defects, and the "re-analysis" of published human statistical studies. The California district court granted summary judgment for Merrell Dow because it found that the plaintiffs' scientific evidence was not generally accepted in the field. The Court of Appeals for the Ninth Circuit affirmed, citing *Frye*. The Ninth Circuit determined that the unpublished re-analysis of the previously published human statistical studies had not been subject to peer review and had been generated for litigation purposes only. It also found that the plaintiffs' scientific evidence was inadmissible and that the plaintiffs had no evidence to prove causation at trial. Thus, summary judgment for the defendant was appropriate. The United States Supreme Court granted certiorari and Justice Blackmun, writing for the majority, held that "Frye made 'general acceptance' the exclusive test for admitting expert scientific testimony. That austere standard, absent from and incompatible with the Federal Rules of Evidence, should not be applied in federal trials." *Id.* at 589. *Frye* was therefore rejected for a new standard.

294. *See id.* at 589.

295. *See id.* at 593.

296. *See id.*

297. *See id.* at 594.

298. *See id.*

Frye. Moreover, "particular degree of acceptance" is but one factor in *Daubert*, whereas "general acceptance" was the entire test under *Frye*. Although *Daubert* is now the authoritative test in the federal system, many states continue to follow the *Frye* test.[299]

Thus, whether CGEs are admissible scientific evidence should be analyzed under the more flexible *Daubert* standard. However, published opinions that have ruled on objections regarding animation, re-creation, and simulation CGEs have been inconsistent in their terminology when labeling these different types of "motion" CGEs.[300] As a result, attorneys and judges often are left with slippery precedent. One case may admit a reconstruction animation and may or may not be used to guide the next case, depending on whether a reconstruction animation is considered the same type of animation as the one at hand. As with all computerized evidence, this process is often a lumbering one because it involves the extra step of establishing if the case or rule can be applied to the computer-generated evidence at all, even before the standard arguments over how they will apply can ensue. This is especially true with scientific evidence. The requirements for admissible scientific evidence depend entirely on what *type* of CGE is proposed because different types of CGEs have different evidentiary *purposes*.

c. Rule 702, *Daubert*, and Demonstrative Exhibits

If a CGE is merely an animation created to illustrate the witness's testimony, then it is *not* substantive evidence in and of itself because the reliability of the evidence in question is based solely on the witness's verbal testimony. This point can be easily understood by comparing a

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299. *See* People v. Leahy, 882 P.2d 321 (Cal. 1994) (assuming the vitality of the *Frye* test and affirming its use); *see also* People v. Kelly, 549 P.2d 1240, (Cal. 1976) (ruling that the reliability of a new scientific technique must be established by expert testimony and must be shown to be generally accepted in the scientific community before evidence based on the technique will be admitted). The *Frye* standard is still employed in seventeen states, and among those, seven have acknowledged *Daubert* but declined to reach the issue while four remain silent on the subject. *See* Heather G. Hamilton, *The Movement from* Frye *to* Daubert*: Where do the States Stand?* 38 JURIMETRICS J. 201 (1998); *see also, e.g.*, Lofgren v. Motorola, No .CV 93-05521, 1998 WL 299925 (Ariz. Super. June 1, 1998) (using the *Frye* test); Commonwealth v. Blasioli,713 A.2d 1117 (Pa. 1998) (stating that Pennsylvania courts use the *Frye* test, and applying it).

300. *See, e.g.*, Racz v. R.T. Merryman Trucking, Inc., No. CIV.A.92-3404, 1994 WL 124857 (E.D. Pa. 1994) (incorrectly describing a reconstruction as mere animation).

non-computerized, "traditional" demonstrative exhibit designed merely to illustrate testimony — where no *Daubert* or Rule 702 analysis is implicated — with a demonstrative CGE. CGE opponents might argue that because a CGE is generated with a computer, which implies math and science, it necessarily must implicate a *Daubert* and Rule 702 analysis. However, this is not the case.

Suppose an eyewitness for a plaintiff in an automobile accident case saw the plaintiff and defendant approach an intersection from opposite directions and crash. The plaintiff's attorney proposes that the eyewitness be allowed to testify that plaintiff's car approached the intersection when the light was green, passed through the intersection when the light was green, and then got hit by defendant's speeding car for whom the light was red. Assume further that plaintiff's attorney has created a large cardboard diagram of the intersection and that the diagram is magnetized to hold up small magnetized objects (to represent cars, pedestrians, etc.) on the diagram. Two small moveable magnetized objects, appearing to be replicas of cars, one representing plaintiff's car, and one representing defendant's car, are given to the eyewitness during his testimony. The plaintiff's attorney proposes that the eyewitness be allowed to use this diagram and the magnetic car replicas as a demonstrative exhibit to help explain to the jury the exact locations of each of the cars before, during, and after the wreck.

Now suppose the defense attorney stands up and objects to the demonstrative exhibit as violating the *Daubert* requirements for scientific evidence because plaintiff's attorney has failed to provide the underlying science to show how magnets work and whether the magnets are positively-charged or negatively-charged. Such objections would be laughable because they miss the entire point. The "science" involved in the magnetized diagram is not "proof" of anything germane in the case, nor does the credibility of the eyewitness's testimony rely on that "science." The defense attorney is at liberty to fully cross-examine the eyewitness on his testimony — how the accident allegedly occurred — but the science behind the diagram, while perhaps interesting, is completely irrelevant. Therefore, the jury should not be denied the opportunity to understand the witness's testimony visually simply because plaintiff has failed to disclose the mechanics facilitating that visual testimony.

It should make no difference if an attorney uses a computer to generate the intersection and movable cars as long as the witness is still testifying as to the cars' exact locations as they moved through the intersection before, during, and after the accident. Thus, any objection based on *Daubert* for a mere demonstrative CGE animation illustrating

a witness's testimony should be rejected because the jurors are not being asked to accept the science used to create the CGE. Instead, they are being asked only to assess the credibility of the eyewitness's testimony as to what he did or did not see. Judges should interpret Rule 702 so that the *Daubert* case does not apply to animation CGEs used as demonstrative exhibits.[301]

d. The Science in Demonstrative CGE Creation

Expert witnesses are almost never eyewitnesses to events. Rather, they analyze information gathered after the lawsuit has begun and offer their expert opinions as to what the analyzed information means in order to help the jury understand the evidence.[302] It is at this juncture — the testimony of an *expert* witness — that Rule 702 and the *Daubert* requirements come into play. However, a critical distinction should be made here.

When an expert witness uses a CGE to help explain her verbal testimony to the jury, that CGE is a *demonstrative exhibit only* — just like the eyewitness of the auto accident using the magnetic diagram in the previous example. In such circumstances, *Daubert* and Rule 702 should come into play only with respect to the underlying scientific testimony that forms the basis of the expert's testimony, *not* with respect to the "science" of the display technology being used to illustrate the expert's testimony. For example, if an expert witness, qualified in the field of Newtonian physics, uses a computer animation to help explain the law of gravity (assuming, of course, that it would be relevant, that there would be no "judicial notice" of the law of gravity,

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301. *See infra* Part IV.B.8 (explaining that judges need to make critical distinctions between the types and purposes of CGEs when deciding whether a CGE is subject to *Daubert*).

302. *See* FED. R. EVID. 702. One court has described role played by expert witnesses as follows:

> [E]xperts are not even permitted to testify unless they possess some scientific, technical or other specialized knowledge which will help the finder of fact understand the evidence in a case or determine a fact in issue. [citation to Rule 702 omitted] . . . . [B]y definition, an expert's testimony takes on added significance because it usually focuses on subjects about which the fact finder has little or no knowledge. Additionally, unlike other witnesses, experts are able to base their opinions on facts not admissible in evidence, if of a nature reasonably relied by others in their field, as well as offer opinion testimony as to ultimate issues in the case [under Rule 704].

Musselman v. Phillips, 176 F.R.D. 194, 199 (D. Md. 1997).

and that the expert's testimony would help the jury understand the case or determine a fact issue), then *Daubert* and Rule 702 would govern analysis for the scientific field of physics and the law of gravity. *Daubert* and Rule 702 should *not* be implicated with respect to the underlying computer science of the CGE, which might include how the computer generates and displays images on the computer monitor. The mere fact that the expert witness would use a computer animation to display or illustrate points in her testimony does not make the display technology itself the relevant science that must be analyzed under Rule 702 and *Daubert*, any more than had the expert witness used a chalkboard and pointer or overhead projector and transparencies. Note that the expert witness can be cross-examined on the science presented for the jury's assessment. But the jury is not required to assess the reliability of the display technology itself, only the underlying science it is portraying. Of course, if the underlying science is inadmissible, then the CGE explaining or illustrating that inadmissible expert testimony would be inadmissible as well — not because the CGE display technology is inadmissible, but because the expert's alleged expertise does not satisfy *Daubert*.

e. Rule 702, *Daubert*, and Substantive Exhibits

If a CGE goes beyond illustration of an expert's opinion to become the basis of that opinion, as in a re-creation or simulation based on input data, then the CGE is substantive in nature. It is being offered on its own merits and at that point would become subject to *Daubert* and Rule 702. The standard for the CGE, as well as any underlying scientific knowledge, is the Rule 702[303] scientific evidence standard under *Daubert*.

For example, if an expert witness qualified in airline disaster accident reconstruction uses input gathered from a crash site and inputs it into a computer program that takes those data and produces a re-creation of the airline crash, the proponent of the expert witness and the re-creation CGE would have to satisfy two requirements: (1) that the expert is qualified in airline accident reconstruction (Rule 702) and such a field fits within *Daubert*; and (2) that the expert is qualified to use and interface with the computer program used to create the CGE and the computer program itself also meets the requirements of *Daubert*.

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303. *See supra* note 284.

f. Meeting Rule 702 and the *Daubert* Requirements

Making general statements about the admissibility of the science behind substantive CGEs is difficult because admissibility turns on the integrity of the underlying computer program and the underlying science employed by the expert witness. The proponent simply has to make certain that the four *Daubert* requirements are met.

First, the evidence definitely can be tested.[304] For example, when confronted with re-creations or simulations based on measured input data, the court or opposing counsel could offer *random* input variables to see how the computer would process that information and how plausible and consistent the results are. In fact, opposing counsel could videotape an actual event and feed the variables for that event into the computer. The parties could then compare the video tape of the actual event with the simulation or re-creation generated by the computer to see how close the computer program is to reality.

Second, computer simulations and re-creations already "[have] been subjected to peer review and publication."[305] Moreover, as this technology continues to proliferate, this hurdle will continue to be less and less of a burden to overcome.

Third, there appears to be developing a "known or potential rate of error,"[306] at least for certain kinds of re-creations, such as accident reconstructions. However, because re-creations and simulations tend to be unique, this kind of information may be difficult to obtain.

Finally, although CGEs were seen as novel science in the past, there clearly has been a "particular degree of acceptance" of this technology, especially in the field itself.[307] As such, this would not be that difficult of a hurdle to overcome; modern computer technology probably would meet even the old *Frye* test.

Perhaps the most important point to keep in mind about *Daubert*, as it relates to substantive CGEs, is that the test was designed to be more flexible than the older *Frye* test, so that new science has a better chance for admissibility.[308] A proponent can argue that computer

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304. *See* Daubert v. Merrell Dow Pharms., 509 U.S. 579, 593 (1993).

305. *Id.*

306. *Id.* at 594.

307. *Id.*

308. *See* Robinson v. Missouri Pac. R.R. Co., 16 F.3d 1083, 1089 (10th Cir. 1994) (noting that *Daubert* makes the standard for allowing scientific evidence "flexible."); *see also* Richard C. Rueben, *Completing the Admissibility Equation*, A.B.A. J. 44 (1997) ("After 70 years under the *Frye* test, *Daubert* was greeted as a revolutionary decision, and it paved the way for much broader use of new and even controversial scientific

generated exhibits, which scientifically re-create or simulate events based on reliable scientific input data, are exactly the new kind of science that *Daubert* was designed to admit.

IV. AMENDING THE RULES TO ENCOURAGE CGE USE

These rules shall be construed to secure fairness . . . and promotion of growth and development of the law of evidence to the end that the truth may be ascertained and proceedings justly determined.[309]

It is in that spirit — the quest for legitimate growth and development of the law of evidence — that the following suggestions to the rules are offered. The reforms set forth herein propose not only amendments to some of the rules, but just as importantly, offer new interpretations of those rules to assist judges and practitioners in trial application. By amending the rules and modifying their interpretation as they relate to the admissibility of CGEs, we would be, as Rule 102 calls for, "promot[ing the] growth and development of the law of evidence"[310] so as to incorporate and accept the legitimate place of computer technology in the practice of law and in the pursuit of justice.

A. Acknowledging "Computer-Generated Exhibits"

1. The New Maryland CGE Definition Rule

On July 1, 1998, Maryland added a new rule governing CGEs to the Maryland Rules of Procedures.[311] Rule 2-504.3, submitted by the Standing Committee on Rules of Practice and Procedure in October 1997,[312] defines "computer-generated evidence"[313] so that any reference

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testimony in both civil and criminal cases"). The Supreme Court recently held that *Daubert*'s general holding applies not only to testimony based on scientific knowledge, but also to testimony based on technical or other specialized knowledge. *See* Kumho Tire Co., Ltd. v. Carmichael, 119 S.Ct. 1167, 1171 (1999).

309. FED. R. EVID. 102.

310. *Id.*

311. MD. RULES 2-504.3.

312. NOTICE OF PROPOSED RULES CHANGES, 136th report, Md. Ct. App. (received Oct. 27, 1997).

313. This article has referred to CGEs as "computer-generated exhibits," whereas Rule 2-504.3 of the Maryland Rules substitutes "evidence" for "exhibits." This Article refers to them as "exhibits" because they do not become "evidence" until they are deemed admissible. Section (a) of Rule 2-504.3 defines computer-generated evidence as follows:

to CGEs in the other rules will be understood. The definition encompasses both demonstrative and substantive CGEs.[314] Although creating only one rule for both may seem overbroad, objections based on the differences between the two types are not prohibited by the rule. In fact, the rule merely asserts that both categories, however distinct, fall under the general title of computer-generated evidence — a general definition that is both simple and efficient as a preliminary matter.

While helpful in that CGEs are given enough legitimacy as a form of evidence to require acknowledgment and recognition in Maryland's rule structure, the rule does not distinguish between demonstrative animations and substantive re-creations and simulations.[315] As discussed, this distinction is important for admissibility purposes and should be included in any definition of CGEs. One positive aspect of the definition is that, while employing the term "computer-generated,"[316] it excludes from the definition documents produced by a word processor and static images projected or displayed by use of a computer.[317] However, the rule should go further to describe the process of generating information with a computer, as opposed to similar but different uses of the computer at trial. For example, is a "computer-*scanned* image"[318] defined as a "computer-*generated* image"[319] under this new rule? Listing the major ingredients of

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> (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 documents 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. RULES 2-504.3(a).

314. *See* NOTICE OF PROPOSED RULES CHANGES (Reporter's Note).

315. *See id.*

316. MD. RULES 2-504.3(a).

317. *See id.*

318. Scanning" is the act of digitizing a document or photograph and creating a computer image of that document or photograph. *See supra* note 98.

319. These are images "created" on the computer, such as animations and certainly re-creations and simulations generated on or by the computer. Image generation

computer generation would make the definition more explicit: "Evidence is 'computer-generated' when information entered into a computer is altered by more than the fact that the document now appears on a screen rather than in its paper form. Such alterations may include a significant change in size, shape or color."

Nonetheless, the spirit of this new rule is an answer to a loud call for greater acknowledgment and use of CGEs at trial. The Federal Rules of Evidence should contain a similar definitional rule, with the added portions set forth above, defining CGEs and making a key distinction between demonstrative and substantive CGEs.

2. The Proposed Federal CGE Definition Rule

The closest mention of computerized evidence in the Federal Rules of Evidence exists under Rule 1001[320] which defines "Writings and Recordings"[321] as consisting of "letters, words, or numbers, or their equivalent, set down by . . . electronic recording;"[322] and "Photographs"[323] as including "video tapes and motion pictures."[324] It further states: "If data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect the data accurately, is an original."[325] But there is no direct reference to computerized evidence in general in the rules, nor an over-arching definition applicable to all of the rules. Thus, the starting point should be to acknowledge the existence of and provide a definition for computer-generated evidence as used in the rules.

One of the most difficult issues is simply finding the correct Article within which to propose a general CGE definitional amendment. Article I, or the 100 series ("General Provisions"), seems so general and policy-oriented that a specific definition of a specific type of evidence would appear out of place. Although Article X, or the 1000 series, is the only place where computerized evidence is really even contemplated by the rules, it is only focused on the context of the "best evidence rule" (or the "original document rule"). Thus, although certain changes should

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requires far more effort and time than simply "scanning" an image of an existing document or photograph.

320. *See* FED. R. EVID. 1001.
321. *Id.*
322. *Id.*
323. *Id.*
324. *Id.*
325. *Id.*

be made to that particular rule, a definition located in Article X[326] would limit its application to Article X, when an application to all of the rules is actually what is needed. Perhaps Article XI, the 1100 series, ("Miscellaneous Rules"), or even Article II, the 200 series, ("Judicial Notice") — allowing judges to take judicial notice of the definition of CGEs — would be sensible places to add a general definition of CGEs, similar to that found in Maryland Rule 2-504.3,[327] with added provisions suggested above, applicable to all eleven Articles of the Federal Rules of Evidence.

B. Specific Reforms

1. Early Disclosure — Rule 26(a)

a. Changing the Interpretation

With respect to mandatory disclosure rules under Rule 26(a) of the Federal Rules of Civil Procedure, Rule 26(a)(2) requires disclosure of an exhibit to be used by a testifying expert witness, but Rule 26(a)(3) requires disclosure of all general exhibits 30 days before trial.[328] Rule 26(a) should be interpreted as explicitly precluding any testifying expert from using a CGE that was not disclosed until 30 days before trial and was introduced through a lay witness pursuant to Rule 26(a)(3) in an attempt to circumvent the 90-day requirement for use by an expert under Rule 26(a)(2). Similarly, when disclosed pursuant to Rule 26(a)(3), the entire CGE itself should be produced, not simply a verbal description of it as some attorneys might try to do given the language of Rule 26(a)(3).[329]

b. The Maryland Example

Rule 26 should encourage judges to require early disclosure of CGEs on their own, and not rely exclusively on the deadlines in Rule 26(a). Beyond that, however, the rule itself should be amended in a similar fashion to the new Maryland Rule regarding the issue of pretrial

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326. Rule 1001(1), "Definitions," states: "*For purposes of this article* [referring to the 1000 series "best evidence rule"] the following definitions are applicable . . . ." FED. R. EVID. 1001(1) (emphasis added).

327. *See supra* note 313.

328. *See supra* Part III.A.2 (discussing Rule 26(a)).

329. *See* text accompanying *supra* notes 123–24 (criticizing attempts by lawyers to produce verbal descriptions of CGEs rather than the CGEs themselves).

disclosure or "notice."[330] Often it is the surprise use of computerized exhibits, more than the exhibits themselves, that trigger objections. The proposed rule requires notice of intent to utilize CGEs no later than 90 days before trial,[331] eliminating any element of unfair surprise. This section goes further to demand a detailed summary of the computerized evidence to be used[332] as well as an assurance that all steps will be taken to make available the equipment needed to present the CGE.[333] These requirements serve to strip away fears that allowing computer-generated evidence in court is a reversion to pre-discovery times when evidence could be hidden and then flashed before the jury, as well as opposing

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330. *See supra* note 313. Section (b) of Maryland Rule 2-504.3 reads:

> (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 90 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 the 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 practicable, 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).

MD. RULES 2-504.3(b).

331. *See id.* This follows the current Federal Rule of Civil Procedure 26(a)(2) for exhibits used by experts, but requires amendment of Rule 26(a)(3) to increase the required disclosure period from 30 days to 90 days for a CGE not to be used by an expert.

332. *See id.*

333. *See id.*

counsel, for the first time at trial. Under this rule, the opposing party would have ample time to examine the computerized evidence and its mode of presentation well before trial begins, eliminating objections under Rule 403 that unfair surprise makes CGEs unfairly prejudicial and therefore inadmissible.

Section (c) of the Maryland rule[334] further requires the party serving notice of intent to use computer-generated evidence to make their evidence available within five days after they serve notice.[335] This section adds a cushion to section (b) by allotting a "reasonable period of time" for the party given notice to discover any relevant information needed to oppose the use of computerized evidence.[336] Thus, if the 90 days between the time of notice and the trial is not sufficient, the opposing party can argue that they need more time, and if they are able to show that their extension is "reasonable," it will be granted to them under this rule.

If the party being served notice of intent to use computer-generated evidence desires to object, that party is given a fair amount of time to do so under section (d).[337] If, however, the would-be objecting party fails to raise an objection within a specified time, all objections are

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334. *See* MD. RULE 2-504(3)(c).

> (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 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.

Id.

335. *See id.*

336. *Id.*

337. *See* MD. RULE 2-504(3)(d).

> (d) Objection. Not later than 60 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.

Id.

waived.[338] This rule balances both fairness to the objecting party, by allowing 60 days after notice to respond with an objection, and efficiency on behalf of the court,[339] which will not have to address any objections once the trial begins.

Section (e)[340] of the Maryland rule calls for a pretrial hearing if one party intends to use computerized evidence and the opposing party objects. This removes what often can be a mini-trial in itself over the presentation of computer-generated exhibits, while keeping it within the realm of the case. Also, the party's respective positions and arguments during the hearing are preserved for appeal.[341] When the objecting party is unsuccessful at the hearing, they need not re-state their position during the trial for the objection to be considered by the appellate court. Similarly, when the proponent is ruled against, they need not make a subsequent offer of proof for preservation. By handling the admittance issue prior to trial, a judge is likely to give more time and consideration to her ruling since she is not shouldering the weight of placing the entire trial on hold while she is contemplating the complicated admittance arguments submitted by both sides. This rule also serves the interest of justice as well, since the continuity of the trial will not suffer a lengthy interlude of arguments surrounding an objection to the

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338. *See id.*
339. *See id.*
340. *See* MD. RULE 2-504(3)(e).

> (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.

Id.

341. *See id.*

computerized evidence. It does mean, however, that counsel and their clients need to prepare early if they desire to use CGEs

There are two other important ramifications of this section of the rule. The first is that it allows the court to appoint an expert for assistance[342] in appropriate cases, which increases efficiency due to the collective knowledge the expert would carry into the hearing or trial. The second ramification is that the court may assess the fees for the expert to the appropriate party,[343] which removes an economic burden from the judicial system.

Finally, this section provides the judge with flexibility in ruling. In lieu of simply ruling to admit or prohibit a CGE, the judge may require modifications[344] to it or impose conditions relating to its use.[345] This section is a thoughtful part of the proposed new rule. It would mean, however, that attorneys could not procrastinate on the decision to use CGEs. Although this would push attorneys to get organized more quickly, it does not seem like a bad idea given the general policies underlying the discovery process — early disclosure and early settlement of cases.

Other important sections of the Maryland Rules of Procedure have miscellaneous rules that should also be helpful regarding early disclosure of CGEs. The first would be Rule 2-504[346] whereby the contents of the scheduling order would include the "dates by which each party shall file the notice required by"[347] the new rule. The second, Rule 2-504(1),[348] would set forth the requirement of a scheduling conference "in any action in which an objection to computer-generated evidence is filed under"[349] the new rule. The third, Rule 4-263,[350] would assert that, with regard to discovery in the circuit court, the defendant and the State must produce its computer-generated evidence upon the request of the other for reports or statements of experts and evidence for use at trial.[351] Lastly, Rule 4-322[352] would be amended to reiterate the preservation section of the new rule to ensure the reduction of

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342. *See id.*
343. *See id.*
344. *See id.*
345. *See id.*
346. *See* MD. RULE 2-504.
347. *Id.*
348. *See* MD. RULE 2-504(1).
349. *Id.*
350. *See* MD. RULE 4-263.
351. *See id.*
352. *See* MD. RULE 4-322.

computerized evidence to a medium that allows review on appeal, or the presentation of that evidence to the appellate court upon its request.[353] Because these miscellaneous rules would help facilitate early disclosure of CGEs, similar provisions should be adopted when implementing the changes to the Federal Rules of Civil Procedure proposed by this Article.

2. Relevance — Rule 402

Rules 401 and 402 of the Federal Rules of Evidence should be interpreted to establish that the test for relevance of a demonstrative CGE should be no more stringent than that used to evaluate the relevancy of a non-computerized exhibit, such as a letter or photograph. Thus, the proper test is that the exhibit, in order to be admissible, must be a "fair and accurate portrayal" of the witness's testimony.[354] Recall, this merely addresses the relevance of a CGE, not whether it single-handedly proves the whole case. Of course, if the verbal testimony underlying the demonstrative CGE is itself irrelevant, then the CGE, by definition, also would be irrelevant. But if the CGE illustrates the witness's testimony, then it is relevant so long as the verbal testimony tends to prove a material issue in the case.

With respect to substantive CGEs — simulations or re-creations — recall that the relevancy standard is higher. That is, the CGE must be deemed to be "substantially similar" to the actual event being depicted.[355] Judges should not require "identicalness" when applying the substantially similar standard. Indeed, even the adjective "substantially" probably should be removed altogether to require only that the re-creation or simulation be *basically* similar to the actual event. To the extent that the CGE and the actual event are not identical, opposing counsel should be free to point out such discrepancies to the jury. However, the jury, not the judge, should make the ultimate determination of whether or not the CGE is similar enough to the event they are considering. Thus, the fact that a CGE may not be *substantially* similar is an argument that should go to the weight of the CGE, not to its admissibility pursuant to a relevancy determination.[356]

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353. *See id.*
354. *See supra* notes 152–53 and accompanying text.
355. *See supra* notes 154–56 and accompanying text.
356. *See supra* notes 161–62 and accompanying text.

3. Danger of Unfair Prejudice — Rule 403

Judges should not be too quick to use Rule 403 to exclude CGEs given that Rule 403 should be used sparingly and only when the prejudice in the CGE is *unfair* prejudice that not only outweighs the probative value but does so *substantially*. Judges also should realize that Rule 403 is not to be used to "equalize" the relative strengths and weaknesses of cases. In other words, just because one party might be able to more persuasively communicate their case to a jury with the help of CGEs, it does not follow that Rule 403 should be used as some kind of "equalizer" to exclude those powerful CGEs in an attempt to compensate for the other party's failure to be as effective in their presentation to the jury.

Moreover, judges should not be so quick to assume that juries are incapable of seeing a CGE and maintaining their ability to assess the weight of the evidence. Instead, judges should allow juries to assume their function — to assess the credibility of witnesses and exhibits and reach a verdict through deliberation. Judges should simply use Rule 105 limiting instructions if they are concerned about the possibility of a jury over-valuing a CGE, but not exclude it altogether. Exclusion should be a rare occurrence used as a last resort — not when the CGE is powerful and effective persuasion, but when the CGE has virtually no probative value and poses a large danger of *unfair* prejudice.

4. Authentication of CGEs — Rule 901

One of the most important changes that needs to be made is for Rule 901 to be interpreted so that CGE animations used as demonstrative exhibits are subject only to the "fair and accurate portrayal" test for authentication[357] The reliability of the exhibit can be fully tested by cross-examining either the eyewitness to the actual event or an expert witness asked to render and explain her conclusions, since the CGE in either case is merely a graphic representation of the witness's testimony. It is critical for judges not to make the mistake of requiring the same level of authentication for demonstrative CGEs as it would for re-creation or simulation CGEs. If an eyewitness demonstratively uses a photograph to help explain his testimony, it is not necessary to cross-examine the photographer in order to authenticate the photo — the eyewitness can be cross-examined as to

357. *See supra* notes 202–03 and accompanying text.

what he saw. It is only when there is no eyewitness to testify, such as when a surveillance camera takes a picture at a certain time and place and reveals an important fact in the case, that the reliability of the evidence must be tested by other means — for example, by making sure the surveillance camera was completely accurate and in working order at the time.

An explicit change should be made to Rule 901,[358] the rule requiring authentication or identification. Between Rule 901(b)(8)[359] ("Ancient Documents or Data Compilations") and Rule 901(b)(9)[360] ("Process or System"), there should be a section on the proper method to authenticate computer-generated evidence as one of the many illustrations of Rule 901(b). It should read as follows:

> Computer-Generated Evidence. In the event that a computerized exhibit is merely a computer display of a type of evidence listed in this Rule, it shall be authenticated according to the section of this Rule that addresses that type of evidence. If it is being used as a demonstrative exhibit only, it is subject to the fair and accurate representation test (like a photograph). If, however, the computerized exhibit is a re-creation, simulation, model, or other type of evidence being used substantively it shall be authenticated by (1) evidence describing the basic mechanics of how the exhibit functions, (2) evidence that all data used in producing the exhibit originated from a reliable source, and that such source is an expert when the nature of the data calls for expertise, and (3) evidence that the programmer(s) who manipulated the data to create the exhibit did so in a manner consistent with its form and did not in any way improperly alter it. To the extent

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358. *See generally supra* Part III.B.3.c.

359. *See* FED. R. EVID. 901(b)(8).

> Evidence that a document or data compilation, in any form, (A) is in such condition as to create no suspicion concerning its authenticity, (B) was in a place where it, if authentic, would likely be, and (C) has been in existence 20 years or more at the time it is offered.

Id.

360. *See* FED. R. EVID. 901(b)(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." *Id.*

> judicial notice of these computerized methods can be taken, judges should do so.

Such an explicit illustration would go a long way in guiding judges on the proper foundation necessary for the different types of CGEs used in various manners at trial.

5. Narrative Testimony and Leading Question Objections — Rule 611

The interpretation of Rule 611[361] should include the practice of informing judges that CGEs are not *inherently* objectionable as "narrative" or "leading" under Rule 611. Of course, just like any other exhibit, they can be used improperly if the attorney does not allow the witness to testify before playing the CGE. However, this is a problem with the method of presentation, not a problem with CGE use in general. Judges should require that attorneys ask the witness non-leading questions prior to playing the corresponding parts of the CGE.

6. The Best Evidence Rule — Rule 1001

In Rule 1001, after the definitions of "Writings and Recordings" and "Photographs," a definition entitled "Computer-Generated Evidence" should be inserted. This provision would read: "Computer-Generated Evidence is any event or thing that is depicted by audio, visual, or any sense that is (1) displayed by the computer after being scanned or entered into the computer, or (2) animated, simulated, or a model of a conclusion based on data that were entered into the computer."

Within the existing definition of "Original,"[362] the following sentence should be added: "An 'original' of a computer-generated exhibit is either the writing or recording that was scanned or otherwise entered into the computer, or data that were used to create any animation, simulation, model or any other type of computerized evidence."

Rule 1002, requiring an original, would subsequently be changed to coincide with 1001. It would read: "To prove the content of a writing, recording, photograph, *or computer-generated exhibit*, the original writing, recording, photograph, *or computer-generated exhibit* is

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361. FED. R. EVID. 611 (titled "Mode and Order of Interrogation and Presentation"); *see supra* note 218.

362. *See* FED. R. EVID. 1001(3)

required, except as otherwise provided in these rules or by Act of Congress."

Likewise, Rule 1006 on summaries should be changed to: "The contents of voluminous writings, recordings, or photographs which cannot conveniently be examined in court may be presented in the form of chart, summary, calculation *or computer-generated exhibit.*"

7. Hearsay and CGEs — Rule 801

Rule 801 should be interpreted so as to instruct judges that when CGEs are used demonstratively, the concern that out-of-court hearsay assertions have been made by the computer programmers is irrelevant. Demonstrative exhibits are not proof themselves and are not being used to prove the truth of the matter asserted. They rely squarely on the testimony of the witness.

On the other hand, if the CGE is used substantively as a re-creation or simulation, then hearsay concerns are appropriate because the assumptions of the computer programers are being used to prove the truth of the matter asserted. However, practitioners should be aware of the many possible hearsay exceptions that may be applicable to address a CGE hearsay concern.[363]

8. CGEs as "Scientific Evidence" Under *Daubert* — Rule 702

Judges should not make the mistake of requiring proponents of CGEs to justify the science involved in creating a CGE used for demonstrative purposes because the jury is not relying on the display technology as science for the case. Instead, the jury is being asked only to accept and rely upon the witness's testimony, of which the CGE is merely a visual depiction. When demonstrative CGEs are used by expert witnesses, judges should simply distinguish the science behind the expert's testimony (which is subject to Rule 702 and *Daubert*) from the science used to create the demonstrative CGE.

Only when CGEs are used substantively must they meet the requirements of Rule 702 and *Daubert*. In that instance, the jury is being asked to rely upon the computer science to make a factual

363. *See supra* Parts III.B.6.b–III.B.6.d (arguing for the applicability of various exceptions to the hearsay rule).

determination.[364] Judges should hold that only in these circumstances should CGEs themselves be subject to the *Daubert* requirements.

9. Miscellaneous Changes — the Maryland Example

There are some additional changes that should be made to the Federal Rules that have already been suggested by the Maryland Rule changes. For example, the final section of Maryland's new rule, section (f),[365] asserts that the party utilizing computerized evidence will preserve it, furnish it to the clerk, and present it to the appellate court if the court so requests. This attempts to solve the concern that, given the nature of computer-generated exhibits, some exhibits may not be reviewed unless someone familiar with computer technology facilitates their exhibition.

However, this section does not specify the manner in which the party will present the computer-generated exhibits to the appellate court. If done in a hearing with only one party present, the demonstration would be an ex-parte proceeding and therefore inappropriate.[366] If opposing counsel is unavailable, or if the court does not wish to conduct an open hearing, a third, non-biased party who is fluent in the computer technology necessary to present the computerized evidence should be designated to present the evidence to the court.

The recent change in the Maryland Rules of Procedure is a suitable springboard from which to suggest changes to both the Federal Rules of Evidence and the Federal Rules of Civil Procedure to address computer-generated evidence.

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364. *See supra* Part III.B.7.f (explaining how substantive CGEs often satisfy the Rule 702/*Daubert* requirements).

365. *See* MD. RULE 2-504(3)(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.

Id.

366. An ex parte proceeding is "[a] proceeding in which not all parties are present or given the opportunity to be heard". BLACK'S LAW DICTIONARY 1221 (7th ed. 1999).

V. THE NEED FOR COMPREHENSIVE LEGAL EDUCATION AND FORMAL JUDICIAL TRAINING

A. Formal Training in CGEs and Computer Technology

CGEs should become as familiar and acceptable to the legal community as traditional forms of evidence — such as X-rays, CAT scans, and fingerprints — and traditional demonstrative exhibits — such as posterboard blowups of letters, maps or photographs, and overhead projectors displaying transparencies of diagrams or contracts. To achieve that goal, there should be a formal and comprehensive educational program for federal judges, as well as a program for their judicial clerks, clerks of the court, and other court staff. This program should teach them about CGEs and basic modern computer technology in order to provide them with a sound fundamental understanding of an automated trial. The sooner the judiciary catches up with the rest of society by harnessing the full power of computer technology to assist judges, attorneys, and jurors in executing their respective roles in litigation inside of our courtrooms, the sooner we can begin to pursue justice in a way that fully reflects the social, market, and technological reality existing outside of the courtroom.

In addition, we in law schools owe an educational duty to our law students to ensure that we are graduating those who not only are ready to practice law in the twenty-first century, but are fully aware of *how* law is being practiced in modern courtrooms.[367] A required legal-oriented computer course in all American Bar Association accredited law schools, plus formal exposure during the first year to CGEs and case management software capabilities (along with LEXIS and Westlaw

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367. *See* Richard A. Matasar & Rosemary Shiels, *Electronic Law Students: Repercussions on Legal Education*, 29 VAL. U. L. REV. 909, 910 (1995) ("Law school graduates will be ill-prepared for their future careers if their schools do not learn to change and adapt, especially to emerging technologies . . . . [N]ot only will [law school] graduates face a changing world, but the students entering law school will demand an education that reflects that world."). The authors cite a 1993 survey showing that "seventy-six percent of the lawyers in reporting firms have a computer or terminal on or near their desks," and that "[l]awyers . . . now have access to computers and computer networks throughout the world." *Id.* at 911–12. Thus, "[t]he challenge for law schools is to find ways to optimize students' legal education by employing the appropriate technological tools. Law school graduates must come to practice with the real-life tools that will help them compete with, or even eclipse, their more traditional colleagues." *Id.* at 913; *see also* Walter, *supra* note 34 (suggesting that students come to law school eager and fearless to learn how to use computers to perform research due to a familiarity with computers that students just five years ahead of them did not have).

computerized research training) would address this issue at the root level.[368] Compared to other graduate institutions preparing students for future professional roles, law schools are seriously behind the curve in training their students to use the computer technology that already is and certainly will grow to be an increasingly important tool in the legal profession.[369]

Once our courthouses begin to expect, and even require, attorneys to use computer technology in preparation for and use during trial, and as more clients expect attorneys to utilize technology, CGEs will become as integral a part of the practice of law as cellular phones, fax machines, and word processors are today. Consequently, it will be a failure on the part of the legal education if law students are not exposed to the power of these legal-specific computer programs until they are out in practice, perhaps finding themselves litigating against a more technologically proficient opponent. Instead, they should be exposed to, and learn about, CGEs and legal software inside the classroom where they can (and should) learn about them in an academic setting on their own time, not in a stressful trial setting and on their clients' time. As legal educators, we have to realize that learning how to "think like a

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368. Although most law students now seem to be very "computer literate," not all are technically proficient, and most are not proficient at law-specific legal technologies.

369. For example, a comparison between law school programs and business school programs shows how far ahead business school programs are in teaching their students the computer technology they will need in their future jobs. The business school programs focus on competency in using personal computers. *See* Robert A. Cronkleton, *Computers Are Close at Hand in MBA Graduate Programs*, KAN. CITY STAR, Jan. 2, 1994, at F15 ("Because computers are so prevalent in the workplace, we feel that our students must be competent on the personal computer." (quoting Martha Gershun, Dean of Keller Graduate School of Management)). It is not just computer competency that many business school programs require of their students; it is also competency in information technology ("IT"), the computer systems, and software that business are commonly using. *See* Aileen Crowley, *These Students Are in a Class of Their Own; Leading Business Schools Enrolling MBA Candidates in IT Curriculum*, PC WEEK, April 21, 1997, at 109 (describing how IT is being taught to students in business school programs across the country). Compare this with the fact that recently, only five U.S. law schools even required that students own a computer, much less have any form of computer competency or knowledge of common software that law offices already use. *See* M.A. Stapleton, *Law Schools Telling Students to Carry a Chip (Plus Keyboard, Mouse, Batteries, Software)*, CHI. DAILY L. BULL., June 7, 1996, at 3. There are a few law schools that have used computer technology more extensively in their curricula, but they are the exceptions, not the rule. *See, e.g.*, Matasar & Shiels, *supra* note 367, at 916–28 (describing the Chicago-Kent College of Law program that uses electronic casebooks); Richard Warner et al., *Teaching Law With Computers*, 24 RUTGERS COMPUTER & TECH. L.J. 107 (1998) (describing the use of electronic casebooks and the use of computers at Rutgers School of Law).

lawyer" today necessarily means learning how to "communicate, persuade, and organize information like lawyer."[370] To accomplish this educational end, law students must be taught to be technologically proficient, or at the very least, technologically aware, before they go out into the modern world as a licensed problem solver and client advocate.

B. A Proposal for CGE and Computer Training

1. Mandatory Training of Federal Judges

Judicial discretion is the standard of review to admit CGEs in most circumstances.[371] In the context of legal technology issues at trial, this begs the question: how knowledgeable are the legal minds behind that great discretion? In order to achieve consistency and predictability in the rulings on the use of CGEs, federal judges, their judicial clerks, and their court staff must become as familiar with CGEs as they are with "traditional," non-computerized forms of evidence and demonstrative exhibits.[372] A formalized program for federal judges and clerks would go much further in bringing about change than the current voluntary approach in which one judge embraces computer technology while another shuns it, thereby limiting lawyers and litigants according to their particular judge's familiarity, comfort level, and knowledge of computer hardware and software.[373]

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370. In the 1973 movie, *The Paper Chase*, actor John Houseman, starring as Professor Kingsfield, delivered a now classic line to his first-year law students during their first class at Harvard Law School, telling them that their brains were like a "bowl of mush," but that when they leave law school they would know how to "think like a lawyer."

371. *See supra* note 147 (noting that abuse of judicial discretion is the legal standard used to review trial court decisions on whether to admit many CGEs, especially when used as demonstrative evidence).

372. Federal judges are targeted in this Article because of the ease of using one or two federal judicial conferences to accomplish the necessary training, as compared to calling for 50 state judicial conferences. Federal courts could lead the way in establishing guidelines for the use of CGEs and related technology. However, state judges should not wait for the federal judiciary to act; they are also encouraged to call their own judicial conferences to accomplish the goals set forth herein.

373. *See* Wesley R. Iversen, *Animation Takes the Stand: Judging the Effectiveness of Computer Animations in the Courtroom*, COMPUTER GRAPHICS WORLD, Nov. 1991, at 48 (expressing as a major drawback to using computer technology in the courtroom the "uncertainty over courtroom admissibility."). According to one litigation consultant, there are many cases "where the side that's presenting the animation has invested lots of money. You're talking about hundreds of thousands of dollars in animation, which they end up not using in trial." *Id.* (quoting Thomas L. Bohan,

A formal legal technology judicial conference would be extremely helpful for all concerned in addressing this need. Judges would learn how CGEs are made, how they are actually very similar to traditional exhibits, and how trial consultants and attorneys use common software in the creation of CGEs. They would also gain the skills to operate the basic hardware and software that attorneys in their courtrooms are already beginning to use, and will increasingly be using in the future.

This is not to advocate that judges and their staffs have to become full-fledged computer experts overnight or that if they fail to do so then the administration of justice will grind to a halt. Rather, the proposed conference is simply a means by which all judges could be exposed to a formal, organized, and fairly comprehensive program in which they could become familiar with CGEs and consider the purported strengths and weaknesses of CGEs. It would be a chance for judges to share their insights, general thoughts, and ideas on admissibility issues, common problems, and practical suggestions when having automated trials. It would also provide a forum for "CGE-literate" judges to increase the knowledge and comfort-level of their less proficient colleagues.

Such a legal technology judicial conference may not be necessary for certain judges, as some of them already are familiar with CGEs and related courtroom technology.[374] However, many judges are not. It is exactly those judges who may shy away from legal technology, exposed to it only haphazardly, who could benefit the most from such

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director of Medical &Technical Consultants — a litigation consulting firm in Portland, ME). In the words of one litigator, "[i]n sophisticated jurisdictions, you can probably get by with [using animations]. But when you get outside of a big city, and you tell the judge you've got a computer that's going to create an animation for trial, he's probably going to laugh at you." *Id.* (quoting Robert B. Reagan, a litigation partner with the Los Angeles firm Adams, Duque & Hazeltine).

374. *See, e.g.*, Stephanie Balzer, *Courtroom Opts For Technology Over Paper*, BUS. J. PHOENIX, May 1, 1998, at 8 (mentioning Arizona's Maricopa County Superior Court Judge Steven Sheldon as one of the proponents of electronic court records in large civil cases); Landman, *supra* note 28 (mentioning Judge Kaye as championing the push to bring in more current technology into the courtroom); Misko & Ames, *supra* note 3 (describing U.S. District Court Judge Carl B. Rubin's enthusiasm for paperless trials); Roger Parloff, *Now Showing in a Courtroom Near You*, AMER. L., May 1990, at 4 (Supp. "Technology 1990") (describing federal Judge Stanley Sporkin's enthusiasm for a laser disc-assisted presentation of evidence); *see also* George Lange III & Lewis M. Smoley, *2nd Circuit is Now First Wired for Video-Argument*, NAT'L L.J., June 9, 1997, at B09 (listing many state and federal courts that have embraced video conferencing in court).

a conference. It is a common human trait to avoid things that make us feel uncomfortable or intimidated, and judges are people, too.[375]

We must climb this mountain of avoidance together, as a profession, before judges will appreciate the view that CGEs, in most respects, are fundamentally no different than "traditional" forms of demonstrative exhibits. If we can de-mystify CGEs for all federal judges, then perhaps they, in turn, will more readily allow computer technology to be used to de-mystify complex cases for juries, so that all concerned can focus their energies on the key matters at hand — resolving legal and factual disputes in a just, efficient, and modern manner.

2. Federal Courthouses and Computer Technology

Even the best initial training will be forgotten over time if the trainee does not have the opportunity coupled with the need to practice his or her newly acquired skills. Therefore, federal courtrooms must be equipped with the basic computer technology soon after, if not before, the suggested judicial training conference, so that federal judges will be encouraged, and even required by necessity, to use CGEs in the courtroom.[376]

This basic equipment[377] should include: monitors for judges, jurors, and testifying witnesses; a whiteboard display system with concurrent computer monitor display and hard disk storage; an attorney's podium equipped with CD-ROM drive and VCR; a front projection LCD projector; real-time court reporting and transcription display;[378] a rear

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375. *See* Hogan, *supra* note 20 (describing the concept of technophobia); *see also* Caudron, *supra* note 21 (describing the very human trait of fear of change); Frank M. Coffin, *Research Efficiency and Quality: Review of Managing Appeals in Federal Courts*, 138 U. PA. L. REV. 1857, 1860 (1990) (reviewing MICHAEL TONRY & ROBERT KATZMANN, MANAGING APPEALS IN FEDERAL COURTS (1988)) (discussing two studies published in 1979 and 1980 examining the effect of word processing equipment and electronic mail in the opinion-producing process in the United States Court of Appeals for the Third Circuit). According Coffin, the cited studies showed a marked difference in improvement of efficiency over time attributed in part to an improvement in user attitudes; in other words, as users became more accepting of the new technology, productivity increased significantly. *See id.*

376. *See* Cohen, *supra* note 28.

377. For a complete description of the latest in computer courtroom technology, visit the website of Courtroom 21, a joint project of the William & Mary School of Law and the National Center for State Courts at <http://www.courtroom21.net>.

378. Real-time court reporting (with transcription display) aids the hearing impaired jurors by allowing them to see a transcript of the testimony being given displayed on the

projection, touch-sensitive, pen-writeable TV; a flatbed scanner;[379] bench and counsel table access to statutory and case law via West and LEXIS CD-ROMs; and a video taping system synchronized to the real-time transcript.[380]

Currently, private industry is funding the model courtrooms that showcase computer technology systems.[381] One court estimates that the investment required to equip a single courtroom is $100,000.[382] One way to deal with the costs is to have the various federal circuit and district courts contract the installation of the equipment to the lowest bidder, allowing for economies of scale in outfitting multiple courtrooms. Another is to approach equipment suppliers with the notion that a price discount given to the court system will spur sales to private law firms and governmental legal agencies[383] who will see that

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video monitor mounted at their jury seat. Rather than having to continually strain to hear the testimony and comprehending only a portion of the words, the hearing impaired juror can read the testimony while the witness is testifying. The display of the testimony appears as the court reporter enters it. *See* Cohen, *supra* note 28; *see also* Candus Thomson, *Instant Transcripts Transform Trials*, THE BALTIMORE SUN, Mar. 2, 1998, at 1B (describing how lawyers can do word searches and track testimony during real-time transcription).

379. *See* Doris O. Wong, *Judge Rubin on How to Run an Automated Courtroom*, COMPUTER COUNS., Sept. 1993, at 22, 23 (partial transcript of a speech by Judge Carl Rubin, a U.S. district judge for the Southern District of Ohio, discussing the advantages of having a scanner in his courtroom).

380. Videotapes with real-time links to the transcript allow appellate courts to see and read what occurred during trial that is being claimed as error by the appellant. It has been reported that Kentucky, the only state that routinely makes direct use of video records, has seen an increase in appellate decisions affirming lower court decisions since instituting the use of video transcripts. *See A Change in Practice: Advancements in Technology Have Resulted in Tremendous Changes in the Way Law Firms and Courtrooms Now Function*, LANE REP., Mar. 1, 1998, at 44, *available in* 1998 WL 9782371. This is enlightening information given the fact that, according to the Federal Courts Study Committee, appeals have multiplied fifteen-fold since 1945, while the size of the federal appellate judiciary has increased only three-fold. *See* Coffin, *supra* note 375, at 1864. In 1990, there were 40,898 appeals filed and only 156 authorized circuit judgeships. *See* Christopher F. Carlton, *The Grinding Wheel of Justice Needs Some Grease: Designing the Federal Courts of the Twenty-First Century*, 6 KAN. J.L. & PUB. POL'Y 1, 2 (1997) (citing THOMAS E. BAKER, RATIONING JUSTICE ON APPEAL: THE PROBLEMS OF THE U.S. COURTS OF APPEALS 45 (1994)).

381. Both Courtroom 2000, *supra* note 28, and Courtroom 21, *supra* note 377, are funded primarily by the vendors of the technology products as part of their marketing effort targeted at courtrooms and legal firms.

382. This is the estimate for outfitting a courtroom with the same equipment as used in Courtroom 2000, *supra* note 28. *See* James D. Zirin, *Techo-Justice Global Economy*, FORBES, May 4, 1998, at 127, 127.

383. *See id.*

the courts are more accepting of the technology. Although cost considerations are very real, justice nonetheless demands that we supply a meaningful forum for our courts to resolve disputes for litigants in modern society. Cost considerations can always make us a prisoner of the status quo, but there must remain open the option of choosing to invest in the future, even with its substantial financial commitment.

3. Training Law School Students

If law school educators expect the judiciary to learn how to use CGEs at trial and to find the funds to pay to reconfigure and outfit their courtrooms, then we would be shirking our own duty as legal educators if we did not also require that the next generation of attorneys and judges be taught how to use basic legal programs, document management systems, and CGE technology. Such instruction in law school certainly would underscore the importance of using computer technology, not only at trial, but in all aspects of litigation, including hearings, negotiations, and conferences. Law students also could be exposed to using computer animations in areas of law beyond litigation, including business closings, mergers, real estate transactions, securities work, and complex financial transactions.

Law school students display the same varying degrees of commanding expertise, satisfactory comfort levels, avoidance strategies, and even outright phobias of technology found among the judiciary.[384] To accomplish the proposed goal for legal education, the first-year electronic legal research training typical in most law schools should be augmented to include a basic exposure to CGEs and case management software. Moreover, a required third-year class in basic computer hardware, CGEs, and case management should be added to the curriculum at every ABA accredited school. In short, a future lawyer's first encounter with presenting computer generated images should not be after he or she actually has become an attorney and is involved in a case against another attorney already experienced and more comfortable with CGEs. This would be a severe disservice to our students of today and their clients of tomorrow.

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384. Although students tend to be more proficient, or at least more comfortable, with computers than the older generation that comprises the judiciary, not every below-thirty student is already a "computer whiz" who is not in any need of computer instruction — especially for legal technologies, to which they probably have never been exposed. While students may be familiar with word processing programs and perhaps spreadsheets from prior work or undergraduate studies, they would not have any exposure to legal office software unless they have previously worked in a law office.

a. Augment First-Year Programs

Currently many law schools arrange with LEXIS and Westlaw[385] to train first-year law school students in two one-hour sessions free of charge.[386] Also, Lexis and Westlaw have had the marketing foresight to give free access to all law students during their entire three years as students in the hopes of creating familiarity with their services so that when those students become attorneys, they will be more likely to use Lexis and Westlaw (and charge their clients for it) over manual research. Many legal research professors, however, stress manual research (digest books) as being lower cost than computer database research (engaged in mostly by larger law firms) and therefore more indicative of the conditions students will find in law practice.[387] Still, many commentators have noted how unprepared for computer research this leaves first-year students.[388]

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385. LEXIS®/NEXIS services at law schools include the full text of reported cases from the last 50 years, federal and state statutes, a selection of federal and state administrative and regulatory materials, and a large collection of secondary legal authorities, such as law review articles, legal encyclopedias, Restatements, legal newspapers, and magazines. *See* STEVEN L. EMANUEL, LEXIS®-NEXIS FOR LAW STUDENTS (3d ed. 1997). Westlaw offers similar services, with over 13,000 databases of information, as listed in its website. *See Today's Westlaw Delivers Information on Your Terms* (visited April 27, 2000) <http://www.westgroup.com/ products/westlaw>. Both services are full text searchable, allowing the user to search for any word or any phrase within a database of documents.

386. Such training is aimed at helping students become familiar with using these legal databases throughout the rest of their law school careers. *See* Matasar & Shiels, *supra* note 367, at 911 ("American law students receive complementary 24-hour-a-day access to LEXIS/NEXIS and WESTLAW . . . .").

387. *See* Marc S. Klein, *Managing Your CALR Money*, N.J.L.J., Nov. 23, 1992, at 17 (noting how modern technology can come at a steep price, evidenced by the fact that large law firms "literally spend millions every year" for computer-assisted legal research ("CALR")); *see also* Lucia Ann Silecchia, *Designing and Teaching Advanced Legal Research and Writing Courses*, 33 DUQ. L. REV. 203 (1995) (noting that training in CALR is needed beyond the first year of law school because the first-year class cannot cover all of the advanced techniques that law students need to learn about CALR; because students are learning about all types of research in their first year, they can use CALR in a second- or third-year course as one part of a comprehensive research strategy, rather than the only method to find information).

388. Many students are taught to use computer assisted legal research ("CALR") by representatives of LEXIS and Westlaw. However, often much of the training beyond the initial few hours of formal training is provided by fellow students trained by these companies. Others are taught and can receive assistance by trained legal librarians. *See* Walter, *supra* note 34, at 581 (examining CALR training currently provided to students while in law school and critiquing the current lack of it on a more systematic basis); *see also* Silecchia, *supra* note 387, at 213 (asserting that students either "wing it" on the

The situation does not change until the student works at a summer job (or perhaps at his or her first job, which might be after graduation) that requires computerized legal research, and then must learn, on his or her own, more than the most simple search techniques. The learning curve is thus unnecessarily protracted. By the middle to end of the first year many students realize how poor their computerized research skills are even though they may have legal research jobs lined up for the coming summer. A two-hour advanced class at this point in the year, perhaps taught by the law librarian, to allow for a student question and answer session and to explain more advanced search techniques, would turn out much more polished,[389] employable first-year researchers.

As part of this program, first-year students also should be exposed to CGEs and case management software systems. Students in the first year do not necessarily have to become technically proficient with these programs at this stage, especially given their time commitments to case study and legal analysis, but at the very least they still should be exposed to the legal technologies available so that they can, even at this early juncture, appreciate the power of technology in the practice of law. Various legal technology vendors could provide demonstrations to first-year students (so as not to tax professorial or librarian resources) in much the same way they now do at technology shows for the ABA.[390] Vendors also could distribute free software demonstrations on CD-ROM and point students to vendor web sites. Students interested in learning more about the software could then do independent research and make further contact with vendors, but at least their law school experience would facilitate that critical initial exposure in a formal way.

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job as they use CALR to a greater extent than was taught to them in their first year of law school, or they lose even the basic skills they learned if they subsequently do not use CALR regularly).

389. Training is improved when students have the opportunity to practice a piece of software for a period of time and find their own problem areas and needs. *See* David Cook, *Computer Training Requires Practice to Make Perfect*, AUSTIN BUS. J., Mar. 13, 1998, at 31, 31 ("People who get the most out of computer instruction are those who have looked at the program and have formulated questions about how the program works and what they need to do."); *see also* Philip Davis, *What Computer Skills Do Employers Expect from Recent College Graduates?*, TECHNOLOGICAL HORIZONS IN EDUC., Sept. 1, 1997, at 74 (reporting that 83.3% of all employers consider computer competency skills either "important" or "very important" in the hiring decision).

390. *See* Piganelli telephone interview, *supra* note 15. Law schools also could sponsor "technology days" where the vendors would set up booths at the law schools for students to visit, much like the tech shows.

b. Required Third-Year Course

In addition to an initial exposure during the first year, all law schools should add a *required* third-year course (but perhaps only a one-hour or at the most two-hour per week course) to teach students the basics of computer equipment,[391] common case management software,[392] and office management software;[393] how to electronically file court documents via the Internet;[394] how to make a legal Web page[395] (especially for solo or contract practitioners); and how to do legal research and even factual investigation (informal discovery) on the Internet.[396] In this course, students would learn how CGEs are made,

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391. *See* Margaret Maher Krause, *Look Beyond LEXIS and WESTLAW: Other Computer Applications in the Practice of Law*, 85 L. LIBR. J. 575 (1993) (stressing the importance of understanding the difference between a field and a record in a database system, the benefits of a print queue, and what a local area network can accomplish, and suggesting that law students should become familiar with a prototypical automated law office similar to what they will encounter in practice); *see also* Joseph Kornowski, *Learning the ABC's of Law Office Computing*, L.A. LAW., Jan. 1996, at 60 (arguing that legal computer training is currently inadequate and thus in need of a serious boost, and noting that 75% of firms believe that the technology at their firms has not been used to its full potential).

392. Examples include Summation Blaze, *supra* note 97, as well as Amicus Attorney and Time Matters. *See* Carol L. Schlein, *Choices: Amicus Attorney or Time Matters?*, 7 N.J. LAW., Mar. 9, 1998, at 19. Learning how to use case management software is beneficial in light of a survey released by the ABA that reported the number of law firms using case management software more than doubled in just one year, from 14% in 1995 to 35% in 1996. *See* Paul Bernstein, *How Up to Date Are You? Law Office Automation and Internet Usage*, TRIAL, Dec. 1, 1996, at 65, *available in* 1996 WL 13323260.

393. Some examples include Trust, Accounts Payable, Check Writing and Conflict Modules for Juris, from Juris Inc., and Amicus Attorney III from Gavel & Gown Software Inc. *See Tools for Office Management: Practice Management*, LAW TECH. PRODUCT NEWS, May 1998, at 6. Other examples include PC LAW accounting software. *See Novation Adds Checklist-Oriented, Customizable Software*, ILL. LEGAL TIMES, June 1997, at 29.

394. *See Model Rules for Electronic Filing*, LAW TECH. PRODUCT NEWS, February 1998, at 50, 50 (indicating that the West Group has recently announced its collaboration with the National Center for State Courts regarding model rules on electronic filing of documents in state courts around the country, as well as a financial analysis of electronic filing to demonstrate that use of this technology will result in productivity gains).

395. *See* Kevin Lee Thomason, *From the Basic to the Truly Awful Website Design*, GA. B.J., Dec. 1997, at 38, 38–40 (describing how to list a website within a certain category, what information to include in a website, and how to promote it).

396. *See* Bernstein, *supra* note 392 at 66 (presenting statistics that show that 58% of attorneys reported using the Internet in 1996, a dramatic increase from the 10% who reported their Internet use just the year before). According to Bernstein, Internet use by law firms breaks down as follows: legal research (65.6%), nonlegal research (57%),

what their strengths and weaknesses are, what the main admissibility concerns are at trial, and how to use them tactically. In addition to web-site design, students should also be taught how to make a CD-ROM disk that contains basic evidence, depositions, and a brief animation clip.

It is important to note that such a course would not require law students to become "computer experts,"[397] but would provide significant, formal exposure to legal software *before* students graduate. However, given that law students are often more "computer literate" than their professors, as well as many current members of the bar,[398] this may seem to present a certain pedagogical challenge to law school professors. This disparity in computer literacy would not mean, of course, that *all* professors would have to become more computer literate than their students. Only those professors actually charged with teaching and introducing CGE software programs to students would have to do so.

One of the main challenges to this proposed curriculum might be professors, who could simply assume that students "will figure it out on their own" when they become attorneys. Or, professors might assume students "know it already," much as we assume student

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communicating with colleagues (44.5%), communicating with clients (41.4%), marketing (14.8%), participating in private discussion groups (14.8%), locating expert witnesses (8.6%), personal use (family/friends) (1.6%). *See id.*

397. This is no different than the amount of expertise a lawyer must have with some other less complex, traditional communication technology. By now, most attorneys are probably familiar with the option of using a fax machine to enhance the speed of communication and the ability to transfer written information without having to physically transport the document containing that written information. However, this does not mean that a law student must therefore learn how fiber optics can translate information over a telephone line or be able to repair a modem in order to learn how to effectively use a fax machine as an attorney. A law student should be familiar enough with legal computer technology to understand the benefits of CGE use in the courtroom and how to argue against an opponent misusing it, as well as to understand the efficiencies associated with computerized document management programs in order to be more organized during discovery and at trial.

398. The reason may be as simple as the fact that the current generations of lawyers, judges, and law professors grew up playing pool, foosball, or pinball, while current law students and young attorneys grew up playing Space Invaders and Pac-Man. *See* Carol L. Schlein, *Law Firm Technology: Getting Lawyers to Use Computers*, N.Y. L.J., April 20, 1993 (noting that baby boomers missed out on the basic skills of typing and keyboarding, and that younger people who have gone through college and law school since 1980 are routinely exposed to computers).

knowledge of the telephone, fax machine, and basic word processing programs.[399]

But simply throwing a student into the proverbial "water" and categorizing it as a "teaching" them to "swim" approach — pursuant to a "they-will-learn-all-that-practice-oriented-stuff-on-their-own" mentality — is really not "teaching" anything. Instead, such conscious neglect is nothing more than an excuse for not teaching — a convenient rationalization to justify shirking the teaching responsibility. It is true that, because our students are smart and resourceful, most will figure out how to survive technologically on their own. Those who find themselves in larger firms will no doubt benefit from special in-house training by the firm's technical support staff. However, to the extent that they may be smart and resourceful and will "land on their feet anyway," then they really do not appear to need professors for much of anything. That is, I suppose we could pursue the logical extreme of that "anti-coddling" theory and simply say, "Look, they'll figure out the bar exam on their own anyway, so why even bother teaching at all?" Indeed, the legal writing and research class was instituted in most law schools only when legal educators realized that future attorneys needed to learn these skills formally. We can always just say that we are teaching "personal responsibility" and "self-reliance" because we are making students learn the law on their own. And I am sure students would be all too happy to pay their tuition for that wonderful and brilliant, but costly, lesson.

To the extent that professorial resistance exists, the course might be farmed out to computer technology vendors who have an economic interest in introducing their software and hardware products to future attorneys. Just as LEXIS and Westlaw representatives are allowed access to students at many law schools, so too might CGE and document management software firms be allowed access to the student market in exchange for introducing students to their software programs.

4. Education for Practicing Attorneys

One incentive for practicing attorneys to learn existing computer technology and to stay abreast of new developments, besides the clear advantage of using CGEs in court, would be to get continuing legal

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399. However, to the extent that legal computer technology is new, formally acknowledging CGEs and document management systems as instructional necessities will help to ensure their acceptance as an integral part of the practice of law.

education credit for courses completed under this subject heading. Law schools could recoup some of their costs of legal technology programs by providing attorneys continuing legal education courses on their campuses on weekends and during breaks.

5. The Proposed Training Package

In sum, federal judges and law school students should be educated and trained in using CGEs and other computer hardware and software in order to maximize understanding and minimize fear of modern computer technology in the courtroom.

Thirty years ago there were no mobile telephones, fax machines or word processing programs. These technologies are now not only common, but integral to the practice of law. "Times change, the law should change" is a bellwether phrase that has signaled transitions in law for hundreds of years.[400] The time has come to change how the legal profession currently deals with the subject of CGEs from an ad hoc treatment to a unified and more formal approach.

VI. COST CONSIDERATION, ECONOMIC DISPARITY, AND STRATEGIC CONCERNS

There are two general cautionary warnings regarding the use of computer technology in the courtroom: (1) the possibility that the high expense of CGEs may exacerbate existing economic inequities between litigants and therefore be unfair to less wealthy litigants who cannot afford them; and (2) the possibility that using CGEs might be a tactical error (seen as "overkill" or "piling on" by some jurors in certain circumstances) by creating a "David and Goliath"[401] situation. These issues need to be addressed in assessing whether or not CGEs should have a legitimate role at trial, first, by the judiciary as a general policy matter, and second, by an attorney or client considering using CGEs in a particular trial.

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400. *See, e.g.*, Pierson v. Post, 3 Cai. Cas. 175, 180 (N.Y. 1805) (Livingston, J., dissenting) ("[I]f men themselves change with the times, why should not laws also undergo an alteration?").

401. The reference is to the story of David and Goliath in the Bible, 1 *Samuel* 17:50, in which David, a mere boy and the proverbial "underdog," is able to slay a giant warrior, Goliath, with a simple slingshot. Despite Goliath's armor, great size, and power, David prevails.

A. Fairness and Equity Concerns

1. The Expense

At first glance, there is no denying the high cost of CGEs. The range of CGEs varies so dramatically that estimates are difficult to ascertain, but complex animations can range in cost from $50,000 to over $100,000.[402] Although simpler animations may be much cheaper,[403] it is not uncommon to spend up to $150,000 on computer exhibits, as the United States government did in the *Delta Airlines* case.[404] The factors affecting cost are the time involved, the number of technical people involved, the accuracy of the objects portrayed in the animation, the type of motion and length of the animation, the variation of angles, speed, and alternative viewpoints, and the degree of precision required.[405] Simulations and re-creations usually cost more than animations because they require extensive input data and programs in order to process that information to produce an accurate result. In terms of sheer costs, many commentators liken them to small Hollywood movie productions, since they can cost tens of thousands of dollars and the initial cost can unexpectedly multiply when revisions and modifications need to be made.

Adding to the initial cost are the contingencies associated with CGEs, including the possibility that they will be challenged or excluded from trial altogether.[406] No matter how many issues were addressed in

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402. *See* Mark C. Joyce, *Using Computer Animations*, S.C. LAW., July/August 1999, at 32, 34; *see also* Wayne J. Lovett, *Demonstrative Evidence Displays a Broader Appeal: Falling Prices and the Ability to Convey Complex Issues to Juries Give Visual Aids a Higher Profile*, NAT'L L.J., Sept. 23, 1996, at B14, B14 (noting that medical animations range from $5000 to $10,000 for a simple gunshot wound, and that complex animations, "such as airline crash simulations, can run into the hundreds of thousands of dollars").

403. *See* Lori Tripoli, *Winning with Visuals... With Lower Cost and Broader Access, Who Isn't Using Animation to Make Their Case?*, INSIDE LITIG., Nov. 1997, at 1, 5 (noting while animations are often expensive, they can also be as low as $5000 to $8000).

404. *In re* Air Crash at Dallas/Fort Worth Airport on Aug. 2, 1985, 720 F. Supp. 1258 (N.D. Tex. 1989); *see also* Paul Marcotte, *Animated Evidence, Delta 191 Crash Re-Created Through Computer Simulations at Trial*, A.B.A. J., Dec. 1989, at 52 (describing the animation of Delta Flight 191 wherein 128 passengers, eight Delta crew members, and one person on the ground died).

405. *See* Telephone Interview with Gene Thompson, Litigation Consultant, Engineering Animation, Inc. (Aug. 5, 1998).

406. *See supra* Part III (discussing possible objections under the Federal Rules of Evidence).

a pretrial hearing before spending the money and time to produce a CGE, several stages of processing and programming may be challenged, resulting in partial or total exclusion.[407] Thus, part of the calculation is not only the initial expense, but also having the funds on hand to pay for any necessary costs in revisions or redactions. And perhaps most daunting, clients must understand that their substantial "investment" in the creation or generation of the CGE may be completely lost if the CGE is excluded. The unavoidable problem is that a proponent of a CGE cannot obtain a ruling on its admissibility until *after* it is created and shown to the judge and opposing counsel for their reactions and arguments.

This all means that a client's litigation budget must be large enough to take on this expense. Further, the client must understand the inherent "gamble" involved — that the jury may never see the CGE. Even the most wealthy corporate clients are concerned that litigation is already too expensive once attorneys' fees, expert witnesses' fees, private investigators' fees, and other costs associated with litigation are taken into account.[408] Consequently, they are sure to be concerned with a substantial additional cost for CGEs. Moreover, for clients with smaller litigation budgets who already find it difficult to pay high attorneys' fees and expert witnesses' fees, using CGEs simply may not be a realistic option.[409]

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407. For example, when the input data is part conjecture, assumptions become possible land mines and objections may destroy the effect of the animation or exclude it altogether. If the combination of assumptions and formulas entered into a computer change slightly, thereby producing different results, the CGE becomes vulnerable to charges of randomness and inaccuracy. The huge amount of money spent on it is then essentially wasted.

408. *See* William D. Underwood, *Divergence in the Age of Cost and Delay Reduction: The Texas Experience with Federal Civil Justice Reform*, 25 TEX. TECH L. REV. 261, 262 n.2 (1994) (citing a survey wherein it was found that "69% of corporate counsel, 85% of public interest litigators, 63% of plaintiff's litigators, 52% of defense litigators, and 56% of federal trial judges surveyed agreed that transaction costs of civil litigation unreasonably impede the use of the civil justice system by ordinary citizens"); *see also* Keith N. Hylton, *Litigation Costs and the Economic Theory of Tort Law*, 46 U. MIAMI L. REV. 111, 114 (1991) ([L]itigation costs are not small. A tort victim's cost of litigating consumes roughly thirty percent of the average damage award.").

409. Some litigants already cannot afford expert witnesses in their cases or fund protracted discoveries. Those litigants would find it almost impossible to pay for CGEs. *See generally* David Medine, *The Constitutional Right to Expert Assistance for Indigents in Civil Cases*, 41 HASTINGS L.J. 281 (1990) (explaining that not only are expert witnesses highly useful, but sometimes they are required by the judge in complex and technical cases, leaving indigents or others who cannot afford the significant expenditures for expert witnesses unable to assert legitimate claims).

2. The Economic Inequities

Of course, if the costs of using CGEs are so large that even very wealthy clients, despite their larger litigation budgets, become concerned about paying for them, then litigants with smaller litigation budgets[410] may simply be "priced out" of the option of using expensive CGEs altogether. As a result, there are crucial cost issues pitting wealthy litigants, who have the economic means to use very expensive computer graphics, against opponents with lesser economic means, who cannot afford sophisticated CGEs and therefore must either suffer with old-fashioned butcher block paper and magic markers or rely exclusively on their attorneys' oratory skills to "paint a mental picture" for the jury. Consequently, those litigants who cannot afford to use CGEs will be unable to present their case as clearly and persuasively as their opposition. Further, the litigants without CGEs might feel more pressure to settle, not based on the merits of the case, but simply because they feel they are "out-gunned."[411]

This problem is not new, nor does it exist only in the context of a "rich" litigant being able to pay for expensive CGEs while a "poor" litigant cannot. Inequality concerns begin *long before* litigants start considering the use of CGEs at trial. The economic inequality between litigants is a long-standing problem in the American legal system.[412]

Unfortunately, many people currently have the impression that money can "buy justice."[413] For example, a wealthy litigant can afford

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410. Indeed, some clients have no litigation budget at all. That is why a mechanism like Legal Aid (privately or publicly funded legal representation for indigents), was created. *See generally* Stephen K. Huber, *Thou Shalt Not Ration Justice: A History and Bibliography of Legal Aid in America*, 44 GEO. WASH. L. REV. 754 (1976). The contingency fee (reimbursement of attorneys by clients of certain costs, most notably the attorneys' salaries paid as a percentage of a client's recovery) serves a similar purpose. *See generally* Dennis E. Curtis & Judith Resnik, *Contingency Fees in Mass Torts: Access, Risk, and the Provision of Legal Services When Layers of Lawyers Work for Individuals and Collectives of Clients*, 47 DEPAUL L. REV. 425 (1998). Unfortunately, costs are still borne by the litigant during the litigation, and the creation of a CGE is a cost.

411. *See* McKeone, *supra* note 133 (recounting that out of 15 cases involving CGEs that did not settle out of court, the side using the CGEs won in *every* case).

412. *See supra* note 36 (explaining cost inequities as a problem in the American legal system).

413. This has been reinforced by recent legal decisions in high profile cases such as the O.J. Simpson trial. *See* William T. Prizzi, *The O.J. Simpson Trial and the American Legal System*, 145 NEW L.J. 990, 990 (1995) (listing recent high profile cases where juries had either acquitted or failed to convict defendants, at least the first time around, against whom the evidence had appeared to be very strong, such as the wealthy

to hire a more articulate and skilled attorney (assuming such attorneys are higher-priced, which presumably is not always the case), whereas the opposing side may be much more limited in whom it is able to hire.[414] A wealthier litigant also has the economic advantage to afford more expensive (and better) private investigators, more expensive (and better) expert witnesses, and for some cases, more expensive (and better) jury selection experts.[415]

The general idea that money allows one party to access more justice in our system is borne out by such issues as the cost of appellate review, which keeps poor litigants from appealing, or the cost of filing lawsuits, especially considering that some states have passed "loser pays" statutes[416] which weigh most heavily upon the poor. Moreover, while these inequities make the litigation model of a "fair fight" unrealistic, the problem is actually compounded by abuses in discovery[417] and "outspending" the other side.[418] What does all of this

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Menendez brothers who murdered their parents and the Los Angeles police officers who had been videotaped clubbing Rodney King); *see also* Michael Ellis, *Attorneys Fear Nanny's Trial May Have Been Tainted by Simpson Case*, BUFF. NEWS, Nov. 1, 1997, at A3, A3 (quoting Randy Gioia, a prominent Boston criminal defense lawyer, as saying that the Simpson verdict made juries skeptical of high-priced, well-known witnesses and attorneys and gave some people the belief that the very rich can buy justice).

414. *See generally* LOIS G. FORER, MONEY AND JUSTICE: WHO OWNS THE COURTS? (1984) (presenting the thesis that American courts are not equally open and available to all, and that the wealthy can get faster trials and pay for better lawyers, investigations, expert witnesses, and documentary and physical evidence).

415. *See id.* at 14.

416. Under the "loser pays" system, known as the "English Rule", the losing party in a lawsuit is obligated to pay the winning party's fees. The approach is meant to encourage litigants to evaluate carefully the merits of their cases before initiating a frivolous claim or adopting a spurious defense. Some believe this rule is rooted in fairness because the party who suffered is made whole again by having the money spent on instigating the action restored. *See generally* Thomas D. Rowe, Jr., *Indemnity or Compensation? The Contract with America, Loser-Pays Attorney Fee Shifting, and a One-Way Alternative*, 37 WASHBURN L.J. 317 (1998). *But see* Frank R. Rosiny, *Full Cost Shifting and Part 130: New York Version of Statutum Armorium*, N.Y. L.J., April 20, 1990, at 2, 2 (warning that the "loser pays" cost-shifting rule may discourage attorneys from representing a litigant if the opposing litigant is substantially more affluent and has employed a much larger law firm because no attorney wants to end up responsible for six-figure fee amounts). "In time, [with the "loser pays" rule in place], only major firms may dare to enter the lists against major firms; squires will contend with squires; and serfs will fight serfs." *Id.*

417. *See* Underwood, *supra* note 408, at 261–70 (stating that discovery abuse has been cited as a principal cause of unnecessary litigation costs in several recent studies, and that the Judicial Conference Committee on Court Administration and Case Management in 1992 informed all 94 federal district courts that excessive discovery is the single greatest factor contributing to unacceptable expense); *see also* Greg M. Zipes,

have to do with CGEs? It must be acknowledged that the general problem of economic disparity leading to inequitable advantages and disadvantages in litigation is not unique to the issue of using CGEs at trial. As such, the problem needs to be addressed in the much *larger context* of litigation in the American system in general,[419] not just as a policy concern to be addressed solely by proponents of using CGEs at trial. Proponents of the freedom to hire good counsel, good experts, and good investigators — or "the best money can buy" — should not escape so unscathed while proponents of CGEs bear the entire brunt of the critique.

Although economic inequality issues are not unique to the usage of CGEs, CGEs nonetheless are often very expensive.[420] The inequality of CGE use does not disappear or become less egregious because economic inequality concerns are legion.[421] The bottom line, both figuratively and literally, is that most poor and even many "middle-class" litigants simply cannot afford the out-of-pocket expense required for CGE use. There are some types of CGEs that are lower cost.[422] One example is "off-the-shelf" CGEs for medical malpractice cases.[423]

Discovery Abuse in the Civil Adversary System: Looking to Bankruptcy's Regime of Mandatory Disclosure and Third Party Control Over the Discovery Process for Solutions, 27 CUMB. L. REV. 1107, 1120 (1996) (showing the lack of control over discovery abuse by courts). "Courts dislike dismissing a case . . . when a party fails to disclose . . . . Instead, courts usually grant second chances or punish the attorney with de minimis monetary sanctions . . . . [S]ome lawyers abuse discovery because of the low risk of harsh discovery sanctions." *Id.*

418. *See* Bockweg v. Anderson, 117 F.R.D. 563 (N.C. 1987) (holding that discovery rule would be construed so as to sanction liberal discovery of expert witnesses).

419. *See generally* FORER, *supra* note 414.

420. *See* Michelleti, *supra* note 14, at 13 (estimating the cost of a piece of computer animation at between a few thousand dollars to a few hundred thousand dollars depending on the complexity and length of the project). The typical computer animation costs between $5,000 and $20,000. *See* Lovett, supra note 402, at B14.

421. Even when an attorney is working on a contingency fee basis, the cost of a CGE is considered an out-of-pocket expense, not part of an attorney's fee, and so it must be paid by the client as an up-front cost. The cost of CGEs is like the cost of expert witnesses, and the common law of most states, with the support of the American Bar Association, forbids any expert witness from testifying on a contingency fee, in response to the fear that a testifying witness will be biased in favor of the litigant who pays his bill. *See* Jeffrey J. Parker, *Contingent Expert Witness Fees: Access and Legitimacy*, 64 S.CAL. L. REV. 1363 (1991).

422. Remember that the term "CGE" covers a wide range of exhibits, which share the advantage of being visual in nature and thus more easily comprehensible and memorable. *See supra* Part II.

423. Off-the-shelf digital medical graphics produced by BioNet cost $298.00. *See* Lovett, *supra* note 402, at B14.

Still, the high cost of CGEs is a legitimate concern that needs to be addressed, regardless of the inequalities co-existing in the larger context of justice in our society.

3. Exaggerated and Unfairly Selective Concerns

One response to this problem is to challenge the assumption that computer technology is too expensive. First, like many new technological advances, computer prices have been steadily declining and probably will continue to do so.[424] Second, and more importantly, the cost of CGEs, when properly accounted for, does not exacerbate existing resource inequalities between rich and poor litigants as much as might be assumed. Significant time savings, cost savings, and overall efficiencies are associated with computer technology.[425] These savings are typically overlooked due to the initial "sticker shock" of using CGEs, but may offset the up-front costs of a CGE.[426] Potential cost savings include a higher rate of pre-trial settlements,[427] shorter

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424. In 1996, a premium PC with a 133 MHZ Pentium chip cost $2,200–$2,500, a 25% decline from the previous year. Up until 1995, price decreases had been averaging 18–20%. *See* Steve Alexander, *Price Chopping Brings Tough Decisions: Buyers Must Choose Between the Low Cost of the Pentium and the Power of the Most Expensive Pentium Pro*, COMPUTER WORLD, May 27, 1996, at 101. By early 1998, a system almost three times faster, with 2–3 times the memory capacity, could be bought for as little as $2,600, and the older system was being deeply discounted. *See* Stephen W. Plain, *Awesome and Affordable*, COMPUTER SHOPPER, Feb. 1, 1998, at 215, *available in* 1998 WL 2082380. By 1999, computers with a 450 MHZ processor and 64 MB RAM were selling for less than $800. *See Value Line: Your Guide to the Best PC Deals*, COMPUTER SHOPPER, Aug. 1, 1999, at 96, *available in* 1999 WL 12875620.

425. *See* David G. Hymer & Thomas R. Lloyd, *U.S. Business Litigation — Seeing Is the Difference Between Victory and Defeat*, CORP. LEGAL TIMES, Feb. 1998, at 34 (noting cost savings in the use of CD's and bar codes to store and retrieve scanned evidence quickly, rather than having to manually search through boxes of evidence at trial or paying for the production of expensive blow ups); Lovett, *supra* note 402, at B14 (noting that many trial lawyers believe that an effective demonstrative evidence presentation can make a significant difference in pretrial settlement); Ronald A. Rust, *Technology Lessons Drawn From High Profile Trials*, MASS. L. WKLY, Apr. 1, 1996, at S1 (recalling that a scanner station set up in the courtroom for one trial eliminated the need for recesses to enter new evidence). All of these savings translate into more pretrial settlements or shorter trials.

426. For example, to account for the cost of housing insulation, a home owner should not simply take into account the up-front cost of the insulation and its installation as a lost cost. Instead, the homeowner should offset that initial cost by the monthly savings to their home heating bill, such that the insulation, although initially a "cost," may end up being much cheaper once it is properly accounted for.

427. CGEs can increase chances of a pretrial settlement. *See* McKeone, *supra* note

trials,[428] fewer attorney hours, and fewer expert witness hours.[429] Thus, the *net* effect, not the *gross* up-front cost of using CGEs, might ultimately cancel out any initial cost inequalities, or at least partially offset the initial price tag.

To the extent that economic inequality exists between litigants, technology is not the place to draw an exclusionary and discriminatory line. Although this does not justify the cost inequities associated with using CGEs, CGEs should not be punished for shortcomings pandemic to the entire American legal system. To accept economic inequity in litigation as an unavoidable reality in the American legal system and then to suddenly argue that inequality is entirely unacceptable as to CGE use would constitute unfair, selective, and contextual enforcement.[430] That is, if we are to be concerned for litigants who may not be as wealthy as

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133 (stating that out of 858 cases in the U.S. that used computer-generated displays, all but 15 of those cases settled out of court); *see also* Lovett, *supra* note 402 (noting that many trial lawyers believe that CGEs should even be presented during settlement negotiations, since "an effective demonstrative evidence presentation can make a real difference at a settlement conference").

428. Trials are shortened by using CDs, CGEs, and scanners in the courtroom. *See* Rust, *supra* note 425; *see also* Halbfinger, *supra* note 28 (reporting that an official review of Courtroom 2000 in New York suggests that commercial cases that will use the high-technology courtroom are expected to be shortened by as much as one half); Robert Reisch & Gregory J. Mazares, *The Legacy of Judge Carl B. Rubin*, LAW TECH. PROD. NEWS, June 1996, at 29 (noting how Judge Rubin sometimes ordered all parties to utilize the imaging system in the court to save time).

> The most telling example of the efficiency and impact of electronic media occurred when defense counsel handed a one-page spreadsheet to a witness. The expert was asked to identify the document and answer a few questions about some of the numbers on the sheet. This single piece of paper was then given to the jury to study, one juror at a time. Each juror took several minutes. For those in the courtroom, the whole process seemed to take forever. During cross-examination, plaintiff's counsel referred to the same spreadsheet but displayed it on computer screens for the witness, judge and all jurors to view simultaneously. In the same time that it took a single juror to study the defense's paper version of the spreadsheet, the entire jury both saw the sheet and heard the plaintiff's counsel cross-examine the witness in detail.

Id.

429. *See* Thomson, *supra* note 378 (relating that attorney Barry Helfand estimated that he saved about $12,000 per day in medical expert costs by giving the experts copies of the real time court transcripts rather than have them sit in the courtroom to monitor the opposing side's medical expert). *See* Piganelli telephone interview, *supra* note 15 (asserting that the cost for a computer expert to testify is about $85–$175/hr).

430. *See* Podgers, *supra* note 36.

their opponents and might be disadvantaged in our justice system, that concern must permeate *all contexts* of litigation, not just CGE use. Whatever the solution to the very general problem of economic inequalities manifesting themselves in unfair litigation advantages, the ultimate solution should be consistent against *all* forms of economic inequality to avoid arbitrarily discriminating against a particular type of advocacy.

An interesting thought experiment is to ponder whether we would be as critical of CGEs had they come *before* litigants started hiring more expensive expert witnesses, expensive jury consultants, and higher-priced lawyers in an effort to gain a litigation advantage. If the system, by mere convention, had always assumed that a litigant should be able to pay for any CGEs they wanted (as is the current case for expert witnesses and private investigators), would we continue to allow the usage of CGEs despite the cost inequities, while adamantly calling attention to the inequalities associated with being able to hire differently-priced attorneys or expert witnesses? The point is that selective enforcement by moral outrage usually reveals more of a pretext to act on prejudices than it does an earnest desire to resolve all apparent inequities uniformly.

4. Various Solutions to the Problem

There are actually two components to the cost issue regarding CGEs: (1) the CGEs themselves,[431] and (2) the technology, or hardware, required to show them.[432] The hardware can be purchased or leased, but the creation of the CGEs, which relies upon software and software specialists, can take much longer.[433]

One proposal regarding the cost issue is to do nothing, to accept the status quo and to add CGEs to the long list of things the "haves" can afford and the "have nots" cannot. The advantages to this suggestion are no forced change in the justice system, no forced cost shifting or sharing, and no increase in court budgets for technology. The disadvantage is that it does nothing to alleviate the problem of economic

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431. *See supra* note 2.

432. "Clients can spend anywhere from $40,000 to $110,000 to bring in their own technology systems for a single trial." Beth Mattson, *Trial by Technology*, MINNEAPOLIS-ST. PAUL CITY BUS., June 27, 1997, at 22.

433. *See* Lovett, *supra* note 402 (listing several companies that provide CGEs along with the qualifications of their technical staffs, and explaining the roles of different specialists whose expertise is highly valuable, if not essential, in the creation of CGEs, such as graphic artists, engineers, and communications consultants).

inequity in the use of CGEs, although inequality may be exaggerated to the extent that only initial gross costs, rather than net costs, are typically taken into account.[434]

A "middle-ground" response to the problem of cost might be to have the parties *share* the overall costs of CGEs for both sides. This would be similar to sharing the costs of a special master, appointed arbitrator, or expert witness. However, we certainly do not say that if one side is able to afford a high-priced attorney and their opponent cannot, then the litigants must share the costs of attorneys. Nevertheless, requiring the parties to share costs of CGEs might make them more acceptable.

There are, of course, certain fairness issues which cut in the opposite direction: why should a "rich" litigant have to partially subsidize a "poor" opponent's computer presentation? Any such inequity associated with an imposed transfer might not be as egregious, however, as the current system in which only one side would get the benefit of CGEs, because they could initially afford them, while the other side might not if they are deterred by the initial cost. At least in the shared cost model, *both sides* have equal access to CGEs, not just one.

One possible disadvantage is that unless the litigant with fewer resources uses a CGE that is as expensive as the opposing litigant's CGE, the first party may end up subsidizing the more wealthy opponent, assuming costs are shared equally. Still, to the extent that parties share the costs of court-appointed experts or special masters, perhaps that could be a useful model to make sure that all litigants get to benefit from technology in the courtroom in the common quest for truth and justice.

A more extreme suggestion would be to shift all or most of the costs of producing and using CGEs at trial *for both sides* to the party who chooses to use them and therefore presumably can most afford to pay for them.[435] That is to say, the side that uses CGEs must not only pay for their own CGE costs, but also must pay the cost for the other side to use them in exchange for the opportunity to use CGEs, thereby forcing a "leveling of the playing field." The advantage to this system is that a litigant who otherwise would not be able to afford the cost of

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434. *See supra* Part VI.A.3 (arguing that there really is no inequality issue or only a minimal one once the advantages of CGEs are accounted for correctly).

435. However, simply because a party desires to use a CGE does not necessarily mean they are the "richer" party. A "poor" plaintiff may be the one who needs and wants to use a CGE more than a defendant who might not want the jury to see any graphic depictions of their alleged wrongdoing. In such a case, CGEs would not be paid for whenever the "rich" party did not think it had an advantage.

using a CGE and providing the technology to display it to the court would now be able to use this very effective evidentiary tool and would not be at a disadvantage relative to the opposing party who is using CGEs.

However, a litigant with more resources at her disposal must completely subsidize the opposing litigant in order to have the right to use a CGE which makes the transfer inequities to the first litigant even more acute than with simple cost-sharing. As a result, neither party would want to ever be the first party to request the use of a CGE as there would be a built-in incentive for parties to wait as long as possible before declaring that they want to use CGEs (hoping that the other side will declare itself the one that wants to use CGEs, thereby having to pay for both sides to use them), which ultimately would result in a disadvantage for a litigant who could less afford them.

It also would result in fewer instances when litigants would use CGEs, for fear of incurring the costs for both sides. Moreover, there are not always easily identifiable "rich" litigants opposing easily identifiably "poor" opponents. Who would pay in situations where the parties are roughly equal in their access to litigation funds, or where one litigant is only slightly wealthier than his opponent? But again, to the extent that this option might be seriously considered, why is there no similar demand from opponents of CGEs for litigants in a position to use CGEs to pay for their opponent's high-priced attorneys or expert witnesses and write it off as a cost of being granted the opportunity to use a high-priced attorney or good expert witnesses at trial?

Of course, when a courtroom takes the initiative and becomes automated on its own and then offers the technology option to the attorneys — much like a court provides seats, microphones, and an easel to both sides — it would minimize any wealth disparity between the litigants and quite literally "level the playing field," at least with respect to equipment technology. Litigants would still have to pay for the cost of making their own CGEs, but perhaps the court could appoint an expert in computer animation and make the "loser" bear the cost.

The court could also provide a library of stock CGE programs for litigants much like proposals for court-appointed experts for the indigent. In any event, this disparate cost equalization concern ends up being yet another reason for judges to automate their courtrooms as set forth in Part V.B.2.

B. Strategic and Tactical Concerns

Switching from the larger policy issue of costs and litigation inequities to more tactical considerations, there are very real trial strategy questions as to whether the decision to use "dazzling" computer graphics might "backfire" with a jury, especially a more provincial one, because counsel might be perceived as trying to "trick" the jury with "fancy cartoons" or "slick infomercials" instead of relating to the jury with substance and actual facts. This raises perhaps the most fundamental point regarding CGEs: they should not be considered a substitute for good lawyering or having a good case. Attorneys must evaluate their case and the type of jury they are likely to encounter and make a decision as to whether the use of a CGE is warranted in that instance.

Another concern is that CGEs are too close to "entertainment" — that jurors may feel they go to the movies for digital entertainment, but while sitting in a courtroom's jury box — a forum just as serious as sitting in a church pew or synagogue listening to oral presentations by members of the clergy — they should receive trial information in a simple, verbal method. Thus, jurors might discount information delivered in too "jazzy" a medium for such a serious endeavor. Although such concerns may ring true where an animation is replacing an easily drawn picture of a straight road with one car on it, there are many cases that simply cannot be understood without something more than oral testimony and static images. The technology of this world has become so advanced that it is impossible to try cases involving technology without using technology.

In a recent patent infringement case,[436] for example, the jury had to understand how stacks of 13 charged plates in each of six cells that are in a wet-cell battery move from an assembly line to a rotating wheel where they are mechanically wrapped in plastic so as to avoid shorting each other. The key issue centered on a tiny gap produced as rollers hit the plates before vacuum holes caused them to scrape upward like cymbals so the machine would take one plate at a time to avoid jams. In cases such as these, where jurors are expected to award or deny large monetary claims depending on how a minute technical machine or part thereof operated, jurors are much more likely to appreciate the CGEs than to liken them to entertainment.

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436. *See* Susan E. Davis, *Animated Trials*, CAL. LAW., Jan. 1997 (discussing a patent law case that utilized animations).

As a cautionary note, the persuasiveness of CGEs can never be ignored, even in a technical case. Even with a CGE that is perfectly accurate, the animator's choice to zoom in or show a particular viewpoint can send a certain unfair or misleading message.[437] This may be totally unintentional, even harming the side presenting the CGE.

Similarly, a growing concern over substantive CGEs is how they might be manipulated after the trial by jurors in deliberation. A CGE where speed is an issue may get distorted and confuse or mislead jurors if they replay it slowly or stop it often in the jury room. How a CGE is presented is usually a large part of the CGE itself. Perhaps a party independent of the trial should be designated to properly present the CGE in the jury room as the jurors ask to see it, instead of relinquishing control of its presentation to them.

Although this Article wholly supports the full implementation of computer technology into the practice of law, it comes full circle in this regard to advise even the staunchest supporters of CGEs that the practice of law is still a very human and social enterprise. Attorneys need to remember that, contrary to popular belief, the medium is not necessarily the message.[438] After all is said and done with respect to CGEs, the strength of the facts and the evidence is where a case actually is won or lost, as it should be.[439] Computer technology merely makes the presentation of those critical facts and evidence in each case more effective and understandable to judges and juries, and such goals

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437. *See* Marcotte, *supra* note 404, at 56.

> Just as a writer uses punctuation, the selective use of a zoom, close-up and fade out can accent different points. A constantly moving object can appear to change speed or direction by merely changing the point where it is viewed. While the animation may be technically correct, it can be misleading. The medium shapes the message.

Id.

438. With apologies to Herbert Marshall McLuhan, *Understanding Media*, 1964, *quoted in* OXFORD DICTIONARY OF QUOTATIONS, 325:16 (3d ed. 1989) (quoting "The medium is the message.").

439. Trial consultant Tim Piganelli set forth the relevant comparison as follows:

> Given the choice between a good lawyer and good computer technology, I'll take the good lawyer — but that is really not the question. Instead, the choice comes down to this: given the choice between a good lawyer *with* good computer technology and even many good lawyers *without* good computer technology, I'll take the one-lawyer technology band.

Timothy Piganelli, Trial Consultant, Panel Speaker at the ABA Technology Show (March 23, 1998).

certainly should not be considered antithetical to the administration of justice.

VII. CONCLUSION

Much Ado about Nothing[440]

The Times, They Are A-Changin'[441]

Just as the telegraph gave way to the telephone, the stagecoach gave way to the automobile, and the typewriter gave way to the wordprocessor, so too will courtroom chalkboards, easels and blow-up placard charts give way to computer-generated exhibits. In fact, this transformation has begun already. Perhaps within a few years, and certainly within thirty, the lawyers, judges, and legal scholars of tomorrow will view computer technology in the courtroom, not so much with a skeptical or technophobic eye, poised to exclude it under the evidentiary and procedural rules, but rather with a commonplace acceptance and rational reliance. Indeed, they probably will wonder how CGEs ever could have been perceived as anything beyond just a more efficient and powerful way than non-computerized exhibits to communicate complex ideas in a persuasive and effective manner in full compliance with the spirit of the Federal Rules of Evidence. It is easy to imagine a future lawyer, looking back to the "old days" and ridiculing our initial fears of CGEs and our various attempts to exclude technology from the courtroom.

Thus, an antiquated interpretation of the Federal Rules of Evidence (and Civil Procedure) should no longer stand as an illegitimate obstacle to this inevitable transformation. Instead, the rules should be updated and interpreted in their true spirit so as to not "discriminate" against technological advances in display technology. Enhanced communication promoting jury understanding while dispelling confusion is not antithetical to the Rules of Evidence and certainly not to the pursuit of the truth by judges and juries in courtrooms across the country. However, only when the bench, bar, and legal academia fully embrace legal technology will the full transition to the extensive use of

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440. WILLIAM SHAKESPEARE, MUCH ADO ABOUT NOTHING.

441. BOB DYLAN, *The Times They Are A-Changin'*, *on* THE TIMES THEY ARE A-CHANGIN' (Columbia Records 1964).

CGEs take place to make our courtrooms the best possible laboratories they can be in the pursuit of justice.

It is perhaps fitting that this article was published within the first few months of the new millennium. As many recently ran in fear of the dreaded "Y2K Millennium Bug," predicting computer gloom and doom of Biblical proportions,[442] others, with a more spring-like hope in what the future may bring, saw the dawning of a new age with exciting new possibilities. It is important to remind ourselves that progress is not an enemy of jurisprudence. However, clinging on to old ways stemming from an irrational fear of change is such an enemy. So let us go forth, cautiously to be sure. We are lawyers after all, but nonetheless, let us proceed and embrace CGEs in the courtroom as the new and powerful tools for justice and jurisprudence that they truly are.

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442. *See, e.g.*, Bill Husted, *Y2K Provided Painless Lesson About Preparedness*, ATLANTA J. & CONST., Jan. 9, 2000, at G1; Teresa Mask, *He Said the Sky Would Fall – A Q&A with one of Y2K's Mistaken Doomsayers*, CHICAGO DAILY HERALD, Jan. 6, 2000, at 1; Harry Preston, *Blame Media for Y2K Hysteria*, DALLAS MORNING NEWS, Jan. 7, 2000, at 23A.