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INTRODUCTION: THE ABILITY OF THE CURRENT LEGAL FRAMEWORK TO ADDRESS ADVANCES IN TECHNOLOGY

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INTRODUCTION

An inquiry into the ability of the current legal framework to address advances in technology quickly encounters two different contexts in which the question arises: The first, on a general plane, is the adoption and use of technology in non-legal endeavors which enable new human capabilities which in turn give rise to legal problems. The second, on a more specific plane, is the adoption and use of technology by lawyers, judges, and others working in and with the law, which allow new capabilities for users and which may or may not lead to problems.

In the former context, the concern is whether and to what extent the legal system, including legal education, can deal with issues that are presented by advances in such fields as genetic engineering and medical technology, or electronic transmission of private and commercial information over global networks. The papers to be presented in this symposium will deal with these issues at length. In the latter context, the concerns are about how legal work can be done using state-of-the art technology and whether adjustments must be made in the legal system to accommodate the changes that technology enables. The main focus of these introductory remarks will be upon the ability of the current legal framework to address advances in technology in this latter context. In Part II, the remarks will briefly examine the history of development of technology pertinent to information systems. Part III will consider the rate of change and make some observations of the extent of adoption of information technology by those who do legal work. Part IV examines some factors pertaining to why the adoption of technology is a matter of some hesitancy in some quarters. Part IV

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presents some introductory thoughts along the general plane of the inquiry, hoping to set the stage for the presentations and responses comprising this Symposium. Finally, Part VI offers some conclusions about the general ability of the legal system to address technological change.

I. INFORMATION TECHNOLOGY IN HISTORICAL CONTEXT

References in this section to technology adopted in the legal community pertain to information systems: combinations of hardware and software that enable people doing legal work to generate, analyze, augment, manipulate, store, retrieve, transmit and receive information in the performance of their various tasks. Such technology involves the use of devices and processes that allow the extension and transformation of human thinking into any form that can be shared with anyone who has access to the same technology. The term is used here in contrast to such other systems as those for transportation, security and entertainment, even though it may have some elements in common with these other systems.

This assessment of the ability of the current legal framework to address advances in technology will examine what has been done up to now, bring into high relief some of the changes that have occurred and then try to project those changes into the future. To do that will require some reference to technological advances outside the realm of legal endeavors.

To borrow an idea from Richard Susskind, who has written an excellent examination of the impact of information technology on legal work, we can obtain a sense of the influence technology has had by simply reflecting upon relatively recent developments and projecting our present circumstance backward.¹ Incidentally, we can also obtain a sense of the difficulty of assessing the ability of the legal system to deal with future developments. If we had conducted this Symposium in 1979, we would be prognosticating the use of personal computers in law offices. Those devices did not arrive on the market until 1981. Could we have foreseen then how widespread and important their use would become in the profession?

If we were to have conducted the Symposium in 1989, we could have predicted that the World Wide Web might have some possible application in the legal field; but, it was not developed until 1990, and who could have foreseen the dimensions that it was so quick to assume?

Today, employing powerful personal computers, network servers, and Internet technology, lawyers and law firms around the world maintain websites and home pages on the Web. Local, state, and federal governments and their agencies have official websites. Vast libraries of information are forming on the Web, and electronic commerce using Web technology continues to grow at a rapid pace. Taking advantage of the strengths of the Web in its capabilities for easily storing, searching, and transmitting data to users, Web-based providers of

1. See RICHARD E. SUSSKIND, *THE FUTURE OF LAW: FACING THE CHALLENGES OF INFORMATION TECHNOLOGY* (1996).

data have created vast and expanding sets of resources for legal researchers' accession through Web browsers. These developments have occurred just in this current decade, and most of it during the past five years.

Deepening our perspective along the time dimension and considering the pace of technological development in a much earlier age increases our appreciation of the pace of change that confronts us today. One hundred and twenty-five years ago, E. Remington & Sons, the gun manufacturer, looking to open new markets after its boom years manufacturing weaponry for the war effort, introduced the first typewriter. The device had actually been patented one hundred and sixty years earlier, but had been considered only experimental technology until Remington put it into commercial use.²

Samuel Clemens purchased a typewriter that first year and became the first author to submit a typed manuscript to a publisher.³ He soon developed a love-hate relationship with the machine that resembles the relationship that some of us have developed with modern technology. Part of his first message stated: "I am trying to get the hang of this new-fangled writing machine, but am not making a shining success of it. However, this is the first attempt I ever have made, & yet I perceive that I shall soon and easily acquire a fine facility in its use."⁴ Twain later said the thing was ruining his morals because it made him want to swear.⁵

During the 1893 World's Fair in Chicago, Elisha Gray introduced a machine that he called the "teleautograph." The function of this invention was to automatically print out on a typing machine at one end of a wire the matter that had been written on another typing machine at the other end of the wire. The device was later developed commercially by a number of people as the teletypewriter, or teletype.⁶

2. The device was first patented in 1714 in England by an engineer named Mills, but the first practical design was not obtained until 1867 when Christopher Latham Sholes, Carlos Glidden and S.W. Soule did so in Milwaukee, Wisconsin. Remington's machine was based on this design. See DONALD HOKE, *INGENIOUS YANKEES: THE RISE OF THE AMERICAN SYSTEM OF MANUFACTURE IN THE PRIVATE SECTOR* 141-150 (1990); see also 12 *THE NEW ENCYCLOPAEDIA BRITANNICA* 86 (15th ed. 1997).

3. The manuscript was likely for *Mississippi Story*. See ALBERT BIGELOW PAINE, *MARK TWAIN: A BIOGRAPHY* 535-38 (1912) (containing a digital representation of a photograph of the first letter Twain typed on a typewriter) cited in Jim Zwick, *A Typewriter, and a Joke on Aldrich* (visited Mar. 24, 1999) <http://marktwain.miningco.com/library/biography/bl_paine_bio_ch099.htm>.

4. *Id.* The quotation is from a letter that Twain wrote to his brother, Orion Clemens. See *id.*

5. See *id.*

6. See LEWIS COE, *THE TELEGRAPH: A HISTORY OF MORSE'S INVENTION AND ITS PREDECESSORS IN THE UNITED STATES* 20 (1993). Elisha Gray was the inventor who lost out to Alexander Graham Bell by a few hours in receiving a patent on the telephone. For his efforts with the telegraph, he may well be considered the great-grandfather of the Internet. See also IRWIN LEBOW, *INFORMATION HIGHWAYS AND BYWAYS: FROM THE TELEGRAPH TO THE 21ST CENTURY* 36, 41, 196 (1995).

In 1890, William Seward Burroughs put his business adding machine into production, but it was not to become successful until 1898. Mr. Burroughs founded the Burroughs Corporation, and his machines became standard equipment in most American offices until they were replaced by modern electronic calculators.⁷

In 1895, Guglielmo Marconi demonstrated the first wireless transmission of electromagnetic signals.⁸ The telegraph, however, was the dominant means of long-distance communication, and Marconi's technology was not to be exploited for several more years. Marconi's main interest was in ship-to-shore wireless transmissions for the maritime industry.⁹ Radios continued to be viewed as experimental devices or expensive toys for several more years.¹⁰ The first commercial broadcasting station did not go on the air until 1920.¹¹ The famous case of *The T.J. Hooper*,¹² in which Judge Learned Hand effectively made radio receivers standard equipment in sea-going tugboats was decided in 1932.

We can see then, that the last decade of the 19th century was a period of great inventiveness. However, with some notable exceptions, the general pattern of development and usage indicate that these useful devices were developed at a fairly leisurely pace and many were developed as curiosities or entertainment devices. Technology did not occupy such an important place in our working culture, and new inventions were not rushed to market and quickly replaced with the latest and greatest upgrade. However, once devices were developed to the point that they made work more efficient, they generally caught on . . . and stayed on. It seems that they underwent a period of casual acceptance in that part of peoples' lives in which they posed no real threat to the status quo. Once they were shown to have some value, then they were readily adopted as important and long-lasting tools for working with information.

Little evidence exists over this historical period to suggest that lawyers and judges either lagged behind or outpaced the rest of the community in employing new information systems. One item, however, was reported almost exactly one hundred years ago that stands out. A New York Times article describes a "New Use for the Telephone" in which a lawyer in Tennessee, who could not make it to trial because of a snowstorm, examined witnesses and gave his final argument over the phone.¹³ He won the case, and the article concludes by stating: "There

7. See BRYAN MORGAN, TOTAL TO DATE: THE EVOLUTION OF THE ADDING MACHINE: THE STORY OF BURROUGHS 30, 47 (1953); see also National Inventors Hall of Fame Website, William Seward Burroughs (visited Mar. 24, 1999) <<http://www.invent.org/book/book-text/17.html>>.

8. See ORRIN E. DUNLAP, MARCONI: THE MAN AND HIS WIRELESS 17 (1971); see also ORRIN E. DUNLAP, COMMUNICATIONS IN SPACE: FROM MARCONI TO MAN ON THE MOON 7 (1970).

9. See STEVEN LUBAR, INFOCULTURE: THE SMITHSONIAN BOOK OF INFORMATION AGE INVENTIONS 102-107 (1993).

10. See *id.* at 214.

11. See *id.* at 34.

12. *The T.J. Hooper v. Northern Barge Corp.*, 60 F.2d 737 (2d Cir.), *cert. denied*, 287 U.S. 662 (1932).

13. *New Use of the Telephone*, N.Y. TIMES, Mar. 12, 1899, at 1.

is much interest among lawyers as to whether it will serve as precedent.”¹⁴

Others did not approach technology with such optimism. In 1899, at the end of this decade of extraordinary inventiveness, Mr. Charles H. Duell, who was Commissioner of the United States Office of Patents, uttered one of the most curious statements of the time. Possibly bowled over by the burst of activity that had occurred in the 90s, he declared that the Patent Office should be abolished because “everything that can be invented has been invented.”¹⁵

II. ADOPTION OF LEGAL INFORMATION TECHNOLOGY IN THE MODERN LEGAL SYSTEM

This historical thumbnail sketch contains no surprises: we have come a long way. But, after all, an entire century has passed since that bygone age of inventiveness, and the devices of that time are bound to seem primitive and quaint. However, the rate of change can be better appreciated when these developments are placed on a time line. For one hundred years, the typewriter was the machine of choice for word processing. Advances? Yes, but its basic function remained the same throughout that period. It remains in use in some quarters, but the personal computer has rendered it obsolete in virtually every business and law office. During that same period of time, separate machines were used for creation, storage, and manipulation of documents and the information that they contained. All of the machines used in those various functions did so in only in print form. In mid-twentieth century, few could have presaged how common central processing units, integrated function software, searchable databases, electronic communications networking, and laser technology would have become in law offices and courthouses. If personal computers with Internet connections and e-mail software, fax machines, and photocopiers were to suddenly disappear from law offices, those offices would simply not be able to continue to deliver legal services in the ways that clients have learned to expect.

Today in some courtrooms across the country, lawyers, judges, and court administrative personnel are using personal computers equipped with software and peripheral devices enabling them to more efficiently present and manage evidence. With the use of scanners, documents and images of non-documentary evidence can be converted into digital form for storage and retrieval. The medium for storage is CD-ROM, enabling storage of massive amounts of material in a lightweight and portable form from which the stored material can be quickly retrieved. “Light pens” connected to these computers can be passed over bar-coded labels in a trial notebook to instruct the computer to find, retrieve, and display on the screens of the participants the digital representation of the evidence so labeled in a matter of seconds.

14. *Id.*

15. Kurt L. Glitzenstein, *A Normative and Positive Analysis of the Scope of the Doctrine of Equivalents*, 7 HARV. J. LAW & TECH. 281, 315 n.148 (1994) (citing Jack Smith, *Criticizing Inventions as Not an Incandescent Idea*, L.A. TIMES, Oct. 3, 1991, at E1)).

As testimony is given, computer-aided systems employed by court reporters can instantaneously translate the court reporters' stenographic symbols into digital form allowing the judges and attorneys to read the transcript on screen in "real time." With the use of document cameras, video cassette recorders and players, digital projectors, and presentation software, lawyers are supplementing their oral presentations of evidence and arguments to aid the triers of fact in their consideration of the evidence. Video conferencing enables participants to visually and orally communicate with each other without meeting in the same room and enduring the travel and inconvenience that face-to-face meetings require. Some courts have employed "electronic noticing" in which the courts' orders are sent by e-mail to the lawyers of interested parties.¹⁶

How are information systems likely to change the way legal work is done in the new millennium? Upon reflection, the past twenty five and past one hundred years should demonstrate the futility of attempts to prognosticate with any degree of precision. Some ideas of what might transpire can be gained, however, by taking some clues from developments that have already occurred. Just within the last decade the size, weight, and cost of personal computing equipment have decreased dramatically. At the same time, the power, speed, and capacity of these machines have increased. Continued development along these lines will enable larger proportions of the general population to use these tools more conveniently and in a wider range of applications. The personal digital assistants or PDAs of today will give way to or evolve into powerful hand held computers that will do what the best of our desk top computers can do and even more. The integration of personal computing and Internet technology with television technology that we are witnessing in its beginning stages will enable the expansion and improvement of information systems in general; legal information systems will enjoy parallel gains. Improvements in speed, bandwidth and storage capacity of the infrastructure servicing the "information superhighway" will give legal workers instant access to vast arrays of information. Improvements in indexing and search and retrieval technologies will allow users of legal information systems to conduct research with greater speed, accuracy and efficiency.¹⁷

Continued development of security measures will enable greater and greater amounts of information to be shared securely across the Internet.¹⁸ Information providers, who have been utilizing Internet-based services only a few years or months, will reach mature status and with the development of more sophisticated

16. See Monica Perin, *Seeing Is Believing in New Frontier of Electronic Trials*, 26 HOUS. BAR J. 29, May 9, 1997.

17. See generally RICHARD SUSSKIND, *THE FUTURE OF LAW: FACING THE CHALLENGES OF INFORMATION TECHNOLOGY*, at x-xxi (1998) (providing more detailed and specific predictions). See also Stephen T. Maher, *Lawfutures, or, Will You Still Need Me, Will You Still Feed Me, when I'm Sixty Four?*, 1 RICH. J. L. & TECH. 6 (1995) <<http://www.urich.edu/~jolt/v1i1/maher.html>>.

18. See Karim Benyekhlef, *Dematerialized Transactions on Electronic Pathways: A Panorama of Legal Issues*, in *THE ELECTRONIC SUPERHIGHWAY 93* (Ejan McKaay & Pierre Trudel eds., 1995).

and powerful equipment will be able to provide legal researchers with extremely current resources having high degrees of reliability and accuracy.

Continued development of voice recognition systems will enable oral testimony to be instantaneously digitized and transcribed into text capable of being read on a computer screen. Expansion of data storage capacity and improvement of retrieval capabilities will mean that entire records of cases will be easily accessible to legal researchers. The combination of these developments will make those records available to researchers almost as soon as they are created.

Greater quantities of increasingly sophisticated data will be usable across a wider spectrum of software applications. For example, lawyers may come to rely routinely upon legal "expert systems,"¹⁹ designed to enhance the analysis of legal problems to aid them in providing advice and services to clients. More information currently available only in print form will be converted to digital form and placed on-line for electronic search and retrieval. Measurement of library holdings in bytes will become as important as the current conventional measurement in volumes.

III. HESITANCY TO ADOPT TECHNOLOGY

Despite the widespread adoption of legal information systems and the ready embrace of other technology in many parts of the legal system, significant hesitancy or outright resistance remains in many quarters. This section presents a set of factors that are likely to affect the willingness to adopt technology generally with some consideration of their effects in the realm of legal work.

Observing technology indirectly as it interacts with humankind can sometimes evoke expressions of interest, perhaps even awe or contempt.²⁰ Observing the use of technology by others is something quite apart from using it to perform one's daily work functions. Many people remain hesitant to interact

19. An expert system is software written with judgment rules drawn from experts in a given field written into the code so that when given a set of data and queried, the software returns information drawn according to logic based upon the judgment rules to enable the user to better evaluate the problem at hand. The technology is currently being used, for example in the medical field in the HELP system, in which, upon being queried about a patient's symptoms the software refers to a database of diseases, symptoms, blood chemistry and drug therapies to aid diagnosis. Early efforts in legal expert systems in law were demonstrated by Reed C. Lawlor and Fred Kort at the Second National Law and Electronics Conference in 1962. The systems presented by Lawlor and Kort were designed to predict the outcomes of judicial proceedings, using data drawn from United States Supreme Court cases involving right-to-counsel issues. See Reed Dickerson, *Some Jurisprudential Implications of Electronic Data Processing*, 28 LAW & CONTEMP. PROBS. 53, 54 (1963).

20. The 1996 chess match between Gary Kasparov and "Deep Blue," an IBM computer captured and maintained the attention of public media for some time. See *Kasparov Downs Big Blue to Win Series* (last modified May 6, 1997) <<http://www.usatoday.com/sports/other/chess30.htm>>.

with technology. A brief consideration of factors pertaining to that hesitancy and why it persists follows, including some suggestions for what should be done to address those factors.

A. Reliability—or the Lack Thereof

Technology is wonderful—when it works. Too often with today's hardware and software applications, it seems that the more complex the technology the higher the probability that it will fail when needed. Persons who are most comfortable with the employment of technology are often those with above-average familiarity with the basic processes underlying the systems as well as the troubleshooting techniques needed to solve operational problems. Lawyers and judges in the performance of their obligations do not want to risk the loss of credibility and authority that can accompany a technological failure. Electronic technology for legal information systems has improved significantly over a very short period of time, but systems engineers and developers must continue efforts to push failure rates closer to zero before full and widespread adoption can be expected. Reliability rates are much higher today than in the early days of the personal computer, but "stability" (i.e., reliability) remains as a major consideration in evaluating operating systems. When that aspect of new systems disappears as an issue, technology will gain new adherents.

B. Authenticity

A map is not the territory it represents, and digital representations of evidence are, of course, not the facts being represented. People have a natural and healthy skepticism about digitally-created representations. Computer-generated images portraying fantastic but realistically-appearing occurrences have become commonplace in television commercials and motion pictures. Some people see these manipulations of "virtual reality" and inductively conclude that it is easy to manipulate digital representations of documents and images. The technical features and visual appeal of digital presentations of evidence can be so impressive that underlying substantive weaknesses might be concealed.²¹ For significant segments of the population, the concepts and parlance of computerized information systems are arcane and mysterious. Lawyers and judges, together with technicians and developers, should address the protocols for authenticating digital documents, signatures, and other electronic evidence which will allow triers of fact to evaluate such evidence without bias for or against the electronic form in which it comes to them.

C. Convenience—or Lack Thereof

This factor is related to the reliability factor in the sense that equipment that does not work properly is inconvenient. Here, the emphasis is upon expenditure

21. Informal parlance in the field of information technology refers to this phenomenon as "The Gee Whiz Factor."

of time and effort to develop the skills necessary to use the technology even when it works as intended. For example, no one wants to spend hours producing an electronically-enhanced presentation of a piece of evidence unless the resulting presentation is more effective than a simple direct proffer of the actual physical evidence. Attorneys will not spend valuable time producing a digital presentation, lug several pounds of equipment into the courtroom, and spend even more time setting up the equipment unless the use of that system adds materially to the strength of the case.²² The skills needed to manipulate sophisticated information technology are substantial, and the time needed to acquire those skills is not trivial. People doing legal (and other) work would rather be spending their time and effort doing that work rather than learning methods and operation of a new version of software. It may well be unreasonable to expect sophisticated systems to do their work simply by pressing the "on" button, but it is also unreasonable to expect widespread adoption of technology that is difficult to learn and complicated to use.²³

Improvement of systems with the convenience factor in mind should be a byproduct of a multi-disciplinary collaborative effort between legal and non-legal workers. Systems engineers should apply increasing amounts of their resources to develop platforms and applications that are easier, rather than more difficult, to use than their predecessor systems. Legal information systems software developers should redouble efforts to consult directly with members of the legal system's workforce to learn where efforts aimed at improvements can be focused. Legal workers should actively communicate their needs and desires to developers. In litigation, the adoption of technology to aid the presentation of a case at trial will be out of the question if the actual use of that technology in the courtroom cannot be realistically anticipated. It is unreasonable to expect courts to provide connectivity for and facilitate employment of every conceivable system that lawyers might wish to use in courtrooms and in communications with the court. However, court administrative officers should develop within their staffs a continuing awareness of innovations in the field of legal information systems and be able to recognize standards that emerge which will enable those who adopt standardized systems to interact with the technology in the courts at

22. This aspect of the problem is not new:

One of the most persuasive arguments against a specific use of technology in the law is that for the purposes of the particular problem, its language and methods are overelaborate. But whether an adequate mathematical model can be created and whether—if created—it is worth the effort and expense to program it for a computer, has not particular relevance here beyond the general point that a lawyer is always well advised not to use a method or device that is more complicated than his particular problem warrants.

Dickerson, *supra* note 19, at 65.

23. The Indiana University School of Law—Indianapolis, through its Program for Management of Legal Information Systems, with which the author has been involved since 1997, has begun to address some of these concerns with efforts to educate not only law students, faculty and staff, but also lawyers and judges in the use of electronic tools.

an optimal level.²⁴ Lawyers contemplating the use of technology in litigation should not assume that the court is completely “wired” and should seek permission to use technology that they plan to bring into the courtroom.

D. Expense

Prices for equipment and software that make up some legal information systems have rapidly declined in the past year, but technology in general remains fairly expensive. The basic investment is sizeable and upgrades become necessary as the technology continues to develop. Those who become interested in adopting technology soon confront the decisional paradox presented by the advice that one should not purchase technology until it is proven but one should not purchase technology that will soon be made obsolete by new advances. Few people outside the special realm of “beta testers” want to be a guinea pig for version 1.0 of new software, and fewer people want to purchase version 2.0 of that software if version 3.0 will be released in a few months without some price protection. Equipment leasing may be an attractive alternative to purchasing for some applications. Software vendors have become more sensitive to the problem, and many now offer incentives to purchase a piece of software late in its development cycle with subscription plans or free or reduced-price upgrades within specified periods. Decision makers for legal workers should explore with vendors all available cost-saving alternatives before committing significant financial resources to information systems technology. Most of those decision makers would not make comparable expenditures for medical intervention without seeking a second opinion. The same should be true in the purchase of information systems.

E. Threat

Two aspects to this factor are important: (1) technology that promises efficiency carries with it a potential for eliminating jobs;²⁵ (2) on a smaller scale,

24. The Institute for Forensic Imaging, located on the campus of Indiana University—Purdue University Indianapolis, with which the author has been involved, has, since 1995, been working to improve the quality of visual evidence and develop a set of standard operating procedures or protocols for the authentication of digital images that will enhance the admissibility those images into evidence. More information about the Institute and its activities is available at its website <<http://www.advancetek.org/ifi/index.html>>.

25. See NICHOLAS A. ASHFORD & CHARLES C. CALDART, *TECHNOLOGY, LAW, AND THE WORKING ENVIRONMENT* (1991).

For industrial workers, these changes [wrought by mass production through assembly lines, specialized machines, standardized goods] meant a reduction in responsibility, security, and control of their work. As craft skills were replaced and supervision tightened, workers were treated more and more like an appendage to the machine, interchangeable with others, needing little in the way of education and training.

Id. at 4.

[These] [n]ew information technologies have facilitated the globalization of production

the thought of interacting with a powerful machine connected to a global network to manipulate huge volumes of information stored in mysterious and intangible "information warehouses" can be intimidating to some people. With respect to the former, those who think their jobs may be modified or eliminated by technology are not likely to warmly embrace it and may actively resist its adoption out of a sense of self-preservation. From the perspective of individuals affected by the adoption of new information systems, this may well be an intractable problem.²⁶ In many situations, however, the adoption of new technology presents new and additional opportunities for those who anticipate the change and prepare themselves by developing some expertise in the technology before the change. Regarding the second aspect, increasing the sophistication of technology necessarily takes it beyond the ken of persons not educated in the field and places it within the realm of mystery. Adoption may lag simply because the decision maker has not reached a comfortable level of understanding of what the system does and the risks it poses for those interacting with it. In addition, the more intrusive the technology becomes in managing the daily affairs of people, the greater the occasion for distrust borne of lack of understanding. So long as the development and control of technology remains in the hands of a small cadre of persons with specialized knowledge, the real potential for abuse and, just as importantly, the perceived potential for abuse remain. Information systems managers, developers and vendors should consider these sensitivities in pressing their objectives upon legal workers and continually renew their efforts to allay the concerns and address the problems that arise.

IV. ADDRESSING TECHNOLOGY-RELATED ISSUES IN THE LEGAL SYSTEM

The focus so far has been upon gadgetry, and though it is easy to compartmentalize thinking of technology as fully-embodied in gadgetry, this Symposium is about technology in a much wider sense. The concern here is about applications of knowledge and invention through the sciences and engineering to address the needs and problems of humankind whether or not they involve hardware and digitally-coded software.

In this broader sense, the advances we have made as a society over the past century are no less remarkable than the marvelous inventions we have come to

by reducing the cost and increasing the speed of international coordination of economic activity. They have led to dramatic changes in the organization of production, making it possible to reorganize manufacturing away from dominant, standardized long-run mass production systems toward more flexible, shorter-run niche strategies. They have had widespread impact on the structure of industry and occupations and on the nature of work in the American economy. They have also created their own set of occupational health hazards.

Id. at 12 (citing *The Microelectronics Industry*, in 1 OCCUPATIONAL MEDICINE: STATE OF THE ART REVIEWS 1-197 (1985)).

26. For example, a librarian whose job will be eliminated when a county court closes a text-based library to convert to a CD-ROM based information system may face few, if any, options.

enjoy. When America was last poised upon the verge of a new century, the health, safety and well-being of its citizenry were matters of great concern in the public eye. From the perspective derived from one hundred years of breakthroughs and advances, life in the late nineteenth century appears to us as dangerous and unhealthy. A program of vaccination for diphtheria had begun in 1895, but by 1899, physicians still hotly debated the methods of combating the disease, with proponents of time-honored chlorine treatment on one side and advocates of antitoxins on the other.²⁷ Smallpox vaccinations had been in use for more than one hundred years, but sizeable outbreaks of the disease were still frequently reported throughout the country.²⁸ Congress, through a special court of inquiry, was conducting a sweeping investigation of meat-packing practices. In March of 1899, Theodore Roosevelt, then Governor of New York, testified about the extent of illness that canned beef had wreaked upon his troops when he commanded the "Rough Riders" in Cuba.²⁹

On the more general plane of consideration of the relationship between law and technology, the problem becomes one of assaying the ability of the legal system to deal with new issues posed in the realm of human interaction by the development of technology. The development of new technologies sometimes brings with it a clash of interests, a modified status, or a new form of interaction for human beings that have not been anticipated.³⁰ The law has sometimes been seen as laggardly in its response to such issues:³¹

Today science does not remain isolated in laboratories; it becomes involved with human life almost instantaneously. The protective time barrier between creating knowledge through science and applying knowledge through technology has disappeared. . . . As the gap between scientific creation and technological development disappears and as the rate of technological innovation increases, the law loses its time for reflection. The profusion of new legal problems removes the period of contemplation that lay behind the law's taking a decisive, calculated direction.³²

With respect to some problems the resolution, if one is at hand, may simply

27. See *Chlorine for Diphtheria*, N.Y. TIMES, Mar. 8, 1899 at 7.

28. See *Smallpox in a Hospital*, N.Y. TIMES, Mar. 1, 1899, at 3; *Students Leave Princeton: Smallpox Scare Drives Them Away*, Mar. 2, 1899, at 3; *Smallpox in a Hospital*, N.Y. TIMES, Mar. 6, 1899, at 2; *Smallpox in the South*, N.Y. TIMES, Mar. 16, 1899, at 2; *More Smallpox Cases at Fall River*, June 11, 1899 at 3.

29. See *Roosevelt on Army Beef: Testifies that the Canned Roast Stuff Sickened His Men*, N.Y. TIMES, Mar. 26, 1899, at 2.

30. See ASHFORD & CALDART, *supra* note 25, at 3.

31. See Wendy R. Leibowitz, *High-Tech Need, No-Tech Courts: Judges Move Slowly to the Web*, THE NATIONAL LAW JOURNAL, (Dec. 1, 1997) <<http://www.ljx.com/tech/wendy/wendy63.html>>.

32. OLIVER SCHROEDER, JR., *THE DYNAMICS OF TECHNOLOGY: FROM MEDICINE AND LAW TO HEALTH AND JUSTICE* 58 (1972).

be a matter of applying existing principles of law to the issue posed by the new technology. The issue of whether a user of technology accepts the offer of an Internet-based vendor when she clicks on the "submit" button at the vendor's website ought to find resolution in existing commercial contract principles, for example.³³ Principles of the law of privacy should be applicable in disputes about whether the manufacturers of a new computer chip that automatically identifies the computer owner and supplies information about the owner to others connected to the same network has enabled others to invade the privacy interests of the computer owner. Principles undergirding public policy against commerce in babies should be able to guide decisions about whether persons who have offered to purchase the eggs of a woman of specified physical and intellectual attributes are engaged in socially-acceptable conduct.

On the other hand, the problem may be a matter of whether existing principles of law do or should address the matter at all. For example, astounding technological breakthroughs in the human reproductive process have given rise to issues such as: (a) what should be done with frozen embryos when the male and female, who supplied the sperm and egg for the embryos, die; (b) whether cloning a human being ought to fall within the category of prohibited conduct; (c) whether it is appropriate for reproductive scientists to perform impregnation procedures upon persons whose medical circumstances present relatively high probabilities of multiple births when their other life circumstances raise doubts about their ability to care for several children; (d) whether parents of embryos exhibiting evidence of non-fatal genetic disease should be permitted to discard the embryo in favor of one without the undesired genetic markers?

Professor Steven Goldberg, in his thoughtful analysis of the relationship of law and science in America, makes the point that some lack of synchronicity between the development of technology and the law's ability to address it is inevitable because of science's emphasis upon progress and law's emphasis upon process:

Thus the fundamental difference in values between science and law is subtle, but important. Science is not a compendium of timelessly true statements. It is, in a sense, a process for formulating and testing hypotheses that are not always open to revision. But in science this process is a means to an end, and that end is progress in our knowledge of the world. In law, process is not simply or primarily a means to an end. In an important sense, process is the end. A fair, publicly accepted mechanism for peacefully resolving disputes is often the most one can reasonably ask for in human society. As Justice Felix Frankfurter wrote in an opinion for the U.S. Supreme Court, ". . . the history of liberty has largely been the history of observance of procedural safeguards."³⁴

33. See Chris Swindells & Kay Henderson, *Legal Regulation of Electronic Commerce*, 3 J. INF. L. & TECH. (Oct. 30, 1998) <<http://www.law.warwick.ac.uk/jilt/98-3/swindells.html>>.

34. STEVEN GOLDBERG, *CULTURE CLASH: LAW AND SCIENCE IN AMERICA* 19 (1994).

CONCLUSION

A brief examination of the history of the development of technology related to information systems and its adoption in the legal system shows that, generally, the legal system is able to positively address advances in technology, and that, in many respects, recent advances have transformed the way in which legal work is done. Some lag may occur, and a full embrace of modern technological gadgets by the legal system may remain in the realm of speculation. Reasons for the lag are susceptible to analysis; however, a consideration of the factors of technological reliability, authenticity, convenience, expense and threat by those responsible for the development and adoption of electronic tools in the legal system should aid in the reduction of that lag.

Gaps may arise, and fortunes may hang in the balance as the courts and legislatures of the land struggle with the more profound problems posed by advancements in technology and issues never before contemplated confront us. Participants in the legal system on all fronts should avoid abdicating the responsibility to engage in the struggle to decide, even though completely satisfactory decisions may elude early efforts. An examination of our society's historic relationship with technology reveals its Janus-like capabilities: It is capable of wondrous life-preserving or life-destroying application, and persons alive today have witnessed its awesome powers of destruction as well as its powers of creation. Ironically, the antidote to the ills of technology may well have been best articulated by an operative of a hateful regime who well-appreciated the destructive power: "Today the danger of being terrorized by technocracy threatens every country in the world. In modern dictatorships this appears to be inevitable. Therefore, the more technical the world becomes, the more necessary is the promotion of individual freedom and the individual's awareness of himself as a counterbalance."³⁵

So long as the courts remain open to the assertions of individual awareness and freedom and remain willing to fashion remedies that do justice to those whose interests have been injured, so long as legislatures remain committed to keeping open avenues of expression of individual awareness and freedom in their resolution of competing claims to public goods, the dangers of technology can be ameliorated while the benefits can be enjoyed on a wide scale.

My role in this Symposium remains an introductory one, and so I shall not engage in these questions in depth. Other presenters will take up specific questions within this larger field of inquiry. Professor Michael H. Shapiro, Dorothy W. Nelson Professor of Law at University of Southern California, and author of *Bioethics and Law*, takes on the sweeping question of whether the advances in medical technology surpassed the ability of the current legal framework (herein "bioethics"). He addresses that question with an equally-sweeping analysis with perhaps some surprising suggestions and conclusions.

35. Albert Speer, Transcript of International Military Tribunal, Nuremberg, Germany, 31 August 1946, at 405, *quoted in* OLIVER SCHROEDER, JR., *THE DYNAMICS OF TECHNOLOGY: FROM MEDICINE AND LAW TO HEALTH AND JUSTICE* 31 (1972).

David Orentlicher, Samuel R. Rosen Professor of Law and Co-Director of our own Center for Law and Health, will respond. Professor Fred H. Cate, Professor of Law and Director of the Information Law and Commerce Institute at Indiana University School of Law—Bloomington and the author of *Privacy in the Information Age*, among other works, considers in depth the debate prompted by the development of information systems that have been built upon the collection and dissemination of private information. Professor Ronald Krotoszynski, one of our own faculty members and an expert on communications law, will respond. Henry Perritt, Dean of the Chicago-Kent College of Law, author of *Law and the Information Superhighway*, among many other works related to technology and law, reflects upon the connection between law and information technology and the ramifications that connection poses for legal education. Michael Heise from our faculty, Professor of Law and Director of the Program on Law and Education will respond.

