ARTICLES

EXPERT ROBOT: USING ARTIFICIAL INTELLIGENCE TO ASSIST JUDGES IN ADMITTING SCIENTIFIC EXPERT TESTIMONY

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I. INTRODUCTION

Does the title of this article alarm you? You are in good company. Skepticism about technology is an ancient phenomenon. Plato fretted about the impact of technology on human relations 2,373 years ago.[1] In *Phaedrus*, in a dialogue between Socrates and Phaedrus, Socrates alleges:

> And in this instance, you who are the father of letters, from a paternal love of your own children have been led to attribute to them a quality which they cannot have; for this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. The specific which you have discovered is an aid not to memory, but to reminiscence, and you give your disciples not truth, but only the semblance of truth; they will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality.[2]

Then he was talking about the technology of pen and paper.[3] Knowledge, he asserted, only truly exists in human interaction. He explained his point by arguing that a written text could not engage in conversation. When the reader of a written work has a question, the paper would respond the same every time, providing no additional explanation. One cannot obtain knowledge from solitary reading; in fact, the written word

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[1] *See* PLATO, THE PHAEDRUS (360 B.C.E.), *available at* http://classics.mit.edu/Plato/phaedrus.html (debating the relative merits of the spoken and written word).

[2] *Id*. Socrates goes on further to assert:

> I cannot help feeling, Phaedrus, that writing is unfortunately like painting; for the creations of the painter have the attitude of life, and yet if you ask them a question they preserve a solemn silence. And the same may be said of speeches. You would imagine that they had intelligence, but if you want to know anything and put a question to one of them, the speaker always gives one unvarying answer. And when they have been once written down they are tumbled about anywhere among those who may or may not understand them, and know not to whom they should reply, to whom not: and, if they are maltreated or abused, they have no parent to protect them; and they cannot protect or defend themselves. *Id.*

[3] *Id.*

actually threatens human ties.[4]

We have come to accept written words as the source of knowledge, more so than dialogue, Plato notwithstanding. We also see how antiquated objections, however well-reasoned, can be challenged and today seem quaint, if not silly. But how far should we go? Technology is not the answer to all problems and there is a tendency to turn to nifty innovations for solutions where they really don't fit. In the field of law, practitioners have fairly readily adopted law office, case management, and communications technologies, for better or for worse. But the acceptance of technological assistance with handling the *substance* of the law and in the courts has been slower.[5] One exception has been in complex litigation and technical areas of law where the use of computer generated evidence and other technologies to help the judge and jury understand the dispute at trial has become *de rigueur*.[6]

This article argues that it is time to take the technology one step further (or back) and bring it into the pre-trial exercise of evaluating expert testimony for admissibility. *Daubert v. Merrell Dow Pharmaceuticals, Inc.* requires judges to act as gatekeepers to expert testimony, only admitting evidence that is relevant and reliable.[7] Judges are faced with a challenge when they are asked to evaluate proposed experts' use of complex science and methodology—most of the time way outside of the judges' areas of expertise.[8] Computers and artificial intelligence can assist in important ways, while leaving the ultimate decision about permissibility in the judges' hands.[9]

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[4] *See id.* (arguing that the written word denies a reader the ability to debate and interact with the author).

[5] *See* Fred Galves, *Where the Not-So-Wild Things Are: Computers in the Courtroom, the Federal Rules of Evidence, and the Need for Institutional Reform and More Judicial Acceptance*, 13 HARV. J.L. & TECH. 161, 169–73 (2000) (discussing the institutional and personal resistance to using technology in the courtroom).

[6] *Id.* at 168–69.

[7] 509 U.S. 579 (1993).

[8] *See* Bruce Abramson, *Blue Smoke or Science? The Challenge of Assessing Expertise Offered as Advocacy,* 22 WHITTIER L. REV. 723, 724 (2001) (explaining that by allowing scientifically untrained judges to decide whether testimony by scientifically trained experts should be admitted creates controversy).

[9] This article does not argue for artificially intelligent experts to provide testimony or evidence at trial. *Cf.* Robert J. Spagnoletti, Note, *Using Artificial Intelligence to Aid in the Resolution of Socioscientific Disputes: A Theory for the Next Generation,* 2 J.L. & TECH. 101, 106 (1987) (presenting an early argument for artificially intelligent expert witnesses).

Part II of this article reviews the function of expert testimony and some of the challenges of using experts in our adversarial system of largely non-specialized courts and lay juries.[10] Part III explores some of the problems judges face as gatekeepers to expert testimony determining, as they are required to under *Daubert*, the admissibility or excludability of expert testimony.[11] Lastly, Part IV explains artificial intelligence and computer technologies and how they are used today, and demonstrates their value in assisting judges with *Daubert* analyses to improve consistency, accuracy, efficiency, and fairness in admission of scientific expert testimony.[12]

II. EXPERTS

A. Function of Expert Testimony

In order to understand and address the problems of judges acting as gatekeepers to scientific expert testimony, it is helpful to understand the function of expert testimony and, generally, some of its inherent problems in our adversarial system of justice.[13] At its most basic level, the United States' adversarial system requires lay juries,[14] or in bench trials, judges[15] without special subject-matter knowledge, to determine facts of the matter to which they apply the law.[16]

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[10] *See infra* Part II.

[11] *See infra* Part III.

[12] *See infra* Part IV.

[13] *See generally* Scott Brewer, *Scientific Expert Testimony and Intellectual Due Process*, 107 YALE L.J. 1535, 1538–39 (1998) (explaining how non-expert judges and juries must regularly evaluate competing scientific evidence to determine what scientific testimony is relevant, and which side to believe).

[14] *See id.* at 1543 (stating that fact finders, which determine relevant facts in a case, includes lay juries).

[15] *See id.* (stating that in situations where there is no jury, judges may also determine relevant facts in a case).

[16] There are many examples of specialized courts in the U.S., but not all of these require judges to have special training or knowledge. Bankruptcy, tax, juvenile, family, mental health, probate, and admiralty courts are some examples. Jay P. Kesan & Gwendolyn G. Ball, *Judicial Experience and the Efficiency and Accuracy of Patent Adjudication: An Empirical Analysis of the Case for a Specialized Patent Trial Court,* 24 HARV. J.L. & TECH. 393, 397–98 (2011). The most recent is the U.S. Court of Appeals for the Federal Circuit, a specialized court for patent appeals. *Id.* at 394. Some courts in the U.S. have a reputation for expertise in certain areas of law because of their location, e.g., N.Y. District Court in Manhattan on securities, or D.C. or V.A. District Courts on national security. *See id.* at 424 (noting that while patent cases were randomly assigned to judges, this was not the case with regards to which

In this system, experts help the fact finder to understand "technical" or "scientific" areas that are relevant to the cause of action and usually essential to one of its elements.[17] The area of expertise may be, for example, chemistry, epidemiology, toxicology, engineering, bio-medical or medical science, genetics, statistics, social science, or psychology.[18] The Federal Rules of Evidence ("FRE") permit admission of traditionally-recognized experts like physicians, chemists, and architects and also "skilled" witnesses with specialized knowledge, like bankers or landowners regarding land values or psychologists about the reliability of eyewitness testimony.[19] An expert might be called upon to help the fact finder understand medical and epidemiological studies regarding food, drugs, pesticides, genetic engineering, and other technologies, battered women's syndrome, post-traumatic stress disorder, valuation, causality, or the veracity of eyewitness testimony.[20] He or she may be asked to testify regarding the method or application of handwriting analysis, DNA fingerprinting, genetic theory, or laboratory methodology.[21]

Experts are often used in tort and toxic tort cases to prove causation where scientific evidence is needed because the mechanisms that cause certain diseases and defects are unknown, not fully understood, or in dispute.[22] They are called by

districts heard patent cases, making location of the court an important variable). In some foreign countries, judges, and courts are specialized as well. *See* Sarang Vijay Damle, Note, *Specialize the Judge, Not the Court: A Lesson from the German Constitutional Court*, 91 VA. L. REV. 1267, 1286 (2005) (describing Germany's specialized court system); Donna M. Gitter, *Should the United States Designate Specialist Patent Trial Judges: An Empirical Analysis of H.R. 628 in Light of the English Experience and the Work of Professor Moore*, 10 COLUM. SCI. & TECH. L. REV. 169, 185–86 (2009) (contrasting England's and the U.S.' patent courts).

[17] *See* Abramson, *supra* note 8, at 724 ("'[S]cientific, technical, or other specialized knowledge [can] assist the trier of fact to understand the evidence or to determine a fact in issue,' and thus appropriate topics for expert testimony.").

[18] *See* Brewer, *supra* note 13, at 1566 (listing examples of scientific theories and methods that are prominent in recent litigation).

[19] *See* FED. R. EVID. 702 advisory committee's note (noting the various occupations that qualify as "skilled" expert witnesses).

[20] *See e.g.*, Brewer, *supra* note 13, at 1566 (stating that complex medical and epidemiological issues are prominent in litigation and often require expert testimony).

[21] *See id.* ("Among the scientific theories and methods that have been prominent in litigation in recent years . . . [is] the use of genetic theories and laboratory methods to access 'DNA fingerprint' evidence. . . .'").

[22] *See* Margaret A. Berger, *The Supreme Court's Trilogy on the Admissibility*

litigants as opinion witnesses and, as such, they offer their opinions, backed up by the science they present.[23] Experts not only explain complicated issues within their areas of competence relevant to the case, but in adversarial settings they serve another purpose as well: experts are often instrumental in furthering the proffering party's case.[24] At trial, the fact finder hears the differences in opinions from experts admitted for both sides and cross examination hopefully reveals the weaknesses and points of disagreement between and among them.[25] Ultimately, the fact finder makes a decision about which they believe to be true.[26]

But, the Federal Rules of Evidence do not trust juries completely with distinguishing between "good" and "bad" science or experts.[27] They give to judges the responsibility of qualifying experts and regulating the subjects and theories about which they may testify based upon their credentials and whether the experts' testimony will be reliable, relevant, and helpful or necessary to the trier of fact.[28]

of Expert Testimony, *in* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 9, 10 (2d ed., 2000) (explaining how the United States Supreme Court promulgated rules to admit expert testimony in cases dealing with toxic torts).

[23] FRE 703 recognizes that experts need not testify as opinion witnesses, but can solely provide explanations of the science or other principle within his/her expertise at issue. FED. R. EVID. 703. The 2011 amendments to the Federal Rules of Evidence do not require that all of the data upon which an expert opinion is based be presented at trial. *Id.* However, the Notes of the Advisory Committee explain that the facts or data upon which the expert relies must "be of a type reasonably relied upon by experts in the particular field." FED. R. EVID. 703 advisory committee's notes. This would be determined by a judge as part of his/her *Daubert* gate keeping function or, if not brought up on motion, at trial upon cross-examination or on appeal. *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

[24] *See* Abramson, *supra* note 8, at 723 (noting that expert testimony can further one's case). *See also* Brewer, *supra* note 13, at 1538–39 (describing how non-experts analyze expert testimony and decide which of the competing testimony is accurate).

[25] *See id.* at 762 (illustrating how the adversarial system, in particular cross-examination, allows the jury to choose among differing scientific testimony).

[26] *See generally id*. (explaining that juries will choose the conclusion that they believe is most reliable, which is based upon flaws in the expert testimony that are typically brought out during cross-examination).

[27] *See generally* FED. R. EVID. 702–706 (placing limitations on how expert testimony may be admitted, and thus controlling the amount of deference a jury has in interpreting the testimony).

[28] *See generally id.* (noting that these rules generally govern how a court admits expert testimony); *see* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 589 (describing how the Federal Rules of Evidence regulate the subjects and theories of expert testimony); *see also* Colin Caffrey, *Can a Computer Read*

B. Challenges of Using Experts in Our Adversarial System

The problem of communicating scientific and technical expertise to laypeople in an adversarial forum and then asking them to apply and administer justice directly raises questions about the utility of experts.[29] Right away, there is the intimation to the untrained that objective facts about science or a technical subject will be presented by experts to the fact finders for their consideration.[30] This is a fundamental misrepresentation of science as certain when the nature of science itself is theory and the testing of theory is constant.[31] Scientific uncertainty may exist in "objective" science itself, as when one study might conclude that *x* is true while another concludes that *x* is false.[32] Ambiguity may also be encountered as to the level of uncertainty in the objective science itself, as when one study might conclude that the "measurements and models" used to explore the problem are "well-established" and ironclad, while another might find "gaps" in the data or methods.[33] In a non-scientific dispute resolution or policymaking forum, it can appear as though sure, certain science will direct the result, when, in fact, it is not certain and usually can do no such thing.[34]

Uncertainty is in full view in the context of litigation, when disagreement among experts about the meaning and inferences drawn from the data is presented.[35] In complex litigation or litigation on technical subjects, both sides often have experts

a Doctor's Mind? Whether Using Data Mining as Proof in Healthcare Fraud Cases is Consistent with the Law of Evidence, 30 N. ILL. U. L. REV. 509, 524 n.142 (citing factors from the Federal Rules of Evidence 702 advisory committee's note that are used to examine whether expert testimony should be admitted).

[29] *See* Brewer, *supra* note 13, at 1594–95 (describing that competing expert testimony causes problems for non-expert jurors in interpreting and deciding which expert to believe, thus undermining the value of their testimony).

[30] *Cf.* KARL R. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY 32 (1959) (noting that science is not composed of a single set of objective facts, but rather a compilation of differing theoretical views that are continually tested and often change).

[31] *See id.* (explaining various methods of testing scientific theories).

[32] *See* Stephanie Tai, *Uncertainty About Uncertainty: The Impact of Judicial Decisions on Assessing Scientific Uncertainty*, 11 U. PA. J. CONST. L. 671, 680 (2009) (describing how the same experiment can produce multiple, different results).

[33] *Id.*

[34] *Id.* at 710–11.

[35] *Id.* at 680.

with opposite or different opinions testifying on their behalves.[36] These opinions may come from similarly credentialed experts in their fields and reveal a degree of uncertainty in the science or scientific bases: there are legitimate differences among viewpoints and scientific conclusions based on valid scientific methods, a reality of scientific inquiry belying the layman's common perception of science as objective and clear.[37] Asking laypeople to settle the uncertainties that the expert community itself has not settled makes little sense.[38] Scott Brewer has gone so far as to call it a violation of "intellectual due process," explaining that since juries and even judges are not able to assess the validity of technical methodologies, theories, and applications they simply decide whom and what to believe based upon non-relevant factors like expert witnesses' credibility, "demeanor," likeability or the skill of lawyers involved.[39]

The difficulty with experts as the "hired champion of one side"[40] is not new. In 1901 Learned Hand blamed the adversarial system's use of experts with usurping the role of the jury and confusing, rather than aiding the jury to get to the facts.[41] His logic was, of course, flawless: expert testimony is necessary only to supply the jury with special knowledge and experience; the validity of the propositions about which they opine can be tested, but only by those who have such specialized knowledge and experience, which juries don't have.[42] That is, the jury can't acquire "mediately" the knowledge or experience necessary to assess the validity of such propositions and laws, or even to

[36] Brewer, *supra* note 13, at 1538, 1539.

[37] *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579, 590 (1993) ("[A]rguably, there are no certainties in science"); Brewer, *supra* note 13, at 1597 ("Of course, it would be unreasonable to conclude that the subject of scientific testimony must be 'known' to a certainty; arguable there are no certainties in science."); David S. Caudill, *Lawyers Judging Experts: Oversimplifying Science and Undervaluing Advocacy to Construct an Ethical Duty?* 38 PEPP. L. REV. 675, 694 (2011) *quoting* Jan Beyea & Daniel Berger, *Scientific Misconceptions Among Daubert Gatekeepers: The Need for Reform of Expert Review Procedures*, LAW & CONTEMP. PROBS. 327, 338, 340 (2001).

[38] *See generally* Charles Weiss, *Expressing Scientific Uncertainty*, 2 L. PROBABILITY & RISK 25, 25 (2003) (explaining how scientific uncertainty is at the core of legal disputes in which members of the judicial system are untrained in the science and are acting as the decision makers).

[39] Brewer, *supra* note 13, at 1538–1539.

[40] Learned Hand, *Historical and Practical Considerations Regarding Expert Testimony*, 15 HARV. L. REV. 40, 53 (1901).

[41] *Id.* at 51, 53.

[42] *Id.* at 43–44, 54–55.

understand their terms or methods, because doing so requires extensive learning, which cannot be done by a jury in the course of litigation.[43] Therefore, the jury is not competent to decide any conflict between contradictory propositions, theories, and/or conclusions that each side may present.[44]

Judicial gate keeping and jury instructions or other directions that explain the nature of experts and science do not solve the problem: the nature of "knowledge" and "truth" are in an arena least suited to explore epistemological questions.[45] Juries are asked to find facts, and this is what they believe they are doing when they believe one properly proffered and admitted expert over another.[46] Appellate courts carry forward these "facts" and they become part of our public policy as precedent.[47]

Science is used to create, implement, or enforce public policy at every level of policymaking, and the problems of using experts permeate each.[48] Congress has the capacity to gather a broad range of scientific information and can hold hearings and reviews from a wide range of sources; they have the resources and often the luxury of time to gather and digest the information provided, including access to enhanced research services and staff.[49] However, because the legislature is a political body, politics gets

[43] *Id.* at 55.

[44] *Id.* at 54–55.

[45] *See* Stephanie Tai, *Comparing Approaches Towards Governing Scientific Advisory Bodies on Food Safety in the United States and European Union*, 2010 WIS. L. REV. 627, 633 (2010) ("[D]ebates about the nature and use of expertise . . . often go to the heart of the metaphysical nature of knowledge itself and its relationship with the concept of truth.").

[46] *See* Hand, *supra* note 40, at 44 (explaining how rules governing expert testimony help maintain the integrity of the jury's function as the finders-of-fact).

[47] Judicial determinations freeze the science in place, conflicting with the very nature of science, which is continuously evolving. *See* Tai, *Uncertainty About Uncertainty*, *supra* note 32, at 696. *See also* Kesan & Ball, *supra* note 16, at 395 *citing* Arti Rai, *Specialized Trial Courts: Concentrating Expertise on Fact,* 17 BERKELEY TECH. L.J. 877, 877, 896 (2002) (arguing that specialized trial courts "can best leverage subject matter expertise" as opposed to specialized appellate courts, which are at greater risk of suffering from "tunnel vision" since their function is to develop law and thus, should have a "broader vision").

[48] *See e.g.*, Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 COLUM. L. REV. 1613, 1618, 1627 (1995) (describing the serious implications in toxic regulation of confusion between science, the use of experts, and policymaking).

[49] Philip P. Frickey & Steven S. Smith, *Judicial Review, the Congressional Process, and the Federalism Cases: An Interdisciplinary Critique,* 111 YALE L.J. 1707, 1738, 1740 (2002).

in the way and can distort the science or the level of scientific certainty.[50] Legislators, wishing to avoid public accountability for their policy decisions, may seek and rely on experts to assert that clear science dictates their decisions; thus avoiding "blame" for their value choices—or choices that favor important interests rather than their constituents' preferences.[51]

Administrative agencies in the position of creating regulatory regimes to address emerging health and environmental risks, among others, must rely upon scientific research for their policymaking.[52] These agencies have some research capacity, but not enough and so often must seek external scientific advice for "risk assessment," i.e., determining the nature and extent of the problem.[53] Experts' input enters at all stages of regulatory decision making and from various actors, including staff, panels, committees, advisory boards, stakeholders, governmental and non-governmental research institutes, and more. One can imagine the conflicts and confusion that arise in the science and inferences there from presented by and to this cast of characters. And, while this can be seen as an asset rather than a problem in regulatory policy making, the way that these tensions are resolved can be random or, at a minimum, unwarranted, reflecting science as "settled" where it is not.[54] The scientific

[50] *See, e.g., id.* at 1751, 1752 (discussing the tension that exists between the judiciary and the legislature in drafting and interpreting statutes).

[51] Legislators may be deterred from fully inquiring into relevant scientific bases and their uncertainties for their decision, if they suspect it may interfere with their preferred or more expedient political choices. *See* Tai, *Uncertainty About Uncertainty*, *supra* note 32, at 703–04 (discussing the observations of Professor Wendy Wagner's study on the "science charade" in toxic regulation); *see also id.* at 694 (noting that the role of interest groups and other stakeholders and their respective resources is also a factor in the legislature's scientific inquiry, making it somewhat less "scientific" than it appears); *cf.* Neal Devins, *Congressional Factfinding and the Scope of Judicial Review: A Preliminary Analysis*, 50 DUKE L.J. 1169, 1178–79 (2001) (explaining how legislators have "numerous advantages" in order to seek out experts to pursue information).

[52] Wagner, *supra* note 48, at 1614.

[53] *See generally* CHRIS WOLD ET AL., TRADE AND THE ENVIRONMENT: LAW AND POLICY, 453–58 (2005) (discussing risk assessment versus risk management process and roles including seeking expert advice); *see also* WTO, *Sanitary and Phytosanitary Measures*, WTO.ORG, http://www.wto.org/english/tratop_e/sps_e/sps_e.htm (last visited September 8, 2013) (discussing the development of international standards to evaluate the science on risk assessment for deciding trade disputes).

[54] I am not arguing against science as a basis for public policy, or against science per se, as it appears Paul Feyerabend does in his essay. Paul Feyerabend, *How to Defend Society Against Science*, *in* THE PHILOSOPHY OF EXPERTISE 358, 359 (Evan Selinger & Robert P. Crease eds., 2006).

"facts" are then presented as a basis for policy, cementing conceptions of expertise and scientific truth in the policy and in the institution itself.[55]

In court litigation, the problems of incorporating scientific expertise may be even worse than in the political policymaking branches because neither side, nor the judge, is *required* to present to the jury the weaknesses in methods or theories presented.[56] The judge's inquiry in this regard may occur, but out of the courtroom, when an expert is proffered.[57] At trial, direct and cross examination may flush out the strengths and deficiencies of competing experts' testimony, but this process more likely than not confuses rather than enlightens the fact-finder.[58]

There is evidence that judges have grown increasingly concerned about the misuse of experts, who sometimes say what the parties paying their fees want without conformity to scientific discipline, and other times are used by litigants as a trial tactic to deplete the resources of their adversaries.[59] "[J]uries are not competent to recognize charlatans," and judges are often not able or willing to exclude their testimony.[60] Even when the professional witnesses are not acting so blatantly as hired guns, the possibility of bias, both of the experts and the underlying science, go largely unexplored in this context. Scientists themselves often have their own biases, sometimes influenced by financial interests.[61] The availability of research funding by the industry for its benefit creates a systemic pressure towards the

[55] *See generally* WOLD ET AL., *supra* note 53, at 457–58 (discussing how scientific information through risk management translates into policy).

[56] *See supra* note 23 and accompanying text.

[57] *See* Michael H. Gottesman, *From* Barefoot *to* Daubert *to* Joiner*: Triple Play or Double Error?,* 40 ARIZ. L. REV. 753, 759 (1998) (explaining a judge's pre-trial determinations of scientific reliability facilitates the exclusion of expert testimony).

[58] *See* Brewer, *supra* note 13, at 1552–53 (questioning how a judge or jury without scientific knowledge would be able to make a decision based on "contrary contentions" of experts).

[59] Gottesman, *supra* note 57, at 756.

[60] *Id.* at 757; *see also* PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 17 (1991) (commenting on the countless claims courts have allowed based on methods and theories not generally accepted by scientific discipline).

[61] Tai, *Uncertainty About Uncertainty*, *supra* note 32, at 682; *see also* Tai, *Comparing Approaches*, *supra* note 45 at 633 (discussing the problem of bias, among other things, in establishing trust in experts' methods and conclusions).

production of science to support its sponsors.[62] Biomedical researches funded by the pharmaceutical industry and health research funded by the tobacco industry are two well-known examples.[63]

The U.S. Supreme Court, in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, tried to address some of the above-referenced problems by giving a more comprehensive role to judges as gatekeepers in the admissibility of experts.[64] Whereas under the standard used previously in federal and most state courts, judges simply had to determine whether experts' testimony will be permitted based upon whether the methods used by the science being presented were "generally accepted,"[65] *Daubert* requires judges to determine the reliability of expert witnesses generally.[66] The idea was to create more focus for the fact finder and help minimize the confusion when the "battle of the experts" is joined at trial, since the basis for the testimony had been previously vetted for reliability.[67] It was also so that the judge/gatekeeper would be able to admit scientifically valid minority views for consideration.[68] But, as we shall see, judges are in no better position to assess reliability than juries and suffer from many of the same problems as juries when assessing scientific and technological methods and modes of inference, albeit at an earlier stage in the litigation process.[69]

III. JUDGES AS GATEKEEPERS UNDER *DAUBERT*

Judges have long played a role in determining the admissibility of expert testimony at trials and evaluating those decisions on appeal under legal standards created by the common law.[70] The legislatively adopted Federal Rules of Evidence (FRE)

62 Tai, *Uncertainty About Uncertainty*, *supra* note 32, at 681.

63 *Id.*

64 509 U.S. 579, 592–93 (1993).

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

66 *Daubert,* 509 U.S. at 589.

67 *Id.* at 589–90 (linking the requirement that an expert's testimony be grounded in science with the requirement that testimony be reliable).

68 *See id.* at 592–97 (describing proving scientific facts as a slow process in which courts must be able to allow evidence that has been generally accepted, with the focus of the inquiry on the principles and methodology not necessarily the conclusions).

69 *See* Gottesman, *supra* note 57, at 759 (noting the observation of two members of the *Daubert* Court on a judge's lack of scientific knowledge).

70 *Daubert*, 509 U.S. at 585.

in 1975 created some confusion about how the common law and this new civil law would interact.[71] The U.S. Supreme Court in *Daubert* settled the matter in 1993, holding that the federal rules superseded the widely-followed common law test established in *Frye v. United States,*[72] which gave the trial court judge the ability to look into whether an expert's technique in coming to his or her conclusion was generally accepted in the relevant scientific community and, if it was, to admit it into the adversarial process for the fact finder to decipher and decide.[73] The Court set forth the obligation of trial judges to act as "gatekeepers" and detailed some factors judges should consider in determining the reliability of expert testimony.[74] In 1997, the Supreme Court decided *General Electric Co. v. Joiner*,[75] regarding the appropriate standard for appellate review of decisions to exclude expert testimony, and in 1999 the Supreme Court decided *Kumho Tire Co. v. Carmichael*,[76] considering whether the FRE and *Daubert* standards applied to only scientific evidence or other forms of specialized or technical knowledge.[77] Then, the 2000 revision of FRE 702 explicitly incorporated the *Daubert* standards, as refined by *Joiner* and *Kumho,* and the 2011 revision further clarified the language of the Rule.[78]

Now that the dust has settled, it is possible to see how artificial intelligence can help judges with their gate keeping function. This is particularly evident when admitting expert testimony that seeks to explain complex scientific or technological information required for the fact finder to understand the basis of the dispute at hand. Below in this section, I will explain how the ruling in *Daubert* and the FRE 702 have been applied by the courts, and the issues that have arisen to create problems for judges and fact finders in cases requiring scientific expert testimony.

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[71] *See id.* at 585–87 (describing the debates and scholarship on the scope of *Frye* as "legion").

[72] *Id.* at 586–87.

[73] *See id.* at 585–86 (describing the test used in *Frye*).

[74] *Id.* at 592–94.

[75] 522 U.S. 136 (1997).

[76] 526 U.S. 137 (1999).

[77] *Id.* at 141.

[78] *See* FED. R. EVID. 702 advisory committee's note (amending the rules in response to *Daubert* and those cases interpreting it (2000); *id.* (2011) (noting that the 2011 amendments to FRE 702 are considered "restyling" amendments to fix the language so that the legal standards are clearly articulated).

A. Daubert Explained

Daubert was a toxic tort case brought against a drug company by people with birth defects whose mothers took the drug Bendectin to prevent nausea during pregnancy.[79] The drug company moved for summary judgment claiming that plaintiffs would not be able to provide any evidence of causation between the drug and the birth defects.[80] In response, plaintiffs pointed to eight experts who would testify regarding animal *in vitro*[81] and *in vivo*[82] studies, pharmacological comparisons, and reanalysis of human epidemiological studies making the link between Bendectin and birth defects like plaintiffs'.[83] All of plaintiffs' experts were excluded by the trial judge,[84] whose decision was affirmed by the United States Court of Appeals for the Ninth Circuit, and summary judgment for respondents was granted.[85] The reasoning of the lower courts exclusion of plaintiffs' experts relied on the view that the non-epidemiological evidence was not generally accepted in the relevant scientific community for the types of conclusions plaintiffs' experts were drawing.[86] In addition, the court found that the reanalysis portion of plaintiffs' experts' proffer were unpublished and not peer reviewed and therefore could not be shown to be generally accepted as reliable.[87]

The U.S. Supreme Court accepted *certiorari* to determine if the general acceptance test of *Frye* as the test for admissibility survived the adoption of FRE, which provided a more fulsome inquiry into reliability.[88] They said that it did not.[89] The holding

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79 Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 582 (1993).

80 *Id.*

81 In the test tube, or any other experimental medium not involving an animal or human being. The term is used especially to describe tests performed outside the living body. 3 J.E. SCHMIDT, ATT'YS DICTIONARY OF MED. AND WORD FINDER at I–55 (2012).

82 In the living body, as opposed to the test tube or other non-living experimental medium. *Id.*

83 *Daubert*, 509 U.S. at 583.

84 Daubert v. Merrell Dow Pharm., Inc., 727 F. Supp. 570, 570 (S.D. Cal. 1989).

85 Daubert v. Merrell Dow Pharm., Inc., 951 F.2d 1128, 1131 (9th Cir. 1991).

86 *Id.* at 1131.

87 *Id.* at 1130.

88 *Daubert*, 509 U.S. at 585, 589.

89 *See id.* at 589. The Court reversed the Ninth Circuit's decision and remanded the case for application of the FRE standards. The Ninth Circuit ultimately found that the experts were properly excluded and upheld summary judgment for the respondent. Daubert v. Merrell Dow Pharm., 43 F.3d 1311,

of the Supreme Court made "reliability" the touchstone of admissibility, with the elements of the *Frye* standard included as just one of many non-exclusive factors to be considered by the judge as gatekeeper.[90] The role of the judge in determining whether the basis for the expert's testimony is scientifically trustworthy is the lynchpin of truth-finding in these circumstances.[91] Therefore, the FRE as interpreted by the Court in *Daubert*, requires that expert testimony be grounded in the methods and procedures of science.[92] This is an empirical validation made by the court to ensure that the expert's theory or technique was derived by a scientific method.[93] The characteristics of what constitutes a reliable scientific methodology are explained in the decision, but must be flexible.[94] The first consideration is whether the theory has been, or can be tested.[95] Then, whether the technique or methodology upon which the opinion is premised has been subject to peer review, published in peer-reviewed journals, or otherwise subjected to the scrutiny of the relevant scientific community.[96] Additionally, when considering a particular scientific method or technique, understanding the known error rates and standards controlling the operation of the method or technique is important,[97] toward the end of determining whether the scientific basis for the expert's testimony is trustworthy enough to present to the jury as fact finder and subject to the adversarial process.[98]

General acceptance in the scientific community, embodied in the *Frye* test, continues to be a factor for consideration after

1322 (9th Cir. 1995).

[90] *See Daubert*, 509 U.S. at 589–91. The majority in *Daubert* use the word "reliability" rather than "validity," which is used by scientists for similar inquiry, to comport with other parts of FRE that refer to trustworthiness. *Id.* at 590 n.9 ("In a case involving scientific evidence, *evidentiary reliability* will be based upon *scientific validity*.").

[91] *Id.* at 592–93.

[92] *See* Abramson, *supra* note 8, at 724 (stating that proffered testimony that conforms to valid scientific principles should be admitted).

[93] *Daubert*, 509 U.S. at 592–93.

[94] *Id.* at 593–94; *see also* Abramson, *supra* note 8, at 730–33 (asserting that *Daubert* and its progeny establish the contours of the judicial investigation about reliability, but must be flexible).

[95] *Daubert*, 509 U.S. at 593; *see also* Berger, *supra* note 22, at 15 ("An expert should not be allowed to base a conclusion solely on experience if the conclusion can easily be tested.").

[96] *Daubert*, 509 U.S. at 593–94.

[97] *Id.* at 594.

[98] *Id.* at 595.

Daubert, though not dispositive as it was under *Frye*.[99] The "general acceptance" standard was both under-inclusive and over-inclusive of evidence permitted for consideration by a jury.[100] It excluded reliable evidence performed with a technique or method that was not generally accepted, though could be proved to be scientific.[101] At the same time, it permitted testimony of experts if there was "a consensus in a narrow field that they themselves established."[102] *Daubert* sought to remedy this by providing the above-mentioned list of non-exclusive factors to assess reliability.[103]

B. Daubert Applied

The general standards from *Daubert* used to judge reliability

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[99] *Id.* at 595–96.

[100] *See* Craig Lee Montz, *Trial Judges as Scientific Gatekeepers after* Daubert*,* Joiner*,* Kumho Tire*, and Amended Rule 702: Is Anyone Still Seriously Buying This?*, 33 UWLA L. Rev. 87, 92 (2001) (implying that the *Frye* test was under-inclusive by excluding reliable evidence); *see also* Berger, *supra* note 22, at 26 (implying the *Frye* test was over-inclusive by allowing expert testimony in their own narrow fields).

[101] *See Daubert*, 509 U.S. at 596–97. The Petitioners in *Daubert* were concerned that the more expansive gatekeeping function of the judge under the FRE and *Daubert* would do more to instill orthodoxy of thought and stifle scientific inquiry. In response, the majority distinguished the goals of court actions and laboratory experiments:

> [T]here are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly . . . . We recognize that, in practice, a gatekeeping role for the judge, no matter how flexible, inevitably on occasion will prevent the jury from learning of authentic insights and innovations. That, nevertheless, is the balance that is struck by Rules of Evidence designed not for the exhaustive search for cosmic understanding but for the particularized resolution of legal disputes. *Id.*

See also Montz, *supra* note 100, at 92 (noting that a criticism oft the *Frye* test was that it would allow reliable, but novel scientific evidence to be excluded).

[102] Berger, *supra* note 22, at 26. *But see* Andre A. Moenssens, *Admissibility of Scientific Evidence: An Alternative to the Frye Rule*, 25 WM. & MARY L. REV. 545, 549–50 (1984) (explaining how some courts refuse to allow the admissibility of voiceprint identification evidence unless validated by "disinterested scientists" not participating in that particular field).

[103] As you will see later, the standards have been seen as so flexible as to permit them to be ignored completely, even where reliability of expert testimony is challenged. In those cases, typically involving expert testimony in non-scientific fields, the gatekeeper requires that the expert employ the "same level of intellectual rigor" that would be used outside of court when working in the relevant discipline. Kumho Tire Ltd. v. Carmichael, 526 U.S. 137, 152 (1999).

and therefore admissibility were fully incorporated into the FRE in 2000, which were later revised for clarity in 2011.[104] FRE 702 now is clear that the trial judge determines whether:

a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;[105]
b) the testimony is based on sufficient facts or data;
c) the testimony is the product of reliable principles and methods; and
d) the expert has reliably applied the principles and methods to the facts of the case.[106]

Daubert and cases following unmistakably assert that this list is non-exclusive;[107] judges may look at other factors to determine reliability, including whether: (i) the expert developed their opinions for purposes of testifying; (ii) the expert's leap from the data to his or her conclusion is justified; and (iii) the expert has considered alternative conclusions deriving from the data upon which his or her testimony is based.[108] The FRE permit experts to give opinions based upon matters beyond their own first-hand knowledge on the understanding and requirement that the basis for the opinion is based upon reliable knowledge and experience within his or her discipline.[109]

The *Daubert* standards have been adopted by a majority of states and their contours have been somewhat clarified through the FRE 702 amendments referenced above as well as various

[104] The Advisory Committee notes for the 2011 amendments explicitly state that the revision should not change the interpretation of the Rule. Note that expert witnesses are initially qualified under FRE 104 based upon their knowledge, skill, experience, training, or education. So, the *Daubert* inquiry is made on already credentialed expert witnesses. *See* FEDERAL RULES OF EVIDENCE 170 (Christopher Mueller & Laird Kirkpatrick eds., 2013) (explaining the nature of the 2011 amendments).

[105] This article does not discuss or advocate for artificial intelligences to assist judges in assessment of this "helpfulness" element, which non-expert judges are uniquely qualified to do without expert assistance.

[106] FED. R. EVID. 702.

[107] Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 595 (1993).

[108] *See* Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) (explaining how trained experts "frequently extrapolate from existing data" however, a "court may conclude that there is simply too great an analytical gap between the data and the opinion . . . ."); Claar v. Burlington N.R.R. Co., 29 F.3d 499, 502–03 (9th Cir. 1994); Ambrosini v. Labarraque, 101 F.3d 129, 139–40 (D.C. Cir. 1996).

[109] *Daubert*, 509 U.S. at 592. The standard for appellate review of the trial judge's FRE 702 determination is abuse of discretion. *Joiner*, 522 U.S. at 141–42.

appellate court decisions.[110] It is absolutely clear that, doctrinally, *Frye* is dead as the exclusive standard for admissibility of scientific or technical expert testimony.[111] The methodology used by experts or the studies upon which they rely need not be generally accepted.[112] Scientific witnesses can depart from methods that are established in their areas, but, "must have grounds for doing so that are consistent with the methods and usages of his scientific community."[113] When so departing, experts should know the generally accepted method and explain why they departed from it.[114] In non-scientific testimony, the basis for their testimony must show they have used "the same level of intellectual rigor" as they would outside of the courtroom and as expected in their field.[115] This "intellectual rigor" test essentially means that "[e]xperts must show that their conclusions were reached by methods that are consistent with how their colleagues in the relevant field or discipline would proceed to establish a proposition were they presented with the same facts and issues."[116]

In cases where the methodology of studies relied on by experts proffered are not attacked, but the conclusions generated by the experts based upon studies are, a court may conclude, applying FRE 702 and *Daubert*, that there is simply too loose a connection between science and the expert opinion.[117] An example of this was presented in *General Electric Co. v. Joiner*,[118] where plaintiff claimed that exposure to polychlorinated biphenyls (PCBs) and

110 *See* C. WRIGHT & V. GOLD, FEDERAL PRACTICE AND PROCEDURE § 6261, at 190 (1997) (explaining how the *Daubert* standards as well as FRE 702 still allow for the exclusion of expert testimony). *See also* Roselle L. Wissler, et al., *Dual-Processing Models of Admissibility: How Legal Tests for the Admissibility of Scientific Evidence Resemble Cognitive Science's System 1 and System 2*, 17 VA. J.L. & TECH. 356, 368 n.43 (2013) (demonstrating that around twenty-eight states have adopted the *Daubert* standards).

111 *See* Wissler et al., *supra* note 110, at 368 n.43 (implying the *Frye* test is not exclusive by stating that the majority of jurisdictions use the *Daubert* standards along with FRE 702).

112 *See* Braun v. Lorillard, Inc., 84 F.3d 230, 234 (7th Cir. 1996) (acknowledging that the *Daubert* court held that opinion evidence was admissible even if it was not yet accepted in the scientific community).

113 *Id.*

114 *Id.* at 235.

115 Kumho Tire Co. v. Carmichael, 526 U.S. 137, 152 (1999).

116 Berger, *supra* note 22, at 25–26.

117 Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997).

118 *Id.*

their derivatives promoted development of his lung cancer.[119] Plaintiff proffered experts to testify with regard to causation based upon animal and epidemiological studies.[120] The trial court refused to admit the experts, finding an inadequate explanation of how the experts extrapolated their opinions about PCB causation to plaintiff from these studies.[121] The Supreme Court upheld this exclusion writing that, while *Daubert* makes a distinction between methods and conclusions,

> . . . nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.[122]

More elucidation came in *Kumho Tire Co. v. Carmichael*,[123] where application of FRE 702 and the *Daubert* gate keeping and reliability requirements were squarely extended to experts intending to give non-scientific testimony, which would include expert testimony in sociology, philosophy, economics, psychology, and other soft sciences.[124] *Kumho* involved a plaintiff who purchased a used minivan that blew out a tire resulting in one passenger's death and another's serious injury. Plaintiffs sued the tire's manufacturer and distributor claiming that the tire was defective and relied on an expert in tire-failure analysis. Their expert concluded on basis of visual inspection of the tire that the blowout was caused by a defect in the tire's manufacture or design.[125] The District Court applied the *Daubert* factors and

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[119] *Id* at 139–40.

[120] The animal studies involved infant mice given massive doses—far lower than that to which plaintiff was exposed over a long period of time—of PCBs directly into their bodies. The infant mice developed a different type of cancer than plaintiff. The experts relied on no studies that showed adult mice or other animals developed cancer from PCB exposure. The epidemiological studies relied on were of workers in a PCB production plant with a high incidence of lung cancer and death from lung cancer. However, the authors of that study did not conclude that the cancer was a result of PCB exposure. *Id.* at 144.

[121] Joiner v. Gen. Elec. Co., 864 F. Supp. 1310, 1326 (N.D.Ga. 1994), *rev'd,* 78 F.3d 524 (1996).

[122] *Gen. Elec. Co.*, 522 U.S. at 146 *citing* Turpin v. Merrell Dow Pharm. Inc., 506 U.S. 826 (1992). Experts alleged that they used a "weight of the evidence" approach, giving different data different weight and then determining the combined impact on the evidence. The judge looked at each individual study relied upon and found them non-relevant, never considering the studies in combination. *Id.* at 152–53 (Breyer, J., concurring).

[123] 526 U.S. 137 (1999).

[124] *Id.* at 147–149.

[125] *Id.* at 143.

refused to admit this testimony, finding it unreliable.[126] The Eleventh Circuit reversed holding that *Daubert* should not be applied to non-scientific expert testimony and the defendant, Kumho Tire, petitioned for *certiorari* for the Supreme Court to settle the matter of when to use *Daubert*'s interpretation of FRE 702.[127] The Supreme Court reversed, finding that judges must act as gatekeepers of reliability where scientific, technical, and non-scientific experts are proffered and the factors of *Daubert,* as well as other indicia of reliability, must be applied to this effort.[128]

Daubert, as interpreted by *Joiner* and *Kumho* and enshrined in FRE 702, is now applied to all areas of expert opinion, scientific and non-scientific, including the forensic sciences.[129] In fingerprinting, handwriting analysis, bite mark analysis, and ballistics, for example, experts rely on experience to arrive at subjective conclusions, which are not "objectively verifiable."[130] But courts have for so many years admitted this type of testimony that they cannot seem to exclude it, even if they cannot meet the standards for reliability.[131] The methodologies of these experts are questionable but their testimony is still being admitted.[132] This is just one example of how the promise of a post-*Daubert* gatekeeping regime has not played out in practice.

C. Problems with Daubert

Under *Daubert* and FRE 702, it is the judge's job to look at the proffered expert's testimony and its scientific basis and determine whether it is so unreasonable that it should not be presented to the jury, who can then assess the merits of the competing opinions presented by opposing experts through the

[126] *Id.* at 146.

[127] *Id.* at 146.

[128] *Id.* at 151. *Daubert* requires the trial court to assure itself that the expert "employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field" but with care to avoid finding "that an expert's testimony is reliable where the discipline itself lacks reliability, as, for example, do theories grounded in any so-called generally accepted principles of astrology or necromancy." *Id.* at 151.

[129] *See e.g.*, Montz, *supra* note 100, at 97 (detailing the interplay of case law and FRE 702 in the admission of expert testimony).

[130] Berger, *supra* note 22, at 31. DNA typing is the only area of forensic science in which the scientific method is used for study. *Id.*

[131] *See id.* (noting that concerns have been expressed about the reliability of forensic document examiners, yet courts still admit them).

[132] *Id.*

process of direct and cross-examination at trial.[133] As *Daubert* has been applied, the concerns of some of the litigants, *amici* and dissenters in the case have been realized.[134]

Confidence in the ability of judges to consider complex scientific fields and scientific methodologies, the differences among them and the arguments for each, are overriding concerns. Chief Justice Rehnquist, in his dissent in *Daubert,* joined by Justice Stevens, reflected his fear that judges are not capable of judging science and scientists.[135] He wrote that while the majority professed "confiden[ce] that federal judges possess the capacity to undertake this review[,]"[136] scientific knowledge is far afield from the expertise of judges and it is unlikely that Congress in the FRE intended judges "to become amateur scientists in order to perform [the reliability screening] role."[137] This concern has been amplified by judges and commentators to follow,[138] including the judge ruling in *Daubert* on remand from the Supreme Court, who pointed out that a judge engages in the FRE 702 inquiry after a proffered expert is already deemed qualified in his/her field, putting judges squarely in the position he laments: "[T]hough we are largely untrained in science and certainly no match for any of the witnesses whose testimony we are reviewing, it is our responsibility to determine whether those experts' proposed testimony amounts to 'scientific knowledge,'

133 *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 595–97 (1993) (describing how a judge assesses the proffered expert testimony for admissibility and then how various methods challenge such testimony).

134 *See*, *e.g.,* Brewer, *supra* note 13, at 1542–53 (arguing that non-expert judges and juries do not understand the cognitive aims and methods of science and therefore rely on other indicia of expertise, resulting in arbitrary judgments under *Daubert*).

135 *See Daubert*, 509 U.S. at 600–01 (Rehnquist, J., dissenting) (stating that the decision to admit expert testimony requires judges to "become amateur scientists in order to perform that role").

136 *Id.* at 593 (majority opinion).

137 *Id.* at 601(Rehnquist, J., dissenting).

138 *See* Brewer, *supra* note 13, at 1542–53 (arguing that non-expert judges and juries do not understand the cognitive aims and methods of science and therefore rely on other indicia of expertise, resulting in arbitrary judgments under *Daubert*); *see* Caudill, *supra* note 37, at 676 (questioning a trend to give attorneys responsibility for vetting experts more closely in light of the inability of judges to make consistent accurate and reliable admissibility rulings); Paul R. Rice, *Truth in Test Tube: Standard for Screening Scientific Evidence is Still Muddled Years after* Daubert*,* LEGAL TIMES, Oct. 16, 2000 at 85, *available at* http://www.wcl.american.edu/pub/journals/evidence/eproject4.html (last visited June 22, 2013) (arguing that the post-*Daubert* test for the admissibility of scientific evidence is as ambiguous as it was before the ruling).

constitutes 'good science,' and was 'derived by the scientific method.'"[139]

The Frye standard was criticized for putting scientists in control of the courtroom: if the methodology proffered by the expert was generally accepted in the relevant scientific community, then it was admissible by the court.[140] But, *Daubert* swings too far in the other direction, marginalizing scientists as just one aspect of a reliability determination, i.e., as part of the inquiry as to whether the technique or methodology upon which the opinion is premised has been subject to peer review, published in peer reviewed journals, or otherwise subject to the scrutiny of the relevant scientific community.[141] Scientific testimony may be admitted under *Daubert* regardless of the scientific community's opinion about viability of conclusions, so long as the basis for the opinion is grounded in valid scientific methodology, according to the judge.[142]

Some contend that scientists are better gatekeepers than judges for this function and challenge the scheme established by *Daubert*.[143] While judges are generalists capable of learning how to understand scientific method, the reality is more complicated: scientists in different disciplines have different standards for inquiry, including experimental design and acceptable error rates.[144] Scientists even within the same field may employ different methodologies.[145] What methods are accepted as science

[139] Daubert v. Merrell Dow Pharm., Inc., 43 F.3d 1311, 1316 (9th Cir. 1995).

[140] *See* Montz, *supra* note 100, at 91 ("'The central assumption of the test articulated in Frye is that courts can trust scientific fields to verify their own knowledge before accepting it.'").

[141] *See Daubert*, 509 U.S. at 593, 594 (noting the ways upon which methods and technology are subjected to scientific scrutiny).

[142] *See* Abramson, *supra* note 8, at 731 (stating that "scientifically valid testimony must be admitted—regardless of the scientific community's (or the judge's) opinion about the validity of the expert's conclusions").

[143] Montz, *supra* note 100, at 105–06; *see also* Bert Black, *A Unified Theory of Scientific Evidence*, 56 FORDHAM L. REV. 595, 672–74 (1988) (describing a case decided by the courts "based" on science, but at odds with the scientific community, thus illustrating the point that "[w]hen the scientific merit of a scientific conclusion is disputed, courts cannot rationally and consistently resolve the dispute without at least some consideration of scientific criteria."). *But see* Abramson, *supra* note 8, at 724 ("[T]he Daubert test is flexible, workable, and above all, requires nothing beyond the competence of any of the trial's participants.").

[144] *See id.* at 742 (stating that although judges generally learn about the scientific methods, it's more complicated because each discipline has its own standards).

[145] Gottesman, *supra* note 57, at 766; *see also* Caudill, *supra* note 37, at 702

and which are not? Determining when "a methodology has graduated from being a unitary view (whose acceptance by a jury would be unreasonable) to being a minority view (whose acceptance by a jury would be reasonable, albeit potentially surprising" is the delicate inquiry for the judge.[146] Judges are usually not competent to determine the correct methodology when there are competing scientific theories.[147]

Not only do judges lack the relevant substantive knowledge, but a single judge, sitting alone and reviewing affidavits making *Daubert* admissibility arguments, is not in the best position to come to an accurate result.[148] Jurors may be even more capable in that there would be more than one decision-maker with some degree of insight from direct and cross examination at trial.[149] In addition, the time constraints faced by judges is a factor: "[W]hile it is possible for a trial judge to devote several days to reflecting upon the complex expert testimony in a single case, the demands of a busy docket are likely to preempt that luxury. The decision thus will be made without the time for extended reflection . . . ."[150]

Determining if an expert's field itself is reliable can be difficult. If the field itself is not reliable, then looking at the methodologies used in that field and comparing them to the ones used by the proffered expert would not be useful in the search for reliability.[151] It is, of course, easier if the expert is from one of

(regarding admissibility of epidemiological evidence: "'Because of limited evidence, consensus scientific bodies in fact frequently utilize various kinds of nonepidemiological evidence in combination.'").

146 Abramson, *supra* note 8, at 726–27.

147 *Id.* at 726.

148 *See* Gottesman, *supra* note 57, at 760 n.33 (enumerating four factors which work against a judge when he or she is making *Daubert* admissibility determinations).

149 *See id.* ("[J]udges usually make their [admissibility] determinations on the basis of . . . summary judgment motions . . . [which do] not provide the same degree of illumination of the merits of the competing opinions (and of the credibility of the experts) as occurs through the process of direct and cross-examination at trial."); *cf.* Kesan, *supra* note 16, at 414–15 (suggesting that judges are not necessarily better than jurors at making determinations about the admissibility of scientific evidence in patent claims).

150 *See* Gottesman, *supra* note 57, at 760 n.33 ("[T]rial judges have an incentive, however much they try to prevent its subconscious effect on their decisions, to clear their crowded dockets of cases that are likely to be time-consuming and, given the technicality of the evidence, tedious. A virtually unreviewable opportunity to shed cases that the judge thinks of doubtful merit must be a powerful temptation.").

151 *See* Kumho Tire Co. Ltd. v. Carmichael, 526 U.S. 137, 151 (1999)

those easily-discredited fields, like astrology or necromancy,[152] but other fields may be more difficult to evaluate. For example, an expert from an emerging field of inquiry or a non-orthodox branch of a traditional discipline like alternative medicine or clinical ecology[153] would require a judgment call of reliability by the gatekeeper, an outsider in the larger field.[154]

Another difficulty with *Daubert* is its prescript that judges should not be deciding admissibility on validity of conclusions drawn by the expert in a case, but only by whether the expert's approach is scientifically valid.[155] The judge must consider whether "the expert has reliably applied the principles and methods to the facts of the case," but not the validity of his or her conclusion.[156] This line is hard to draw and often is not.[157] In *General Electric v. Joiner*, discussed above, the Supreme Court explicitly recognized that "conclusions and methodology are not entirely distinct from one another."[158] So, while the expert's conclusions are not supposed to be considered by the judge as part of his or her gatekeeping function under *Daubert*, in fact they are.[159] Scientific methodology is outside the realm of specialized knowledge of most judges while making decisions about logical inference is squarely within judicial competence, which may be why judges naturally default to this inquiry when screening experts.[160]

("*Daubert's* general acceptance factor [does not] help show that an expert's testimony is reliable where the discipline itself lacks reliability . . . .").

[152] *Id.*

[153] Clinical ecology claims that exposure to certain chemicals can cause an individual to develop multiple chemical sensitivities, making them hyper-sensitive to many substances. Berger, *supra* note 22, at 30.

[154] *See id.* at 30 (describing how courts will eventually need to decide on the admissibility of new scientific theories using the *Daubert* factors). There is an argument to be made that a judge's distance from the controversies that emerging fields often trigger can be an advantage to an unbiased *Daubert* inquiry into their relative merits. *Id.*

[155] Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 595 (1993) ("The focus, of course, must be solely on principles and methodology, not the conclusions that they generate.").

[156] FED. R. EVID. 702(d).

[157] *See* Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) (recognizing that methodology and conclusions are not entirely distinct in scientific inquiry).

[158] *Id.*; *see supra* text accompanying notes 117–21 (describing *Joiner*).

[159] *See Joiner*, 522 U.S. at 146 (describing how judges have to determine whether there is a significant analytical gap between the data and the opinion that is proffered, thus forcing them to examine the expert's conclusion).

[160] This article suggests using AI to address the problem of judicial competence (incompetence) in assessing the scientific validity of the underlying

Wissler, Williams, and Saks summed up the problem with *Daubert* nicely in their recent article about models of cognition in the application of the *Frye* and *Daubert* tests for admissibility.[161] They first described the two cognitive systems of processing information: System 1, which is "quick, automatic, heuristic-based, emotional, and effortless," and System 2, which is "slow, voluntary, analytic, and effortful . . . requir[ing] working memory capacity[.]"[162] They then looked at how the "quick and intuitive" System 1 model is analogous to the *Frye* test since that test merely requires judges to look at what others think, i.e., what is generally accepted, about the expert evidence being proffered.[163] The *Daubert* test, in contrast, requires judges to engage in a more elaborate and complex System 2 analysis, asking judges to evaluate the science underlying the testimony.[164] The authors found that, in practice, judges applying *Daubert* engage in System 1 processing, declining to engage in the difficult reasoning commanded by *Daubert* and only giving it, in effect, lip service.[165] Wissler, et. al., use examples from courts deciding on the admissibility of expert fingerprinting testimony after *Daubert* where judges have continued to admit such testimony without

studies or science, rather than the conclusion being drawn by the expert based upon his or her experience or intuition. In any event, if a proffering party brought in experts on statistics to establish the validity of their scientific expert's inferential leaps AI could assess the methodology used by those experts and provide more guidance to the gatekeeper.

161 Wissler et al., *supra* note 110, at 367–71 (analyzing the issues that the *Daubert* and *Frye* tests create for judges in deciding whether to admit expert testimony).

162 *Id.* at 359.

163 *Id.* at 363 (arguing that the *Frye* "general acceptance" test, now referred to as the "marketplace" test, calls for System 1 analysis).

164 *See id.* at 367–69 (describing how under *Daubert*, judges must learn new and difficult information, think about experts' claims, and then determine how well the research supports those conclusions).

165 *See id.* at 368 (noting that judges sometimes use System 1 reasoning even under the more demanding *Daubert* test). This became apparent shortly after *Daubert* was decided when in *Kumho Tire*, the court had to "clarify" how the standards in *Daubert* were to be applied, accentuating their non-exclusive and non-essential nature. *See* Kumho Tire Co. v. Carmichael, 526 U.S. 137, 141, 146–47 (1999) (stating that the *Daubert* test is flexible, and its "list of specific factors neither necessarily nor exclusively applies to all experts or in every case."); *see also* Rice, *supra* note 138, at 84 ("*Daubert* is little more than *Frye* in drag."); Brewer, *supra* note 13, at 1597 ("Although many jurists seem to have de dicto concerns about 'knowledge' and 'scientific knowledge' and often conduct their analyses in just those terms, from a philosophical point of view their de re concern is really only with justified belief."); *id.* at 1618 ("Some courts have essentially converted the *Daubert* test into the old *Frye* test . . . .").

applying the *Daubert* factors merely because such evidence has been admitted for centuries.[166] In the end, the authors call for the development of "ways to assist judges in employing the kind of thought processes best suited to the rules under which they are required to make their decisions."[167] Enter artificial intelligence!

IV. THE ARTIFICIAL INTELLIGENCE (AI) SOLUTION

All evidence points to the fact that *Daubert* is simply not working as the optimistic majority intended it to; Rehnquist and Stevens in dissent were onto something.[168] Suggestions to more extensively use empanelled experts to give advice to judges as gatekeepers have proven difficult to implement.[169] But if judges' expertise is not sufficient, and advisory experts unworkable, why not make available a more trustworthy and consistent resource: a national (rather international) "panel" in the form of AI? Computers, software, and AI have been slowly making their way into legal practice and courts.[170] Expert systems have been used by businesses and professionals for decades and have developed into "thinking" participants in many professions and practices, including law.[171] This Part III will describe some of the current uses of artificial intelligence and expert systems in the law, science and elsewhere and suggest that they be expanded to assist judges in making decisions about admissibility of experts under the *Daubert* legal standards.

AI was born at a conference at Dartmouth University in 1956: the Summer Research Project on Artificial Intelligence.[172] There,

166 Wissler, et al., *supra* note 110, at 370–71; *see also* DAVID L. FAIGMAN, ET AL., 4 MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 33–1.2.1, at 6 (2002) (noting that some scientific theories are so well accepted, that courts will take judicial notice and admit expert testimony based on such theories as a matter of course).

167 Wissler, et al., *supra* note 110, at 371.

168 *See Daubert*, 509 U.S. at 600–01 (Rehnqusit, J., dissenting) (concluding that although judges have some gatekeeping authority, they should not assume the role of amateur scientists).

169 *See* Berger, *supra* note 22, at 5, 7–8 (noting the ways in which the judiciary, scientific, and professional communities are seeking to better perform the judges' gatekeeping function).

170 *See* Spagnoletti, *supra* note 9, at 107, 114, 115–16 (describing AI programs that have been developed in an effort to assist with expert testimony, judges' decisions on sentencing, and generally in the legal community).

171 *Id.* at 103.

172 Andrzej Kowalski, *Leading Law Students to Unchartered Waters and Making Them Think: Teaching Artificial Intelligence and Law*, 2 J.L. INFO. & SCI. 185, 197 n.41 (1991), *available at* http://www.austlii.edu.au/au/journals/

Dartmouth Professor John McCarthy is credited with coining the term "artificial intelligence" which has generally become understood to mean a subfield of computer science involved with making machines that can think.[173] Marvin Minsky, one of the founders of AI, called it "the science of making machines do things that would require intelligence if done by men."[174]

AI can do more than simply what the computer program requests: it can reason and learn.[175] In non-AI software, programmers give computers instructions and tasks, which they perform.[176] AI can follow these, but can also determine whether the instructions are correct, whether there is a better method to reach the desired result, or if the process had been used successfully before.[177] AI machines can gain experiences and learn from them.[178]

JlLawInfoSci/1991/4.pdf (last visited Jan. 10, 2014); *see also* Nils J. Nilsson, *John McCarthy 1927–2011,* NATIONAL ACADEMY OF SCIENCES (2012) 1, 7, *available at* http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/mccarthy-john.pdf (last visited Jan. 10, 2014) (explaining how John McCarthy was credited with coining the term "artificial intelligence").

173 The Association for the Advancement of Artificial Intelligence defines AI as "the scientific understanding of the mechanisms underlying thought and intelligent behavior and their embodiment in machines." *AI Overview: Broad Discussions of Artificial Intelligence*, AI TOPICS, http://www.aitopics.org/topic/ai-overview (last visited Jan. 10, 2014); *see also* Edwina L. Rissland, Comment, *Artificial Intelligence and Law: Stepping Stones to a Model of Legal Reasoning*, 99 YALE L.J. 1957, 1958 (1990) (describing behaviors within the realm of AI, which would require human intelligence).

174 *Id.* at 1958.

175 Spagnoletti, *supra* note 9, at 103.

176 *Id.*

177 *See id.* (stating that non-artificial intelligence software is not capable of performing these tasks, however artificially intelligent software can because it is able to think and perform).

178 Gabriel Hallevy, *"I Robot - I, Criminal"–When Science Fiction Becomes Reality: Legal Liability of AI Robots Committing Criminal Offenses*, 22 SYRACUSE SCI. & TECH. REP. 1, 6 (2010). The very essence of the nature of humans is raised by "thinking machines," and the labeling of them as intelligent. *Id.* at 4. Gabriel Hallevy in his article*, "I Robot - I, Criminal"–When Science Fiction Becomes Reality: Legal Liability of AI Robots Committing Criminal Offense*, writes that some have called AI robots a new species and that, regardless of its name or category, AI robots have all the basic qualities of human intelligence: (i) communication, some knowledge about itself; (ii) knowledge about the outside world and the ability to learn about and utilize this knowledge; (iii) the ability to take action to achieve goals; and (iv) creativity, defined as "the ability to take alternate action when initial action fails." *Id.* at 4–5. AI robots are now able to fool people into thinking they are human using Alan Turing's "imitation game" where an interviewer talks with two players, one a human and one a computer, via teleprinter and decides which is human. *See* BRIAN CHRISTIAN, THE MOST HUMAN HUMAN: WHAT

AI is currently used in many ways, including "making mathematical discoveries . . . interpreting visual scenes, diagnosing diseases, and reasoning by analogy."[179] It is, unfortunately, likely to be an extremely effective job-killing technology.[180] As one commentator has written, "[v]irtually any job that now involves answering questions and conducting commercial transactions by telephone will soon be at risk."[181] Its potential to replace human experts in many fields, including the law, has been recognized.[182]

A. AI & the Law

While computers and AI have taken a while to trickle into the conservative legal profession and courts, some have become a matter of course in law practice and litigation.[183] Software for case management and legal research is ubiquitous.[184] The acceptance of AI in courtrooms and venues of the justice administration has been slow but steady.[185] For instance,

TALKING WITH COMPUTERS TEACHES US ABOUT WHAT IT MEANS TO BE ALIVE 4–5 (2011) (describing the mechanics of the Turing Test). Some futurists and philosophers have written about humans becoming "cyborgs," seamlessly integrating computing power into our minds and bodies until there is little to no difference between the robot and the human. *See* RAY KURZWEIL, THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY 377 (2005) (explaining how humans are already making the transition from "biological to nonbiological" through the use of technology like neural implants). *See also* ANDY CLARK, NATURAL-BORN CYBORGS: MINDS, TECHNOLOGIES, AND THE FUTURE OF HUMAN INTELLIGENCE 16, 27 (2003) (suggesting humans are transitioning into "cyborgs" through the use of medical technology like cochlear implants and noting other devices being used to monitor heart rate and breathing); *see generally* RAY KURZWEIL, THE AGE OF SPIRITUAL MACHINES: WHEN HUMANS EXCEED HUMAN INTELLIGENCE 101–110 (1999) (proposing a process for building an "intelligent machine" with the characteristics of the human brain).

179 Rissland, *supra* note 173, at 1958.

180 John Markoff, *A Fight to Win the Future: Computers vs. Humans*, N,Y. TIMES (Feb. 14, 2011), http://www.nytimes.com/2011/02/15/science/15essay.html.

181 *Id.*

182 *See AI am the Law*, ECONOMIST, (Mar. 10, 2005), http://www.economist.com/node/3714082 (explaining how choosing between a lawyer or a computer for legal help is in the "not-too-distant future," especially since there is already computer software based on AI that can give out legal advice. *But cf. id.* ("[T]he introduction of smarter programs . . . could turn the [legal] profession on its head [, but] [t]hat is not to say that laptops will soon be representing people in court.").

183 *See* Galves, *supra* note 5, at 193–94 (explaining how computers are used in all stages of litigation, but that their true value begins prior to litigation).

184 *Id.*

185 *Id.* at 169 ("Although computers can greatly assist lawyers in their

computer generated images (CGI)[186] are now routinely used as demonstrative evidence and in simulations as substantive evidence in litigation.[187] CGI animations assist experts in their testimony to explain or demonstrate testimony or help the fact finder understand complex ideas.[188] CGI simulations recreate events or experiments by using scientific principles or data and analyzing them.[189] In this way, the CGI can act as a sort of expert itself. The human expert introducing the CGI is the computer programmer and/or scientist who explains the simulation, what it shows, and testifies to the validity of the incorporated scientific

practice, much like the telephone, the mails and the fax machine do—and it is really impossible to imagine the practice of law today without these basic modes of communication—there is still some lingering resistance to the *full* incorporation of computerization into the practice of law, especially in the courtroom."); *see also* Johnathan Jenkins, Note, *What Can Information Technology Do For Law?*, 21 HARV. J.L. & TECH. 589, 590–91 (2008) (noting how the adoption of information technology in the legal professionals in comparison to other industries "has somewhat lagged behind."); *cf.* Frederic I. Lederer, *Introduction: What Have We Wrought?* 12 WM. & MARY BILL RTS. J. 637, 648 (2004) (questioning the use of courtroom technology towards the goal of administering justice).

[186] CGI and computer generated exhibits (CGE's) are interchangeable terms. *See generally* Galves, *supra* note 5, at 165 n.2 (listing commonly used CGEs ranging from simple to more advanced).

[187] *See* Commonwealth v. Serge, No. 01-CR-260, 2001 WL 34058294, at *84 (Pa. Ct. Com. Pl. Sept. 14, 2001) (noting that some jurisdictions are amending evidence rules to include CGE's); *see also* Kurtis A. Kemper, Annotation, *Admissibility of Computer–Generated Animation*, 111 A.L.R.5TH 529 § 2[a] (2003) (discussing the usefulness of CGI's in civil and criminal trials in helping to visually demonstrate an expert's testimony as to how an accident or crime had occurred, or to illustrate the mechanism of an injury in personal injury litigation. In cases involving products liability, CGI simulations can support expert testimony involving the design, operation, or use of the product. *Id.* at §§ 4[a], 5[a], 8[a]. They can also be used to support witness testimony about what they saw at an accident. *Id.* § 9[a].

[188] *Id.* at §§ 2[a], 5[a]; *see also* Galves, *supra* note 5, at 183 (explaining how "animations also allow in-depth" representations to the jury of particular situations). Galves goes even further to assert that CGI animations are a more cost-effective alternative to expert testimony since CGI's are cheaper, quicker and provide a clearer explanation of the facts to jurors. *Id.* at 172.

[189] *Id.* at 183–84. Experts can use CGI's animations or simulations, though the standards for admissibility will differ, depending upon whether the generated images are intended to recreate the situation at issue (simulation) or merely to support the testimony related to a discreet element thereof (animation). *Id.* at 228; *see also* Kemper, *supra* note 187, at § 2[b] (survey of the state case law on admissibility of CGIs). *See generally* Mary Elizabeth McGinnis Hadley, *Access to CGAs and Justice: The Impact of the Use of Computer Generated Animations on Indigent Criminal Defendants' Constitutional Rights*, 22 GEO. J. LEGAL ETHICS 877, 883 (2009) (differences between computer generated animations and computer generated simulations).

and mathematical formulas, techniques, and processes.[190]

AI is also being used to model legal knowledge and reasoning.[191] It uses a rule-based system initially, having as its input cases, laws, rules, and arguments.[192] The thinking part of this AI system is in its ability to perform legal reasoning and argumentation tasks, like using analogy, distinguishing unfavorable cases, anticipating adversaries' arguments, and creating hypotheticals.[193] The code used to create this system involves modeling that requires digging down to determine the processes involved with legal reasoning and incorporating them into the AI software, somewhat analogous to what would be required for an AI system assessing processes and methodologies in a scientific field.[194]

There are many types of computer-based legal diagnostic tools available to help attorneys devise and assess strategies and arguments and facilitate settlement negotiations in litigation.[195] These "artificially intelligent assistant[s]" can have an expertise in many areas of law and access to vast stores of data.[196] A case under consideration can be analyzed by the AI with the relevant expertise, which, in an advisory role, identifies issues and arguments for all sides, and assesses likely outcomes.[197]

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[190] *See* Kemper, *supra* note 187, at § 3 (noting what qualifies a person as a proper foundation witness). Admissibility of computer simulations can be more difficult than computer animations, because the simulations themselves are substantive evidence while the animations are merely demonstrative. *See* Hadley, *supra* note 189, at 885 (explaining that demonstrative evidence like animations "carry less independent evidentiary value," and are thus easier to admit into evidence). The underlying scientific or physical principles and data of the simulation require validation under the same rules of evidence as other scientific evidence before the computer simulation will be admitted. *See id.* at 884–85 (describing how federal courts use the same evidentiary rules to admit CGIs as with other demonstrative evidence).

[191] *See* Rissland, *supra* note 173, at 1957 (emphasizing that the field of "AI and law is directed at improving . . . understanding and modeling of legal reasoning").

[192] *See generally id.* at 1965–79 (discussing legal reasoning AI programs including HYPO and CABARET).

[193] *Id.* at 1960.

[194] *See id.* at 1965–66 (explaining that in order to create rule-based AI systems rules are encoded and then synthesized using an "heuristic" method much like an expert would).

[195] *See e.g.*, *id.* at 1966 (describing the Legal Decision-making System ("LDS"), which helps to compute settlements for strict liability and comparative negligence suits).

[196] Spagnoletti, *supra* note 9, at 112.

[197] *Id*. Spagnoletti wrote in 1987 about the *potential* for artificially intelligent legal assistants, which today are a reality. Some examples include RAND

The ability of AI systems to understand and manipulate science and technology and utilize that knowledge to apply it to current situations makes them useful not only in litigation, but also in alternate dispute resolution and in other law and policymaking bodies.[198] One scholar has suggested a unique role for AI in helping to resolve socio-scientific problems in courts, legislatures, and regulatory bodies involving things like genetic engineering, nuclear power, and reproductive technologies.[199] These and other areas where science and law intersect make policy analysis very difficult because of the depth and breadth of knowledge and skill required in such varying fields.[200] AI systems working in this arena would be capable of utilizing large databases and connecting current situations with past events by reasoning and drawing inferences, bringing expertise to bear in areas where the problem-solvers lack specialized knowledge.[201]

B. Expert Systems

An expert system is a special-purpose computer program, which has special knowledge in a narrow problem area or domain.[202] "Typically, such a program uses rules to represent its knowledge and to reason."[203] These rule-based systems have been around since at least the 1980's, and are sometimes spoken about as a subset or type of AI, though basic expert systems do not have to think or learn, but can simply apply the rules they are programmed with to different circumstances.[204] These rules are

Corporation's Center for Civil Justice's Legal Decision-Making System, RAND's System for Asbestos Litigation, and the University of Massachusetts' HYPO system. *See* Rissland, *supra* note 173, at 1966–72; *see also* Jenkins, *supra* note 185, at 598–600 (explaining Anne von der Lieth Gardner's early development of a rule-based system to evaluate contract law situations and later developments including CATO and GREBE). The ability to integrate substantive or procedural knowledge and legal standards is one aspect of these systems that support the idea of expert robot as proposed in this paper.

198 *See e.g.,* Rissland, *supra* note 173, at 1966 (describing the use of the AI system known as LDS in dispute resolution for particular suits).

199 *See* Spagnoletti, *supra* note 9, at 103–04 (advocating for the use of AI in resolving complex disputes).

200 *Id.* at 101–03.

201 *See id*. at 103–04 (discussing the success of AI systems as not only "expert systems" (limited areas of expertise), but also in completing tasks such as recognizing human faces, detecting language, and playing chess).

202 *Id.*

203 Rissland, *supra* note 173, at 1965 n.31.

204 *See generally id.* at 1965–66 (discussing how a rule-based system is programmed using an if-then system).

programmed in basic "if-then" format, a standard computational format providing that if certain conditions exist, then a conclusion or other set of actions follows.[205] Rule-based expert systems are now being expanded into thinking AI systems by formatting experts' problem solving methods as rules, combining them with existing, specialized knowledge, and putting them together using well-accepted programming tools.[206]

There are ample expert systems in use today in many fields.[207] Notably, these systems often assist and sometimes even take the place of experts outside of courts, due to their efficiency, consistency, and ability to dispassionately handle and synthesize vast amounts of data. For example, MYCIN and INTERNIST/ CADUCEUS are medical expert systems used by physicians for diagnosis and treatment advice.[208] Molecular Genetics ("MOLEGEN") is an expert system that gives advice to genetic engineers engaged in cloning and to biologists analyzing DNA.[209]

In law, expert systems have been developed for use by attorneys and regulatory bodies working in bankruptcy, immigration, estate planning, food and drug safety and securities matters, and to evaluate cases under the Uniform Commercial Code and Employees Retirement Income Security Act, among others.[210] In various ways, these expert systems evaluate input against existing information (including legal rules and analyses), draw inferences, make conclusions, and recommendations, and provide the reasoning therefor.[211] The GetAid expert system, developed by Australian computer scientists John Zelesnikow and Andrew Stranieri, is being used by Victoria (Australia) Legal Aid to predict whether potential clients will qualify for legal aid.[212] SplitUp is another expert system in use in Australia, which examines divorcing couples' assets to help resolve their property disputes.[213] In Amsterdam, an expert system applying Dutch landlord tenant law has been developed.[214]

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[205] *Id.* at 1965.

[206] *Id.* at 1966.

[207] *See* Spagnoletti, *supra* note 9, at 106 (discussing how several expert systems are in operation today).

[208] *Id.*

[209] *Id.* at 103 n.17.

[210] Spagnoletti, *supra* note 9, at 107; Nancy Blodgett, *Artificial Intelligence Comes of Age*, 73 A.B.A.J. 68, 68 (1987).

[211] Spagnoletti, *supra* note 9, at 107.

[212] *AI Am the Law*, *supra* note 182.

[213] *Id.*

[214] This system is a "hybrid system" which integrates rule-based and case-

Expert systems and machine learning algorithms are even being used currently to advise judges. In Brazil, judges use a computer program that is programmed with an algorithm to review past decisions and recommend results in matters involving traffic collisions.[215] Statistical software has been available to judges for many years to assist in sentencing, giving them an idea of sentencing on similar convictions in the past.[216] Judges can now use expert systems to do that and more, such as: evaluate the convict's record, their seriousness, and frequency, as well as a number of other factors to be considered in sentencing.[217] Then, these systems can weigh the factors and provide judges with the reasoning for their decisions.[218] While these expert systems don't make the decisions for the judges, they provide consultative or advisory tools to save time and provide consistency to decisions.[219] AI can provide the same function and benefits to judges facing expert admissibility decisions when sophisticated science and technology are at issue.[220]

C. Use of AI to Advise Judges Making Expert Admissibility Determinations

The intersection of expert regimes and computers and law already exists. CGIs are being used *by* experts and, in some senses, *instead of* experts.[221] Expert systems are used *as* experts in many fields, including the law, and machine learning combined with expert systems have become prevalent and powerful tools in all sectors of society, including law and the courts.[222] Bringing AI to support judges in their inquiries into the reliability of experts' proffered testimony is a logical step to improve outcomes when engaged in the difficult task of ensuring consistency, accuracy, efficiency, and fairness in courts when the

based reasoning. Rissland, *supra* note 173, at 1976–77.

[215] Jenkins, *supra* note 185, at 602.

[216] *AI Am the Law, supra* note 182.

[217] *Id.*

[218] *Id.*

[219] *Id.*

[220] *See e.g.*, *id.* (recognizing the use of AI systems in those fields that are within the realm of sophisticated science and technology).

[221] *See generally* Galves, *supra* note 5, at 188, 189 (discussing the benefits to using CGI's).

[222] *See AI am the Law, supra* note 182 (explaining how some courts are using AI systems).

intersection of science and law is at hand.

Current tools in use today simply don't meet the need.[223] As mentioned earlier, there are no specific procedures a judge must follow to determine an expert's reliability under FRE 702 or case law.[224] *Daubert* motions *in limine*, pretrial hearings to narrow issues, summary judgment motions, post-trial appeals, and the like are the most typical arenas in which the problem of judges as gatekeepers, passing judgment on methods and processes about which s/he likely knows little, arises.[225] Justice Blackmun, writing for the Court in *Daubert*, and others after him, have suggested more frequent and liberal use of FRE 706 for court-appointed experts.[226] FRE 706 permits, though does not require, a judge to appoint his/her own expert to enhance the court's understanding of an issue to reach a decision or aid in settlement negotiations.[227] The court's inherent authority can also be the basis for appointing experts who will not testify at trial, but will advise the judge on technical or scientific matters.[228] But there are several problems with a court appointing its own expert. First, there are no real standards or guidance on when or how

[223] *See* Brewer, *supra* note 13, at 1550 (discussing how judges, when making a *Daubert* inquiry, have neither the scientific knowledge nor tools to properly make these decisions, and are therefore forced to act as amateur scientists).

[224] *See supra* Part III.C.

[225] *See supra* Part III.C.

[226] *See generally* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 595 (1993) (explanation of purpose of Rule 706).

[227] *See generally* Joe S. Cecil & Thomas E. Willging, *Accepting Daubert's Invitation: Defining a Role for Court-Appointed Experts in Assessing Scientific Validity,* 43 EMORY L.J. 995, 1009 (1994) (discussing the reasons why some judges choose to invoke Rule 706). For examples of when the court has appointed experts under FRE 706 *see* Danville Tobacco Ass'n. v. Bryant-Buckner Assocs., Inc., 333 F.2d 202, 208–09 (4th Cir. 1964) (appointment of a master with knowledge about tobacco marketing); Hepting v. AT&T Corp., 439 F. Supp.2d 974, 1010–11 (N.D. Cal. 2006) (discussing the appointment of an expert to assist the court in determining which evidence, if disclosed, will create a danger to national security); DeAngelis v. A. Tarricone, Inc., 151 F.R.D. 245, 246–48 (S.D.N.Y. 1993) (appointment of an expert to evaluate physical and psychological impacts of gasoline leakage); *In re* Joint E. & S. Dists. Asbestos Litig., 122 B.R. 6, 7 (E.D.N.Y. 1990) (appointment of an expert and panel of experts to provide accurate estimates about asbestos exposure).

[228] Cecil, *supra* note 227, at 998, 1002–04; *see also* FED. R. EVID. 706 advisory committee's note ("The inherent power of a trial judge to appoint an expert of his own choosing is virtually unquestioned."). *See generally* Reilly v. United States, 863 F.2d 149, 156 (1st Cir. 1988) (clarifying the restrictions of FRE 706's restrictions on the court's ability to appoint a technical advisor); Note, *Improving Judicial Gatekeeping: Technical Advisors and Scientific Evidence*, 110 HARV. L. REV. 941, 948–51 (1997) (analyzing the parameters of FRE 706 and the courts inherent authority to appoint experts).

the court should appoint an expert.[229] Whom to appoint and how to supervise them, how to pay them, and the rules of engagement between the court appointed expert and the adversaries are very thorny issues.[230]

Neutral science panels or advisory boards are another option. These are generally groups of experts than can be used as "technical advisors" to the judge on substantive matters, appointed pursuant to the court's inherent authority.[231] They can also act as a sort of super-credentialing entity to help the judge evaluate the reliability of proffered experts in terms of their methodology and reliability, generally.[232] Such boards can also act as court appointed experts under FRE 706.[233] The Federal Judicial Center has studied each of these types of court appointed experts in the context of complex breast implant

[229] FRE 706 provides no instructions or standards for determining when an expert should be appointed. *See* Steele v. Shah, 87 F.3d 1266, 1271 (11th Cir.1996) (stating that under FRE 706, it is within the court's discretionary powers to choose when to appoint an expert witness either *sua sponte* or upon a motion by a party).

[230] *See* WRIGHT & GOLD, *supra* note 110, at § 6304 (raising issues of court appointed experts' biases and the special weight that the jury will give their testimony); *id.* at § 6305 (procedural issues of FRE 706); *see also* Cecil, *supra* note 227, at 21–22 (citing lack of suitable candidates to act as experts and compensation issues as reasons why judges opt against appointing experts).

[231] *See* Sofia Adrogue & Alan Ratliff, *The Independent Expert Evolution: From the "Path of Least Resistance" to the "Road Less Traveled?,"* 34 TEX. TECH L. REV. 843, 886 (2003) ("The use of court-appointed technical advisors has been on the rise, with . . . science panels and individual experts in breast implant, asbestos and other toxic tort litigation . . . and other novel scientific issues.").

[232] *See* Brewer, *supra* note 13, at 1615–16 (advocating for the implementation of Anthony Kenny's idea for an expert "register," which would act as a "super-credential"). Judge William Acker, Jr. of Alabama also seemed to support the creation of an expert registry in a letter to the Judicial Conference of the United States. Deborah C. Runkle, *Court-Appointed Scientific Experts: Providing Objective Scientific Advice to the Judiciary*, *in* SCIENTIFIC EVIDENCE REVIEW: CURRENT ISSUES AT THE CROSSROADS OF SCIENCE, TECHNOLOGY, AND THE LAW 25, 25 n.39 (2006). Scientific Advisory Boards are used in other contexts, such as in regulatory regimes, where science, technology, and law intersect, and policymakers need experts with a full grounding in the theoretical nature and methodologies of the science at issue. Tai, *Uncertainty About Uncertainty*, *supra* note 32, at 672–73 (discussing how regulatory agencies, similar to the courts, must employ "meta-experts" to assess the expertise of the individual boards being consulted).

[233] *See* Peter J. Gross et al., *Clearing Away the Junk: Court-Appointed Experts, Scientifically Marginal Evidence, and the Silicone Gel Breast Implant Litigation*, 56 FOOD & DRUG L.J. 227, 227 (2001) ("Courts can educate themselves and jurors by appointing independent experts to testify and consult on complex scientific matters.").

liability litigation.[234] The study looked at two cases where judges used expert panels to assist with managing scientific evidence proffered by plaintiffs to establish the link between silicone gel breast implants and various systemic connective tissue diseases.[235] Evaluation of the evidence required the judges to consider research in many scientific areas, including epidemiology, toxicology, immunology, and rheumatology.[236] The study found, among other things, that "[t]he cost, time, and difficulty of finding appropriate candidates who are willing to serve, and the problems of administering the work of the panel[s]" made them impractical in all but the most exceptional cases.[237] There were also serious conflict of interest issues, particularly in specialty areas where there is a small community of experts.[238] An AI system like that proposed here would not be plagued by these deficiencies and would solve many of the problems presented by the dictates of the FRE as interpreted by case law, when "amateurs [in] black robes . . . [must] assume the intolerable burden of becoming experts themselves in every discipline known to the physical and social sciences, and some as yet unknown but sure to blossom."[239]

D. How it Would Work

The AI system, "Expert Robot," could serve as either a technical advisor under the court's inherent authority, a special master under Federal Rule of Civil Procedure 53, or an independent expert under FRE 706, to advise a judge on his or her gate keeping function.[240] It would not be the final word on

[234] *See generally* LAURAL L. HOOPER ET AL., NEUTRAL SCIENCE PANELS: TWO EXAMPLES OF PANELS OF COURT-APPOINTED EXPERTS IN BREAST IMPLANTS PRODUCTS LIABILITY LITIGATION (Fed. Judicial Ctr. ed., 2001) (comparative analysis of the science panels used in two breast implant litigation cases).

[235] *Id.* at 1–2; *see also* 8, 13–14 (stating the facts specific to each case which influenced the judges to appoint experts).

[236] HOOPER, *supra* note 234, at 1–2. Judge Jones used the panel to assist him in making decisions about admissibility, while Judge Pointer used the panel to actually provide testimony at trial. *Id.* at 3. Both judges appointed special masters to help select the experts on the panels. *Id*, at 8, 27.

[237] *Id.* at 5.

[238] *Id.*

[239] Stephen Breyer, *Introduction*, *in* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 7 (Fed. Judicial Ctr. ed., 2d ed. 2000).

[240] *See generally* Margaret Farrell, *Coping with Scientific Evidence: The Use of Special Masters,* 43 EMORY L.J. 927 (1994) (describing the court's authority to appoint experts under FRE 706 and FRCP 53). Rules for the development of the AI system would have to be written, with the help of AI experts and

admissibility of an expert, nor would it be crucial to the judge's effort to evaluate the conclusions the expert plans to draw in his or her testimony, because this type of inferential or deductive reasoning is generally within the special competence of judges.[241] The AI system would, however, have access to a vast database of knowledge and information, both scientific and legal. It would be able, then, to apply that knowledge and information to the expert testimony under consideration. The reliability of the testimony would be assessed against the science using the admissibility factors set forth in the FRE 702, as interpreted by evolving case law.

On the science, the AI system would be programmed to access the published scientific literature in a specialty field and analyze it to explore the details, methodologies, and reasoning used in the discipline. Where there are no existing databases, or to supplement those that exist, an algorithm for curation, evaluation, and ranking of scientific literature has been developed by researchers at North Carolina State University.[242] The algorithm they developed is part of a text-mining process that evaluates text from thousands of peer-reviewed scientific papers dealing with how environmental chemicals interact with genes to impact human health (toxicogenomics), and ranks the papers for relevancy, among other things.[243] The toxicogenomics AI system uses, and takes one step further, machine-learning methods used in programs like Wormbase and Textpresso[244] that have been used for years to access and manipulate existing databases, like PubMed, the resource database of the National Center for Biotechnology Information.[245]

programmers, and adopted by the legislature for its use by judges.

[241] *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579 (1993) (describing the judge's role as gatekeeper to scientific evidence).

[242] *See* Allan Peter Davis et al., *Text Mining Effectively Scores and Ranks the Literature for Improving Chemical-Gene-Disease Curation at the Comparative Toxogenomics Database*, PLOS ONE (Apr. 17, 2013), http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0058201&representation=PDF (describing a text-mining program that searches scientific articles based on toxicogenomics).

[243] *Id.*

[244] *See generally* Hans-Michael Muller et al., *Textpresso: An Ontology-based Information Retrieval and Extraction System for Biological Literature*, PLOS ONE (Sept. 21, 2004), http://www.plosbiology.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pbio.0020309&representation=PDF (describing "Textpresso," a program that mines scientific literature by searching for categories of terms).

[245] Davis et al., *supra* note 242. PubMed is a database that compiles

While enlisting the help of AI experts and programmers would be essential to develop the details of this effort, the basic idea of the Expert Robot AI program would be to use a structural framework organized around and delving into the scientific methods used and written about in published scientific literature and studies.[246] An argumentation scheme of expert opinion "specifically designed . . . to deal with problems of both the admissibility and the evaluation of expert opinion testimony" already exists, and can be used as part of the modeling for the program.[247] So could a program like IBM's chess-playing program, Deep Thought, which captures another style of expert reasoning.[248]

The categories of concepts comprising the framework would follow the science, as well as blueprints contained in existing reference guides created to assist judges with identify issues in, and providing analytical approaches to, areas where expert evidence is frequently offered, such as reference guides on medical testimony, epidemiology, toxicology, statistics, engineering practice and methods, and more.[249] These guides identify specific issues in each specialty area, and break them down into a series of questions that a judge might explore in a *Daubert* inquiry into to the methodology and reasoning underlying the proffered expert's testimony. These questions can be used as prototypes for (or at least additions to) the ontology of Expert Robot.

Next, the AI program would consider the proffered expert testimony and the studies upon which the expert is relying. Experts whose opinions are derived from reliable, well-defined scientific methodologies will be relatively easy to assess with AI. The Expert Robot will be able to evaluate the expert testimony under its rules and compare it with vast stores of existing literature and studies to determine whether the experiment's design has been subject to review within the relevant scientific

biomedical literature from MedLine, life science journals, and online books. PUBMED.GOV, http://www.ncbi.nlm.nih.gov/pubmed (last visited Oct. 6, 2013).

[246] The ontology may have to vary for special field of science or technology where the rules of experimentation are different.

[247] Douglas Walton, *Visualization Tools, Argumentation Schemes and Expert Opinion Evidence in Law*, 6 L. PROBABILITY & RISK 119, 120 (2007).

[248] Rissland, *supra* note 173, at 1959 n.17.

[249] *See generally* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 83–632 (Fed. Judicial Ctr. ed., 2d ed. 2000) (setting out judicially recognized reference guides on statistics, multiple regression, survey research, etc.).

community. It will see whether the study reveals details for independent investigators to recreate, and almost immediately will be able to identify existing studies where the same or similar methods were used, and their results.[250] The AI system will detect whether the data from the relied-upon experiment was collected appropriately, using the pre-programmed and learned rules.[251] Through comparative analysis, it will show to the judge whether the method of data analysis used by the proffered expert is accepted in the relevant area of substantive science, and whether the conclusions drawn from data used formal, logical techniques accepted in the expert's field.[252] In addition, the system would be able to assess whether the hypothesis of study lays within the expert's area of expertise, and could detect potential biases of the expert, through input of information about the expert's resume including his/her grants, affiliations, and scholarship.[253] The AI robot will be able to manipulate and display its comparative information in whatever way and level of detail the judge desires.[254]

The AI system will be trained to use scientific methods from previous studies in the relevant field for comparison, and also tuned to consider how the particular methodology's admissibility has been ruled on in previous cases, if at all, and the reasoning therefor.[255] It will also incorporate the reasoning for its application in future cases, so as to keep itself accurate and up-to-date. So, for example, if an expert on epidemiology were proffered, the AI robot would put his/her methodology through the epidemiological scientific databases to discover studies and scholarly writings. The system's findings regarding study and data analysis methods in the epidemiological community would be applied to the proffered expert's testimony. Expert Robot would also put the proffered testimony through the case law databases to find previous court rulings on epidemiological expert testimony. If it found a case in which the court accepted a methodology not previously found reliable, this new rule would

[250] *See* Abramson, *supra* note 8, at 727 n.12 (explaining that these attributes are a broadly accepted hallmark of good science, commonly referred to as the "replicability" standard).

[251] *Id.* at 743.

[252] *Id.*

[253] *Id.*

[254] *See generally id.* at 744–46 (describing the process by which a judge should apply the *Daubert* test).

[255] *See generally id.* at 747–48 (discussing methods of scientific inference).

be "learned" by the AI system, and added to the existing framework. The judge would be able to see which methodological rules, both from the scientific and case law databases, were most common and/or reliable and which where outliers. It would be up to the judge to decide what limits are acceptable.

Sometimes there may be overlap in issues and specialty areas so that, for example, both the epidemiology and immunology databases may need to be accessed for the methodologies involved in studying the expert testimony at hand. This would be very expensive and unwieldy without the AI system, leaving the judge to identify the issues, access the information, then assess the results in what is likely a strange, new field for him/her.[256] The AI system would be able to not only access all the information quickly and synthesize the results, but also break them out by specialty for the judge to review, and include an analysis of the degree of reliability of each method.

The type of AI system being proposed for use in courts to assist judges would improve consistency and fairness in judicial decision-making.[257] FRE 702 does not provide much guidance to judges—non-scientists, generally—on how to assess scientific reliability.[258] So, the decisions have varied depending on the nature of the case, the judge, and the type of expert testimony.[259] Although I have not discovered a comprehensive study on this phenomenon, one can imagine a court considering the same complex study in toxicology used by an expert in a contract case against a manufacturer as unreliable, where in a personal injury case involving a child, the same study may be found reliable.[260]

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[256] *See* Wissler, et al.,*supra* note 110, at 356–57 (describing the process by which judges screen expert testimony as a way to limit misleading experts from testifying or jurors placing too much weight on one expert's testimony over the because of being awe-struck as a paradox since judges must make determinations about issues where they too "lack knowledge or understanding").

[257] *See generally* Wissler, et al., *supra* note 110, at 356–57 (describing the current issues and inconsistencies with judicial decision-making process absent the use of AI).

[258] *See* FED. R. EVID. 702 (list of factors experts must meet in order to testify); *cf.* Fed. R. Evid. 702 advisory committee's notes (explaining that the rules were updated to reflect the rulings in *Daubert* and its progeny in order to assist trial judges in excluding unreliable testimony).

[259] Wissler, et al., *supra* note 110, at 370–71 (looking at how *Daubert* factors were used by conflicting judges on Fourth Circuit to admit and exclude the same fingerprint expert in *United States v. Crisp*).

[260] *Cf.* DAVID S. CAUDILL & LEWIS H. LARUE, NO MAGIC WAND: THE IDEALIZATION OF SCIENCE IN LAW 19–21 (2006) (examples of *Daubert* decisions

The factors are that malleable and subject to error in the hands of non-scientists.[261] This lack of uniformity undermines the integrity of the process and is untenable.[262] And, it would be less likely to occur when using an AI system that assesses and compares the methodologies at issue in a uniform way, in accordance with the distinct rules and peculiarities of the specialty area, and in relation to previous court rulings, and presents its synthesis and details to the judge.

Judges' decisions on reliability would likely be more accurate, and, on the whole, cost less to arrive at, than current systems to assist judges with these determinations, like court appointed experts under FRE 706, meta-experts, science panels and the like.[263] An AI system would be able to communicate not just the reliability, but also the range of certainty of the science under consideration.[264] The difficulty of finding a court-appointed expert free of professional or institutional biases would be allayed.[265] And accessing Expert Robot would not cost the litigants any money, thus preventing the inequalities that plague the expert system in adversarial settings, generally, from extending to this portion of the litigation. In other alternatives, for example Rule 706 court appointed experts, one party, either the proffering party or the party objecting to the expert, picks up the tab for the expert.[266] The cost of using Expert Robot, I would argue, should be picked up by the court system as is done with court appointed

reversed on appeal).

[261] *Id.*

[262] *See id.* at 31–44 (theorizing that the court's idealization of science and scientists, and the gullibility of judges creates a harmful dichotomy).

[263] No doubt that the up-front cost of creating Expert Robot would be great and its maintenance costly, but once created and available, accessing it would cost little.

[264] *See* Tai, *Uncertainty About Uncertainty*, *supra* note 32 (offering an in-depth discussion of the challenges of scientific uncertainty); *see also supra* Part I.

[265] *Cf.* 29 THE LATE CHARLES ALAN WRIGHT, KENNETH W. GRAHAM JR., VICTOR JAMES GOLD & MICHAEL H. GRAHAM, FEDERAL PRACTICE AND PROCEDURE § 6301 n.4 (citing *Position Paper on Proposed Fed. R. Evid. 706, Comm. of Fed. Evid. & Procedure, Ass'n of Trial Lawyers of America*, 2 House Hearings 141–44) (expressing concern about bias in appointment of experts by the court).

[266] Cecil, *supra* note 227, at 1048. This increased cost may be prohibitive for those less-resourced parties. *See* Edward J. Imwinkelried, *Impoverishing the Trier of Fact: Excluding the Proponents Expert Testimony due to the Opponents Inability to Afford Rebuttal Evidence*, 40 CONN. L. REV. 317 (2007) (describing the difficulty of weighing the probative value of an expensive expert witnesses against the unfair prejudice an opposing party faces who cannot afford a similar expert).

experts in criminal cases today.[267]

Expert Robot would not usurp the function of judges in their gate keeping role or the jury in its fact-finding role. It would provide judges with completely neutral, objective assistance in evaluating complex scientific and technical issues so that they need not become experts themselves.[268] Judges would use the AI system's information and analysis in their decision-making.[269] And they would use their well-developed logic skills to determine whether "the expert has reliably applied the principles and methods to the facts of the case,"[270] i.e., whether the methods and conclusions are connected closely enough to present to the jury. The scientific techniques would be subject to AI, but the jury, after some vetting by the judge, would still decide on whether conclusions of the expert have been validly drawn from the science, a distinction between methods and conclusions treated with importance in *Daubert*.[271]

Overall, using an AI system as described would lead to better decision making, ensure more uniformity and integrity in the process, and therefore greater trust in the system. It also might have more far reaching benefits. It would arguably enhance the business climate by improving verdicts in tort litigation, where the battles of the experts are often most fierce and expensive.[272] Verdicts relying on unreliable science create a climate of fear and uncertainty, encouraging frivolous lawsuits, and unpredictable results.[273] Justice Breyer made this argument in *Joiner*, not for AI in particular but for effective gate keeping, which it can advance:

> [M]odern life, including good health as well as economic well-being, depends upon the use of artificial or manufactured substances,

[267] Timothy Hillman, *Using Court-Appointed Experts*, 36 NEW ENG. L. REV. 587, 588 (2002).

[268] *Cf.* Derek L Mogck, *Are We There Yet?: Refining the Test for Expert Testimony Through Daubert, Kumho Tire And Proposed Federal Rule of Evidence 702*, 33 CONN. L. REV. 303, 320–321(highlighting the dangers of expert bias when educating judges).

[269] *Cf. id.* (explaining how judges must currently use experts to aid in their analysis).

[270] FED. R. EVID. 702(d).

[271] Daubert v. Merrell Dow Pharm., 509 U.S. 579, 596 (1993).

[272] *See* Edward V. Di Lello, *Fighting Fire with Firefighters: A Proposal for Expert Judges at the Trial Level,* 93 COLUM. L. REV. 473, 474 (1993) ("[E]xpert testimony . . . 'has led to longer trials [and] more expensive litigation.'") (citation omitted).

[273] Gottesman, *supra* note 57, at 777–78 (noting forum shopping and inconsistency in rulings on similar issues as adverse consequences).

> such as chemicals. And it may, therefore, prove particularly important to see that judges fulfill their *Daubert* gate keeping function, so that they help assure that the powerful engine of tort liability, which can generate strong financial incentives to reduce, or to eliminate, production, points towards the right substances and does not destroy the wrong ones.[274]

Of course, there would be some challenges in creating the software and objections to overcome with this plan. In any software, there is danger of programming bias, and the curation and assessment aspects of the AI system would also be open to this peril.[275] However, Expert Robot would be created in advance of any litigation for which it will be used. There would be no systemic bias or incentive to reflect any other bias of programmers of this type of AI system. In fact, it would undermine their business to do so.[276]

Where the scientific method is not the measure of reliability, e.g., when expert's personal knowledge or experience is the basis for proffered testimony, then it would be harder to fashion a program to meet the standard.[277] There also may be Confrontation Clause issues presented with the use of this AI system.[278] The 2009 U.S. Supreme Court case *Melendez-Diaz v. Massachusetts* expanded the meaning of the Sixth Amendment's Confrontation Clause to require forensics experts to testify in order to admit their laboratory findings into evidence, leaving

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[274] Gen. Elec. Co. v. Joiner, 522 U.S. 136, 148–49 (1997) (Breyer, J., concurring).

[275] Spagnoletti, *supra* note 9, at 109.

[276] *See* Galves, *supra* note 5, at 249–50 (stating that programming bias in CGE software is highly uncommon since the program is based on math and/or physics. However, mistakes or "lies" found in such programs are usually found in mass produced ones rather than custom made programs, and because of the easy detectability of errors in math and physics the entire program is discredited).

[277] The extension of *Daubert* by *Kumho* to non-scientific testimony makes a blanket application of AI to assist in gate keeping more problematic. It may make sense to stick to scientific or technological expert testimony only when initially developing the AI system. Although even for non-scientific testimony the AI system could be used to assess the general acceptance of the methodology being used by the expert, the Frye test that remains as one of the many screening factors under *Daubert*. Daubert v. Merrell Dow Pharm., 509 U.S. 579, 596 (1993).

[278] *See generally* Deborah Meyer, *Melendez-Diaz v. Massachusetts: What the Expanded Confrontation Clause Ruling Means for Computer Forensics and Electronic Discovery*, 28 TEMP. J. SCI. TECH & ENVTL. L. 243, 276–77 (2009) (discussing the burdensome impacts of the heightened protection of the right to confront those who proffer evidence against a party).

open the possibility of its application to data generated by computers, like our AI system.[279] However, it is not likely that *Melendez* will be applied to the AI system advising the judge, since it would not be producing anything close to testimonial evidence for trial.[280]

An adversary whose proffer is blocked by a judge relying on the system would likely raise these and other issues during pendency of the action and/or on appeal.[281] There would have to be rules providing for parties to have access to the AI system's contribution to the judge's decision, so that contested aspects of the development of the AI system would come to light.[282] This transparency would lead to improvements in the system.[283]

V. CONCLUSION

The judge's function as gatekeeper to the admissibility of expert testimony is intended to retain the role of the jury as fact-finder and balance this against a search for truth.[284] The idea is to allow the jury system to function but be sure that it is being done in the pursuit of truth. Experts from both sides that are admitted will testify at trial, but the system under Daubert does not leave it to the fact-finder to determine whether what they are hearing is reliable. Nor should it be left to an unaided judge. The current options available to assist judges are not readily accessible and, when accessed, are not effective. As a result, the reliability inquiry is, at best, less than it should be; all this at a time when the role of science and technology in today's trials is growing and becoming more complex.

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[279] Melendez-Diaz v. Mass., 557 U.S. 305 (2009); *see also* Meyer*, supra* note 278, at 276–77.

[280] *See generally Melendez*, 557 U.S. at 307, 310 (providing a list of a core class of testimonial statements).

[281] *See* Meyer*, supra* note 278, at 276–277 (discussing the expanded rights of parties to confront those who offer evidence against them.)

[282] It is doubtful that the mandatory disclosure rules of the Federal Rules of Civil Procedure ("FRCP"), FRCP 26 (a)(2)(B), requires data or other information considered by the [expert] witness in forming the opinions. Any exhibit to be used as summary of or support for the opinions would be applied to the AI system upon which a judge would rely, and so the ability to challenge the system, and therefore improve it, will be hampered unless other rules are developed. Fed. R. Civ. P. 26(a)(2)(B).

[283] *See* Tai, *supra* note 32, at 636 ("Transparency . . . could also be seen as a technique for enhancing the legitimacy" of deliberations in regulatory bodies).

[284] WRIGHT & GOLD, *supra* note 110, at § 6262.

June 28, 2013 marked the 20th anniversary of *Daubert*.[285] Rather than permit the current problems under this case, and FRE 702 to persist for another twenty years, and lamenting its challenges and failures, we should accept a limited role for AI in judge's chambers. This is not only important to relieve the pressure on judges to perform a function for which they are not trained in the hurried atmosphere of litigation and to address the inaccurate, unreasoned, and inconsistent admissibility determinations that result. "It is . . . essential in this science-related area that the courts administer the Federal Rules of Evidence in order to achieve the 'end[s]' that the Rules themselves set forth, not only so that proceedings may be 'justly determined,' but also so 'that the truth may be ascertained.'"[286]

Technology is not always the answer to everything, but in this case, the existence and use of digital databases, expert systems, and AI, in both science and law engaged in similar pursuits, makes its adaptability to assist judges in assessing science—to let in the good and keep out the junk—practically unavoidable.[287] Obstacles exist but opening the door to consideration and development will reveal the benefits as well as the challenges, from which improvements may be made. Maybe Plato was right: pen and paper technology has destroyed knowledge and truth, and replaced them with "the semblance of truth."[288] But maybe it has advanced truth, which is what Expert Robot seeks to do.

[285] Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

[286] Gen. Elec. Co. v. Joiner, 522 U.S. 136, 149 (1997) (Breyer, J., concurring)

[287] *Cf.* Fedric I. Lederer, *The Road to the Virtual Courtroom? A Consideration of Today's—and Tomorrow's High—Technology Courtroom,* 50 S.C. L. REV. 799, 803 (1999) (stating that the courtroom is not a vacuum, and must also adapt technological changes).

[288] Plato, *supra* note 1.