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Cross-Examining the Computer: Uncertainty in the Court

„Przesłuchiwanie komputera". Niepewność na sali sądowej

ABSTRACT

This paper is intended to provide lawyers, young and old, with an analytical approach to their practice that is perhaps broader than they originally learned in law school or as young associates. Because lawyers and judges tend to be derived in large part from the liberal arts, this approach broadens that view borrowed in part on the principles of quantum mechanics, in particular Heisenberg's "uncertainty principle." While lawyers and judges are accustomed to some level of uncertainty, whether in an office context or at trial, the question of how to deal with it varies quite widely from person to person, and the subjectivity itself creates problems. Admittedly, this is an exercise in the "intellectual aspects of the practice of law," which is an eminently practical activity, but it is intended to raise questions as to the role of modern technology in the legal context, as well as provide, to some extent, answers.

Keywords: judicial axiology; uncertainty; Big Data; technoevidence; cyberethics; black swan

The world ain't what it seems,
is it…?
The moment you think
you've got it figured,
you're wrong!

Levon Helm in *Shooter*

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INTRODUCTION

Throughout human history, there has been the question of how disputes, whether between individuals or between individuals and the government (regardless of the form), should be resolved. Over the millennia, this has evolved from individuals or groups with weapons into the modern court systems that exist. What is important to keep in mind is that, at its foundation, the judicial system and its processes are deeply rooted in the human nature. Indeed, it can be argued that the "rules of procedure," no matter how detailed, are the definition of "due process" in any given court system. If a citizen has a dispute, whether with another citizen or against the government, a formal complaint is presented to the court. At that point, the judicial process provides notice to the opposing party of the complaint, and then the matter proceeds toward resolution. The resolution may be in the form of a trial, or it may be a matter of alternative dispute resolution such as arbitration or mediation.

RESEARCH

At the constitutional level in the United States, the discussion of "due process" sometimes appears as the "originalist" versus "living" interpretations of the document. In fact, the drafters built into the Constitution the possibility that times might change in such a way as to require amendment to the basic document.[1] One thing that is quite interesting in this debate is that, at the end of the day, once a case reaches the Supreme Court, each case is often decided in a mixture of the two views. The reason, quite simply, is that since it is the function of the Supreme Court to construe the laws before it in relation to the Constitution, the Court is in the position of making public policy, just as any other branch of the government does. It is this mixture in the outcomes that fuels the continuation of the debate as to whether law is a matter of art or science and demonstrates the importance of the independent judiciary as an instrument of national policy. To that extent, the policy behind this debate is possibly common to any legal system that has a documentary constitutional foundation supplemented by legislation created pursuant to it.

As an example, Article I Section 8 Clause 3 of the US Constitution provides that Congress has the authority to regulate commerce with foreign countries, among the states and Indian tribes. At the time it was written, in 1789, the principal sources of commercial travel, whether between the United States and foreign countries or among the states, were boats (or ships), wagons and a few stagecoaches. The originalist approach to constitutional interpretation would arguably restrict the authority to Congress to those devices. In a very short time, 1824 to be precise, a case

[1] Article V of the Constitution of the United States.

went to the Supreme Court involving the grant of a monopoly for steamboats on the rivers of one state. The Supreme Court ruled that, pursuant to the "commerce clause," only Congress had authority over commercial matters that crossed state lines, and, therefore, ultimately regulation of commerce throughout the United States would be uniform.[2]

Subsequent technological developments such as railroads, telegraphs, telephones, airplanes, and e-commerce led to Congressional acts that regulated those activities to the present day. For example, whether and to what extent AOL and other internet services are engaged in interstate commerce so as to be subject to regulation is an ongoing question in the law. Similarly, whether Facebook and Twitter are protected by freedom of the press and speech from erroneous or damaging postings is a subject of serious debate in the modern day. In effect, early on science impacted the law in a fashion that led to an outcome that reflected the mixture of human art with science. No matter the mechanism that ultimately determines the outcome, the reality is that the courts are fundamentally human in origin, intent, and process.

DISCUSSION

What is at issue in the 21st century, however, is the collision between this uniquely human institution and the technological milieu of the society of which it is a part and that it is supposed to serve. For the purposes of the discussion in this context, the judicial system and process of the United States will serve as an example of some of the problems inherent in this collision. To some extent, because of the state-federal system of justice in the United States, it can be asserted that this is unique, but in the broader view, it is not. Even if a system of justice should be unitary in its structure, such as is characteristic of the civil law jurisdictions in Europe, the problems of evidence and process remain as related to technology.

Indeed, one of the great and ongoing discussions in the legal community generally is whether the practice of law is an art, as to which few specific rules would apply, or some sort of science governed by its own internal rules. There also has been an ongoing and sometimes very heated debate in relation to the judiciary between what may be called the "artists" and the "mechanics" (an admittedly unflattering term). The "artists" tend to place greater emphasis on the æsthetics, consequences, and ethics of the process, sometimes referred to as "the spirit of the law."[3] This approach to judicial decision-making often looks at the context of the dispute as a major, if not determinative, factor in the process. The result is sometimes perceived

[2] *Gibbons v. Ogden*, 22 U.S. (9 Wheat.) 1 (1824).

[3] Montesquieu, *L'Esprit des lois*, 1750. See also J. McClellan Marshall, *Examining Judicial Decision-making: An Axiological Analytical Tool*, "Studia Iuridica Lublinensia" 2020, vol. 29(3).

as "judicial activism" or "legislation from the bench." By contrast, the "mechanics" simply take the law as written, add the facts, and, rather like a computer, produce a result with little or no serious thought as to the societal or moral consequences of the decision. This approach can, and sometimes does, lead to a result that is perceived to be cold and unfeeling. It is the "I am paid to make decisions for those who cannot, or will not, make them for themselves, not be a philosopher-king" attitude that is sometimes criticized in the media.[4] In such an environment, the "big picture" would appear quite different to an "artist" and to a "mechanic" and, hence, the resolution. To this extent, the background and philosophy of the judge would very possibly be an "external" fact in the overall context of a case. In either context, there is an element of uncertainty in the resolution of a dispute.

In an individual case, this problem is first addressed when a client walks into the attorney's office. Typically, at the initial interview, the lawyer listens closely to the prospective client. The matter at hand may be one that likely will involve litigation, or at least negotiation, or it may be one that is more suited to the attorney's role as "counsellor." In either case, the process is two-fold: first, to gather as much information as possible while it is fresh in the mind of the client; second, to see if the client is being truthful and accurate in the recitation of what happened, or didn't.

In this earliest phase of the relationship, it is up to the lawyer to ask appropriate, even if insulting, questions to flesh out the "big picture" that is being presented. By definition, this will likely bring out details that the client hitherto thought were "unimportant" or even embarrassing. Only after the client has completed his or her presentation to the lawyer and departed can the lawyer approach the question of whether these details are indeed "unimportant".

It is in the accuracy of the narrative that the lawyer first encounters the uncertainty principle.[5] At its simplest, the "uncertainty principle," while generally viewed in terms of the laws of physics, states that, as applied to particles, the more precisely the position of some particle is determined, the less precisely its momentum can be predicted from initial conditions, and *vice versa*. In other words, the measurement of a particular particle in both space and time will change merely as a result of the process of measurement. As a result, the outcome of an experiment, or a legal case, can, and likely will, change depending on the weight by which we measure a particular aspect of the components involved, sometimes called "the observer effect." Obviously, the principal "observer" is the judge or the jury, and their perception is paramount.

In an effort to expand the analytical base of the attorney's view of a case, it is useful to borrow a concept from the field of physics. In 1900, Max Planck pub-

[4] See Plato, *The Republic*, 5.473.d. (c. 375 BC).

[5] See W. Heisenberg, *Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik*, "Zeitschrift für Physik" 1927, vol. 43(3–4), pp. 172–198.

lished his quantum hypothesis that, in effect, asked the question, "How much?"[6] The Latin word *quantum* describes this analytical process as it is playing out in the initial interview with the client and as the case later develops. In the early 20th century, scientists discovered that the laws governing macroscopic objects do not function the same in such small realms. Put another way, a client's case, like this branch of physics starts with the "big picture" and proceeds to examination of the micro of which it is composed to see how it "ticks." Even that, however, is subject to the uncertainty principle.

The "facts" that are presented necessarily pass through the filter of the perceptive skills of the client. This is a function of not only the senses, but is also impacted by such things as educational background and vocabulary. Obviously, what is being posited at the threshold is the human factor. "A lawyer's time and advice are his stock in trade" is the classic legal aphorism that is often credited to Abraham Lincoln.[7] A lawyer takes the time to listen, and then provides advice as to how the case should proceed based upon such "facts" as are known at the time. It is important for the lawyer to take as much time as possible with the client at the outset of the representation to get those details down. Only after that can their impact be properly assessed in both the preparation of the case and in the ability to predict its ultimate outcome. It is axiomatic that most lawyers, and judges, are trained in the liberal arts and the use of language as the foundations of their profession. By definition, vocabulary may well be a significant "external" fact in a given case.

What most clients tell the attorney is a "big picture" of what has happened, or will happen, or what is needed that demands the services of an attorney. For these reasons, the lawyer must listen closely not only to what is said, but how it is said, in order to evaluate the "credibility" of the client. By extension, it is crucial to the entire process that in receiving the narrative of the client, the lawyer not confuse "information" with "facts." Of at least equal importance is what is not being told by the client as to the situation, which is where the combination of instinct and experience enables the lawyer for get more details.

Even if the lawyer is highly experienced, when the client asks for assistance, the lawyer in effect becomes the "listener" to the client and "observer" of the information that is presented. As is true of much that occurs in human existence, however, the devil is in the details, and it is up to the attorney to get to those details as quickly and precisely as possible. The reason is that there is a difference between "facts" that are internal to the situation in which the client has found himself or

[6] For a discussion of the quantum theory, see H. Kragh, *Max Planck: The Reluctant Revolutionary*, 1.12.2000, https://physicsworld.com/a/max-planck-the-reluctant-revolutionary (access: 28.8.2023).

[7] Though there is no clear indication, or definable source, that Lincoln actually said it, it is nonetheless an accurate assessment of the source of most of what an attorney does in relation to the cases that come before him.

herself and those factors external to the "facts" that impact what happens as that information is brought into the judicial system. The factors that are "external" relate in large part to the contextual setting of what a client is presenting to the lawyer.

On the other hand, if it should be more of a counseling and planning matter, such as drafting of a contract, a will, or a prenuptial agreement, the details will lead somewhat more predictably to their conclusion. At its most basic, a preliminary decision as to whether a matter should be managed in a non-litigious manner or should go to court needs to be made at this early stage. Generally speaking, in either situation, the more microscopic the approach, the better. The analytical process that is employed by the lawyer applies with equal strength whether the matter involves litigation or not. The importance of this is that the overwhelming number of matters that come before an attorney do not involve litigation. Of those that do, should they proceed to trial, in roughly 95% of them the trial verdict will be the "last word," and there are no appeals. As a consequence, a lawyer must be prepared to go in either direction with equal skill or at least refer a matter to someone with greater expertise in that field.

It is in this initial phase of the preparation of a case that the attorney, based upon the information received from the client, typically develops a theory on which the case will proceed, particularly if it should lead to litigation. At its most basic, the lawyer reviews the facts as the law applies to them in a sort of "decision tree" structure that provides a rough estimate of the course of the suit and outcome probabilities.[8] This is true whether the client is to be plaintiff or defendant.

What is seductive for the lawyer is the tendency to settle on a theory at the threshold and stick with it no matter what happens later in the case. The reality is that a lawsuit, regardless of the topic, becomes by definition a composite of many parts, if only because it is grounded in human behavior, the first of the external factors that will impact the process. That decision, however, should not be cast "in stone" because as the matter develops the picture likely will change considerably.

If the lawyer is indeed an "observer" in relation to what has been presented by the client, then he or she must be alert to the reality that how it appears at the beginning may very well not remain the same as time passes. Indeed, it is axiomatic that how a case appears at the time of the first interview will likely change, sometimes radically, whether it is a non-litigation matter or not. What must be kept in mind is that this is a normal consequence of the uncertainty principle as it applies in the analysis of a potential legal problem.

[8] From this point forward, the attorney, whether consciously or not, is employing a Bayesian analytical process relative to assessment of the probability of the outcome.

[9] See M. Tymkiw, T. Foulsham, *Eye Tracking, Spatial Biases and Normative Spectatorship in Museums*, "Leonardo" 2020, vol. 53(5), pp. 542–546 – for a discussion of the perception of the observer ("spatial bias") as a contextual factor in the observation of "facts."

In the legal context, this can be expressed as the determination of the relationships between the "facts" of the case. In the analysis of a legal case, this would correspond to the assessment of the relevance of any particular fact. To that extent, it is a question that the attorney should constantly ask as to the priorities that are to be assigned to the pool of information at hand. It is in the initial evaluation, particularly of a litigation matter, that the attorney is confronted with the "uncertainty principle" at its most basic. Indeed, it is this line between art and science that is at the heart of the law.

If it should be decided by the attorney to initiate a lawsuit, each party undertakes to discover additional facts about the plaintiff's case or defense that is anticipated. It is at this stage when the uncertainty principle is most applicable because of the constant re-evaluation of the "facts" that had been elicited in the initial interview with the client. What may have looked crucial at that point may later appear to be of minimal importance, if not outright irrelevant. In order for the attorney to be effective in the giving of sound advice, he or she must be ready to alter the structure of the client's position to meet this re-evaluation.

In the 21st century, this evaluation of the information brought by the client has been dramatically impacted by the presence of technology. Indeed, it can be argued that the failure of a lawyer to be aware of and utilize the available technological tools as part of the routine preparation of a case is a form of malpractice. That argument itself presents the entirety of the legal profession, from law students to the judiciary at all levels, with the need for some familiarity with the tools that technology offers, both at present and potentially.

During the early phase in the life of a legal representation, the lawyer who is best equipped to make these adjustments is more likely to be successful at trial or in a negotiation. Of course, if the adjustments should be made quickly and with some level of logic, then the prospects of resolution of the matter are enhanced, and there might not be a trial or an impasse in a negotiation. Even if there should be one, success may well depend upon knowing the opponent's case as well as, if not better, than he or she does.

It is in the accomplishment of this position in the life of a legal matter that the quantum analytical model can be borrowed with positive effect. Moving from the "big picture" with lots of "facts" at the initial interview, the proper analysis of the individual pieces will, inevitably, cause the view of the "big picture," if not the content of the picture itself, to change. Only when the "facts" are viewed microscopically can the attorney gain a proper perspective on the matter. To that extent, the lawyer is engaging in "art," because the evaluation of the components is necessarily highly subjective. This is because of the background of the attorney, the prior relationship, if any, with the client, and the intellectual skills available.

Yet, even so, this analysis depends to some extent on putting the pieces together in a precise manner at a given time. That, unfortunately, is antithetical to the reality that the pieces themselves are in constant motion and shifting in importance,

sometimes due to the insertion of additional "facts" into the picture. Because this characteristically occurs in a seemingly random fashion during the lifetime of a case, the level of uncertainty is never low.

In this process, the attorney must have confidence that the client was telling the truth to the best of his or her ability. In other words, "the truth" most likely consists of accurately reciting what the client saw, smelled, felt, or heard on the occasion in question. At the same time, the lawyer must be sensitive to the possibility that there may be some significant inaccuracies or omissions contained in the initial recitation of by the client that will only be revealed later in the process. In this way, the attorney is enabled to maximize the efficiency of the preparation of the case while at the same time minimizing the chance of a "surprise" at the time of trial.

One of the tools available to a lawyer to assist in assessing the authenticity of the "facts" presented by the client is called "discovery." At its simplest, it is the asking of questions of the opposition in a proper format that provide "the other side" of the picture to the questioner. Mechanically, it typically consists of interrogatories, questions that ask about certain facts, and depositions in which the testimony of witnesses is recorded for future reference or even use in court.

In the modern practice of law, the discovery phase of a lawsuit has become quite complex, regardless of the subject matter of the case. This is a function of what is often termed "Big Data." Indeed, it has been noted that "we have gone from an age that was meaning rich but data poor, to one that is data rich but meaning poor (…) [and] this is an epistemological revolution as fundamental as the Copernican revolution."[9]

All forms of research in recent years have been influenced dramatically by the ability of the personal computer to search the internet for information, including the law. Yet, the question as to the quality of the information remains. One result of this situation is that a lawyer may not in fact know what questions should be asked of the opposition in order to evaluate the quality of the information gained from the client. It is in this context where the law and technology come into closest proximity.

RESULTS

The problem, at its simplest, is that the lawyer must digest enormous amounts of information in order to determine what is "relevant" or "irrelevant" to the case at hand. While there has been considerable discussion of the impact of AI (artificial intelligence) on the legal system, there may have been a confusion of the concepts of AI, AI-Life, and ML (machine learning) in the minds of some commentators.[10]

[9] D.J. Boorstin, *Cleopatra's Nose: Essays on the Unexpected*, New York 1994.

[10] A. Zuckerman, *Artificial Intelligence: Implications for the Legal Profession, Adversarial Process and Rule of Law*, "Law Quarterly Review" 2020, vol. 136, pp. 427–453. This discussion is

The growing expansion of high performance supercomputers into academic research programs as a means for the application of AI "for societal good" raises an entirely new series of issues in the relationship between technology and the law.[11] The philosophical implications of the extensive employment of AI as part of the legal process, whether at the level of academic or scholarly research, the practicing attorney, or the judiciary, reflect a potentially negative impact on the human utility of the judicial process. Obviously, in its logical extension such an outcome negates the necessity of a judicial system at all.

This might well lead to the issue of how expert testimony may be a factor in the analysis of a lawsuit. One of the most frequently cited benefits of modern technology has been the introduction of what might be termed "technoevidence" into the judicial process. Technoevidence can be defined simply as "that information that would not be available to the trier of fact (whether judge or jury) no matter how smart the investigator, in the absence of modern technology," that is, technology that is contemporary to the creation of the evidence. Put another way, if it should be evidence that cannot be deduced by the employment of sheer brain power by a human being, it may be deemed to be admissible in court because of its seemingly intrinsic trustworthiness, derived from technology.[12] This is not to be confused with digital evidence which is primarily a feature of information storage and is at the root of ML. It refers in the broader sense to all of the various technologies that are available to aid in the clarification of the information that may be available.

It is when technology is at the base of the creation of the evidentiary picture, rather than providing a clarifying or explanatory function, that there may well be a problem of the evolution of the technology that will be employed. The technology that was used as recently as two or three years ago to analyze, categorize, and store information may have been superseded by a more sophisticated version. The result of such a re-examination of a piece of evidence because of nothing more than the passage of time could, as a result, be altered dramatically and impact the case in the process.

To that extent, the computer literacy of an attorney or judge is of great significance in the quality of the research and the product received. This issue can be addressed in the educational process either in law school or as a prerequisite to graduation. By extension, the ability of the court to determine admissibility of the evidence that such a search might produce may be limited by the current "rules of evidence" such that amendment may be necessary to balance the new system with the former.

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primarily from the point of view of the British system, but the principles are generally applicable in their cautionary considerations.

[11] K. Cobb, *Supersizing Supercomputing*, "SMU Magazine" 2022, vol. 72(2), p. 12. This is particularly true in relation to the NVIDIA and Microsoft "deep learning" product Megatron-Turing NLG.

[12] J. McClellan Marshall, *Technoevidence: The Turing Limit 2020*, "AI and Society" 2021, vol. 36(3).

For example, a digitally recorded document that was created four or five years ago may not be readable by the modern programming, even though 2+2 will continue to equal 4. Indeed, it may not be readable at all if the hardware or software to do so no longer exists. The most pedestrian example is the loss of numerous musical catologues due to the absence of eight-track tape machines. In effect, that evidence is "down the memory hole" and, for all practical purposes, simply does not exist.[13] Sometimes this situation arises as a result of the simply routine restructuring of computer systems as a part of good business management.

A corollary to this problem is the potential for witnesses to testify through what might be termed "digital immortality."[14] The concept blends both ML and AI in an effort to allow for the creation of a "digital" persona that is capable of offering meaningful testimony. Of course, if this were produced as part of a deposition that is taken under oath, there would be little difference between that and modern deposition practice. The problem could arise in a situation in which a person who has suffered some injury has died, yet the lawsuit includes a claim for mental anguish. Does that evidence die with the witness, or does "digital immortality" allow a "persona" to testify on behalf of the deceased? The presence of technological evolution, however, allows creation of a remote personality (who may not have ever actually lived) that is maintained through software and is then offered in court as if it were "live."

The potential for this to come into the courtroom in the form of documentation is enhanced by such software as GPT-3 (Generative Pre-trained Transformer 3). This software, an example of ML based upon "deep learning" utilizes a logical/analytical "structure" similar to the human brain that can create prose text that is practically indistinguishable from human production.[15] The problem with these "technowitnesses" is that their responses to questions, hence their testimony, are subject to the choice as to the "keywords lexicon" used in the programming, a problem sometimes described as "implicit bias." In turn, that is limited by the quality of the information that has been available to the "memory" of the "technowitness," which necessarily involves translational issues. To that extent, the GIGO (Garbage In, Garbage Out) potential for manipulation of the content of the testimony is both real and enormous. Considering the consequences, this is not analogous to a "virtual" Elvis or Whitney Houston performing in a concert by way of hologram.

A similar problem may be presented by software that allows for "delegation devices," such as those used by Presidents Jefferson and Wilson, to be programmed

[13] See idem, *The Modern Memory Hole: Cyberethics Unchained*, "Athenaeum Review" 2019, vol. 94 – for an extended discussion of the problems of data retention.

[14] M. Savin-Baden, D. Burden, *Digital Immortality and Virtual Humans*, "Postdigital Science and Education" 2019, vol. 1, pp. 87–103.

[15] See R. DiResta, *The Supply of Disinformation Will Soon Be Infinite*, "The Atlantic", 20.9.2020 – an article that was itself created in part with the aid of GPT-3.

to create robotic signatures. Such software is currently commercially available. The recent *SEING Performance*, a legal-robotic exercise executed by a signatory robot, demonstrates the potential problem of *post-mortem* forgery when dealing with the authentication of documents.[16]

Likewise, the problem of technologically-based evidence could emerge in a totally new context of, literally, galactic proportions. While many people are familiar with SETI (Search for Extraterrestrial Intelligence), a subset of that effort is known as METI (Message Extraterrestrial Intelligence). The principal distinction between the two entities is that SETI searches for biosignatures that exist in the atmospheres of exoplanets that are of an organic nature, as well as technosignatures generated by technology, in an essentially passive mode. By contrast, METI proactively transmits and detects technosignatures mediated by technology, such as radio waves. For example, a recent METI discovery, BLC-1 (Breakthrough Listen Candidate-1) was announced on December 18, 2020. This appears to be a "technosignature" possibly originating from a distant exoplanet from an artificially created radio signal.[17] While the precise location is still unclear, the implications of such a discovery are dramatic. Among the conventional legal issues created would be questions of ownership (privately initiated and financed) of the copyright of the software used to detect the signal, the patent of the hardware used to detect the signal, and the licensing of the information. Of course, this also implicates the question of governmental interest in taking control of the information for the public benefit, both economic and military. Because these issues involve ML, as well as possibly some forms of AI, the ability of the courts to deal with resolving these questions will likely need to be addressed.

In the United States, the general rule is that the proffered evidence must be examined by the judge, both as to methodology and as to the qualifications of the testifying witness before it can be considered.[18] This "gatekeeper" function vested in the judiciary places the judge in a rather interesting position in relation to the scientist. After all, in most instances, the judge is the product of an undergraduate liberal arts educational background that is reinforced in law school by virtue of the extensive reading that is customarily required. When confronted with evidence grounded in the sciences, the judge must now evaluate on a scientific level the quality of the information. Even with the increased sophistication of the technology that is used for measurement or creation of evidence, while the machine may not be subject to

[16] See E. Mahé, *Signatory Robots*, "Leonardo" 2021, vol. 54(3).

[17] This is discussed as an offshoot of SETI in A. Frank, *A New Frontier Is Opening in the Search for Extraterrestrial Life*, 31.12.2020, https://www.washingtonpost.com/outlook/2020/12/31/breakthrough-listen-seti-technosignatures (access: 28.8.2023).

[18] *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S. Ct. 2786, 125 L. Ed. 2d 469 (1993).

traditional forms of cross-examination, the operator of it will be. That reality should insure that manipulation of the evidence because "the computer says it is so" can be kept to a minimum by alert lawyers and judges. By definition, this process moves from the "big picture" of what the expert might offer through the "micro," sometimes to the "nano" of inquiry. Of necessity, the "observer effect" is now the product of what the judge sees, not merely what the lawyers might have argued.

By contrast, a perhaps much simpler example of the positive impact of technological evolution is the recent explosion of the reversal of criminal convictions based upon a review of DNA evidence. Starting in the 1980s, DNA evidence gradually became central to the prosecution of criminal cases, particularly rape. It was the principal means to demonstrate that the accused was present at the scene and probably acted in the commission of the offense. DNA rapidly replaced fingerprints as the "top of the food chain" evidence in terms of conclusiveness and led to an enormous number of convictions. The technology at the time was able to detect between five and ten markers, and this was deemed sufficient. By the end of the first decade of the 21st century, however, the technology had evolved to allow detection of as many as 12 to 15 markers. The result was that the earlier evidence was found not sufficient to have identified the defendant correctly after all. As a result, many cases were vacated and formerly convicted persons released from prison. The evolution of the technology itself changed the focus of the inquiry in these cases to a new level of precision.

The shift of focus away from people to increased dependence upon machines mimics much of the world in which humanity now finds itself. As Tacitus once said, "Because they didn't know better, they called it 'civilization', when it was part of their slavery [*idque apud imperitos humanitas vocabatur, cum pars servitutis esset*]".[19] If this thought process should be combined with the problems inherent in "Big Data," then the ability of the judicial process and its "experts" to rely on their analyses is potentially badly flawed. To that extent, the potential "enslavement" of the judicial process to technological capability is something to which lawyers and judges need to be sensitive. In the use of such evidence, it is imperative that the qualifications of the "expert" be clear and unequivocal.

Once the discovery phase of a lawsuit begins, the investigation of the macro moving down the chain to the micro and even nano, to use technological terms, uncovers more and more detail that creates a "color" of the parties and the injury. Interrogatories addressed to the physician involved would divulge what was done to the patient. Depositions of the physician and other expert witnesses would be necessary to determine whether what was done was within the professional standards expected of a physician in that field. It may be that the type of injury is extremely rare, one that a competent physician would not have normally anticipated. The

[19] Tacitus, *Agricola* (98), Book 1, paragraph 21.

impact on the case could be considerable, because proving the error at trial would be much more difficult. Mixed with such problems is the question of what expert medical testimony on both sides will be brought forward either prove or disprove the negligence of the physician. Of course, there is a potential collateral issue if the patient did something that aggravated the injury beyond what the physician had done or simply had ignored the physician's instructions.

For example, in a medical malpractice case, one of the key issues is expert testimony as to what the physician either did or failed to do that resulted in injury. At the outset of the case, there is normally a set of injuries that are fairly well-defined, and the actors, physician and injured patient, are clearly identified. In a case of this type, the question becomes whether the actions of the physicians fall outside a defined standard of care that is expected of physicians in a similar situation. These factors are the foundation of both the plaintiff and defense cases, which tends to put them at the "head of the class" of evidentiary matters that govern the case.

What is being discussed here is a legal process that moves at its own pace and, because of that, alters the perceptions of the lawyers as to what will be the focus of the case by the time it goes to trial. In other words, this is an effort on all sides to reduce the level of uncertainty about the case, and that involves the mind of an artist. Why?

It is because the attorney is, in effect, drawing a picture, the "big picture" for the judge or jury. It contains not just the brush strokes from the initial interview, but includes all of the colors of the palette that should have emerged in the discovery process. Again, however, the attorney needs to be on guard as to the inherent self-deception that can occur when he or she becomes satisfied that everything that can be done has been done. In other words, the maintenance of a strong focus on preparation can lead to a narrowing of the vision such that the lawyer misses some aspect of the case that can become an unpleasant surprise at trial.

The problem of "missing the point" can be at its most basic if the attorney fails to trade the position of "observer" for "juror." An example arises from the most basic characteristic of the adversarial legal system – cross-examination of witnesses. This device is considered essential to fleshing out for the jury the full story as it applies in the case, and the skill of the attorney in cross-examination is often the determining factor. When confronted by technology, however, the results can be quite different. In a case in which an automatic teller machine (ATM) had been activated by a person needing some cash for medicine, the machine failed to dispense the money, yet created a receipt that showed that it had given him $200. When the person's bank statement arrived, it showed a deduction of $200, which led to a lawsuit against the bank for that money to be restored to the account. The bank brought forward a computer printout of the activity of the ATM that day, including this transaction, indicating that it had given him his money. Attached to the printout was an affidavit that certified this as a true and correct record of the bank and was signed by an officer of the bank. The plaintiff's lawyer summoned

the person who had signed the affidavit and, on examination, determined that he knew nothing about it, only that it was his job to authenticate such records. The attorney for the alleged debtor objected to the printout as evidence because it was not possible to cross-examine the machine, and since the affidavit was qualitatively defective, there was nothing to support the bank's defense. The court sustained the objection, and the bank settled the case. The point is that a body of evidence that is solely technologically-based may not persuade a jury unless it can be authenticated by means other than cross-examination.

The impact of external facts on the outcome of a case is illustrated in the medical malpractice case referred to earlier. Each side had prepared the best medical experts that could be obtained to support the position of that side. In one rather spectacular case where this failed, the case was about three days into trial when a new witness appeared. It was a nurse who had been in the delivery room when the damaged child was born. Everyone knew who she was, but no one had invited her to participate because she lived outside the state. There was a subtle condescension to the effect "what can a nurse say to counter our physician?" In the end, it was not so much what she said about the medical aspects of the delivery that mattered. It was when, on cross-examination by the physician's attorney, she revealed that she had heard about the trial, came to the court at her own expense. The attorney made the cardinal error of asking her "why?", and her response was that her motive was simply to be sure that the whole story was told. As a practical matter, this ended the trial. This "uncertainty" shifted the question from "how much" to "what are we looking at?" The human factor of the judge or jury's viewpoint determined the outcome of the case.

Similarly, in a case in which a young woman was taken to the emergency room of a hospital in an apparent state of delirium. Fortunately, given her situation, the hospital contacted a judge who asked if anyone understood what she was saying. The response was negative, which led the judge to the conclusion that the woman might be foreign. It turned out that she was indeed Swedish, and she was diabetic in need of insulin. This "near miss" led to the proper, life-saving treatment.

In another example, in a case involving silicone gel breast implants, the plaintiffs presented as experts a structural engineer who would testify about the physical damage from an excessively large implant and a chemical engineer who would testify as to the chemical changes in the blood from leakage (though none had ever been recorded). When challenged by the manufacturer of the implants on the grounds that their testimony was not relevant, the response from the plaintiff was, "Well, Judge, these men have testified in hundreds of cases throughout the country". To this the judge responded, with uncharacteristic candour, "Counselors, this court is not responsible for the stupidity of our colleagues elsewhere" and disallowed the "experts." The case, obviously, collapsed under the weight of the "observer effect" from the bench.

Such events result when the attorney thinks that all of the pieces have been detected and examined to the nano level and are now all in place. This is known generally as a "black swan."[20] Clearly, this is something that should be avoided at all costs, but it is not always possible to do so. Part of the reason is that, with the passage of time, what appeared at the onset of the case to be central may have been reduced in significance, either by the addition of information or by changes in the technology, that was underlying the problem in the first place.

In this context, reference to self-driving automobiles is a useful analogy. When such a vehicle crashes, injuring the driver, the question becomes "who is responsible?" Initially, the standard approach is to examine the driver as to his or her condition at the time. Was the driver drunk, asleep, experiencing a physical emergency? Each of these questions must be answered to bring that part of the "big picture" into some level of focus. Beyond that is the nature of the vehicle and its technology. For example, was the autopilot engaged or not; did the airbags deploy properly or not at all (this has been a problem in recent years); how fast was the vehicle traveling; what is the level of technology that would have kept the vehicle on the road and did it alert the driver? The answers to these questions clearly point to the developer of the software and the design of the vehicle that incorporated this technology. Such an analysis could well follow traditional lines of liability relative to the putting of such a device into the stream of commerce without adequate testing. If the software were of a sufficiently new type, then the issue would be what the industry standards for design and testing might be. If they had been exceeded by the employment of the new technology, then the manufacturer might not be held liable, but the question would remain for the jury to decide.[21]

An example of such a situation arose in a case involving the death of a lady who was run over by a city bus. The bus had a lock that was intended to prevent it from moving if the door was open. In this case, the lady was getting off the bus, and it moved forward trapping her under the front wheel and killing her. During the discovery phase of the case, her family's attorney requested the maintenance records of the bus in question to determine if there had been any problems with this feature in the past. The bus company produced a computer printout approximately two inches thick that recited all of the maintenance activity for the previous several years, with each item numbered sequentially. As it happened, there were some gaps

[20] A "black swan" is an event that is beyond what is normally expected of a situation, hence "unpredictable," and has potentially severe consequences. Black swan events are characterized by their extreme rarity, severe impact, and the practice in hindsight of explaining widespread failure to predict them as simple folly. The term was popularized by Nassim Nicholas Taleb, a finance professor, writer, and former Wall Street trader, but it since has been applied to a much wider range of planning and prediction constructs.

[21] See the discussion in P. Su, *Who to Blame in an Autonomous Vehicle Crash?*, "Mensa Bulletin" 2020 (July).

in the sequence of the repairs, and upon inquiry as to why, the explanation was that the computer system that recorded these matters was being "restructured." Part of the redesign involved a new program that simply had omitted some of the matters in the original record. Of course, the omitted matters related to the locking system, but there was no way to recover them. Whether the omission in the computer record was intentional or not, the impact on the case was both obvious and enormous. It settled a few days later in favor of the deceased lady's family.

In this context, the limitations of the "uncertainty principle" are drawn into sharp focus in part by the view of Albert Einstein as to Heisenberg. It was Heisenberg's contention that the uncertainty theory implied that the future could not be predicted with certainty and could very well have several possible outcomes. This conflicted with Einstein's view that if one knows everything in the present, then the future can be predicted with some certainty. He summed it up in the well--known quote, "I will never believe that the Good Lord rules the world by playing dice".[22] For the lawyer and for the judge, the existence and application of the legal principle of *stare decisis* (precedent) when combined with common sense lends some validity to this limitation on any analysis based upon Heisenberg.

It is ironic that in this instance the humanities remain somewhat in control of the scientific component of the process for the time being, because in many cases the judge simply applies common sense to the decision process, allowing the evidence if "it will assist the trier of fact". To that extent, the "science" that is offered becomes subject to the "art" that is the reflection of the humanity of the process that subjects the evidence to scrutiny. Of course, in the context of a trial as it unfolds, the "uncertainty principle" is most active and contributes to much dyspepsia among lawyers.

The shift in the appearance of a legal matter from the first time a client comes into the office of the lawyer until the matter is resolved by negotiation and draftsmanship or goes to trial is in part a function of the shift in emphasis on the "internal facts" that results from the in-depth examination of them in the context of the "external facts." Just when it probably looked clear to the attorney, if only because of the passage of time, it changed. In the end, recognition of the "uncertainty principle" should provide the lawyer with pause for thought at each step of the way, and do the same for the judge if the matter should go that far.

More precisely, this leads to the philosophical concept of "cyberethics." This can be defined as "the relationship between the ethical and legal systems that have been developed to serve humanity from ancient times to the present as expressed in our judicial process and the ability of computer-driven technology to operate outside those conventions with almost no limits."[23]

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[22] Quoted in T. von Kármán, *The Wind and Beyond*, Boston 1967, p. 182.

[23] This concept was originally articulated by the author in the paper *The Terminator Missed a Chip!: Cyberethics*, presented at the International Astronautical Congress of 1995 in Oslo, Nor-

CONCLUSIONS

On the broader view of jurisprudence, whether as an attorney or as a judge, the question of authentication may be radically impacted by technology, as noted above. In such a case, the rules of evidence may need some level of modification to accommodate these changes. This is not to suggest that the question of "authenticity" should be surrendered pell-mell to machines. "The computer says so" is no answer. It is to suggest that the standards for the credentials of experts and the quality of the evidence may need to be re-examined. Indeed, this problem would not be unique to the Anglo-American system of jurisprudence but would be applicable in varying forms throughout the world. Similarly, there likely should be some provision in law schools for acquainting the next generation of lawyers with both the present state of the technologies that they may encounter, but the potential damage that such technologies could do to the search for the truth.

Further, the ability of technology to manipulate nature itself literally alters the entire picture of what is "authentic." Examples of this are genetic engineering of plants and, of course, of human beings, both of which technologies are increasing in sophistication with every passing day. Crops can be made disease resistant with genetic engineering, which has led to the patenting of certain "unnatural" strains of plant life. Similarly, the ability of genetic engineers to modify the DNA of unborn children to eliminate potential diseases is not science fiction. That, however, is highly questionable from the cyberethical perspective, since it tampers with the evolutionary process that has defined human beings for æons. The problem that it presents is that the offspring of the "perfect" human being created in the 21st century may not be genetically equipped to adapt to changes in the environment in the 22nd century with the result that the species is in danger of extinction. Put another way, the manipulation of nature by technology could lead to dinosaurs, and lawyers need to understand this.

When considered from the practical aspects of the legal profession, the questions presented by this technological revolution are quite significant in their import. At the very base of the issue is that there probably needs to be some consideration as to the educational base of attorneys and judges. After all, how effective can their evaluation of a case be if they cannot understand the technical components of it or at least perceive a technical issue? For example, it might be that admission to law school would require as a prerequisite a basic course in computer science. At the very least, such a course could be required for graduation from law school.

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way, and originally published by the American Institute of Aeronauticsand Astronautics, Inc. with permission. Released to IAF/AIAA to publish in all forms. The corollary is the potential ability of technology to drive alterations in societal conventions, in this case legal conventions, without regard to human input in a societal "default" to the machines.

Similarly, continuing judicial education could include updates on technological capabilities and changes that can impact the presentation of a case.

From the perspective of the relationship between technology and the human factors of the processes of society and the law, the fundamental question may well not be whether AI or ML has a place in this environment, but more properly the cyberethical question of what that place is.

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ABSTRAKT

Niniejszy artykuł ma na celu przedstawienie prawnikom, zarówno młodym, jak i nieco starszym, podejścia analitycznego do praktyki zawodowej, być może szerszego niż to, które przyswoili sobie podczas studiów lub aplikacji. Ponieważ pełnomocnicy procesowi i sędziowie zwykle funkcjonują w środowisku nauk humanistycznych i społecznych, proponowane podejście rozszerza tę perspektywę, zapożyczając elementy z mechaniki kwantowej, w szczególności zasady nieoznaczoności Heisenberga. O ile pełnomocnicy i sędziowie miewają do czynienia z pewnym stopniem niepewności, czy to w kontekście pracy w kancelarii, czy to na sali sądowej, to kwestia jak z nią postępować różni się w zależności od osoby, a sama subiektywność bywa przyczyną problemów. Wprawdzie jest to ćwiczenie z „intelektualnych aspektów praktyki prawniczej", będącej przecież działalnością wybitnie praktyczną, ale ma ono na celu postawienie pytań dotyczących roli współczesnej technologii w kontekście prawnym, a także do pewnego stopnia udzielenie na nie odpowiedzi.

Słowa kluczowe: aksjologia prawnicza; niepewność; Big Data; dowody oparte na środkach technicznych; etyka informatyczna; czarny łabędź