How Machines Reveal the Gaps in Evidence Law

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INTRODUCTION

This Symposium asks participants to reimagine the Federal Rules of Evidence on the fiftieth anniversary of their effective date. As part of that conversation, this short Essay argues that the Rules of Evidence contain critical gaps in terms of empowering litigants to

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meaningfully challenge the credibility of evidence. Specifically, the increasing use of machine-generated proof has made clear that evidence law does not offer sufficiently meaningful opportunities to scrutinize conveyances of information whose flaws cannot be exposed through cross-examination. These underscrutinized conveyances include machine-generated output, information conveyed by animals, and statements made by absent hearsay declarants. Even for some witnesses who can be cross-examined—such as eyewitnesses offering identifications and experts using a testable method—evidence law too often fails to subject their claims to meaningful scrutiny because of its overreliance on cross-examination.

As I explain below, these gaps have not always existed. That is, the rules of evidence have not always myopically focused on cross-examination as the primary means of testing human assertions, nor have they always excluded claims whose flaws cannot easily be tested by cross-examination from the scope of testimonial safeguards.[1] Instead, this narrowing of evidence law appears to correspond with the rise of the "lawyerly art" of cross-examination in the mid-nineteenth century and a greater focus on the one testimonial infirmity of humans—insincerity—particularly suited to testing by cross-examination.[2] Ironically, the legal case for a right to meaningfully scrutinize machine-generated proof might have been easier to make in 1823 than in 2023.

Of course, it is not too late to correct course. After explaining how evidence law has critical gaps because of an overemphasis on cross-examination and the danger of insincerity, this Essay suggests changes to evidence rules and constitutional evidence doctrines that would better achieve accuracy—especially as proof becomes exceedingly technologically complex over the next fifty years.

I. THE NEED FOR SCRUTINY OF HUMAN AND NONHUMAN SOURCES OF INFORMATION BEYOND CROSS-EXAMINATION AT TRIAL

In this Part, I explain how current evidentiary rules categorize proof and argue that this categorization leaves critical gaps in credibility testing of sources of information, both human and nonhuman.

1. *See* discussion *infra* Section II.A.
2. *See* discussion *infra* Section II.B.

A. Overview of Existing Evidentiary Safeguards

The Federal Rules of Evidence, and nearly all state rules, divide the universe of proof into two categories: (1) human assertions intended as assertions, offered for their truth, and (2) everything else.[3] The "everything else" category includes not just physical objects, but nonhuman sources of information, such as dog alerts or machine-generated conveyances of information.[4] It even includes certain human acts or utterances offered to prove something by inference, based on the person's belief that something is true (i.e., "implied" assertions, which are currently treated by nearly all jurisdictions as nonassertive physical conduct).[5]

Human assertions, at least those intended as assertions and offered to prove the truth of the matter asserted, are subject to a few key safeguards that offer the jury more context to judge credibility. Live witnesses are subject to physical confrontation, cross-examination, and the oath, as well as a few additional requirements when necessary (such as qualification and reliability requirements for testifying expert witnesses).[6] These requirements are enforced through the rule against hearsay, which excludes certain out-of-court human assertions if offered for their truth,[7] and in criminal cases, the Sixth Amendment's Confrontation Clause.[8] In addition, Federal Rule of Evidence 806 and its state analogs allow litigants to impeach hearsay declarants (such as declarants of dying declarations and business records) in any way they could be impeached had they testified at trial.[9]

Meanwhile, all other evidence—physical objects, nonhuman sources of information, and impliedly assertive human acts and utterances—is subject to almost no safeguards, other than the requirement that it be authenticated as "what the proponent claims it

3. *See* Andrea Roth, *Machine Testimony*, 126 YALE L.J. 1972, 1984–85 (2017) (explaining the development of evidentiary categories of "testimonial" and "physical" evidence).

4. *See generally id.* (explaining how nonhuman conveyances of information are akin to testimony but are treated as physical evidence under existing rules).

5. *See, e.g.*, Stoddard v. State, 887 A.2d 564, 577 (Md. 2005) (noting that its view that implied assertions constitute hearsay is considered the "minority" view).

6. *See, e.g.*, Roth, *supra* note 3, at 1984–85 (discussing testimonial safeguards for live witnesses).

7. FED. R. EVID. 801-802 (presumptively excluding statements by human declarants when offered to prove the truth of the matter asserted).

8. U.S. CONST. amend. VI ("In all criminal prosecutions, the accused shall enjoy the right . . . to be confronted with the witnesses against him . . . .").

9. *See, e.g.*, FED. R. EVID. 806 ("When a hearsay statement . . . has been admitted in evidence, the declarant's credibility may be attacked . . . by any evidence that would be admissible for those purposes if the declarant had testified as a witness."); *see also* ARIZ. R. EVID. 806 (same).

is."[10] For example, to introduce a baggie of cocaine in a drug distribution case, the prosecution would have to satisfy the jury, through a showing of chain-of-custody witnesses, that the baggie was the same one collected from the suspect or scene.[11] Likewise, to introduce a dog alert, thermometer reading, or Google Earth result, the proponent need only authenticate it through "[e]vidence describing a process or system and showing that it produces an accurate result."[12]

At first, this might seem like a decent state of affairs; after all, John Henry Wigmore declared cross-examination the "greatest legal engine ever invented for the discovery of truth."[13] Cross-examination is indeed a powerful tool for both discovery (to learn more about the context of a witness's testimony) and exposing flaws (to allow the cross-examiner to elicit prior acts of untruthfulness, prior inconsistencies, and the like). True, some sources of information cannot be cross-examined, including implied assertions, admissible hearsay of absent declarants, and animal and machine sources. The logic, however, goes that these sources of information are either incapable of being cross-examined or are unlikely to be insincere and are thus less likely to benefit from cross-examination.[14]

The problem is that this logic gets things backwards. If we cared about ensuring that jurors draw the correct inferences from sources of information, we would determine what might make jurors reach incorrect conclusions and then craft safeguards to meet those sources of inferential error. If a source of information, like a dog alert or machine output, might appear accurate to a juror but, in fact, be tainted by misperception or ambiguity, we should presumably find ways to minimize or expose such flaws. But these sources of information are treated merely as physical evidence and are therefore not subject to the sorts of safeguards reserved for evidence we deem testimonial. In turn, the Rules of Evidence have essentially defined testimony as "anything that would benefit from cross-examination" and then made the primary testimonial safeguard cross-examination. We should not be surprised

10. FED. R. EVID. 901(a).

11. *See, e.g.*, United States v. Collado, 957 F.2d 38, 39 (1st Cir. 1992) (deeming the plastic bag of cocaine found at the scene to be sufficiently authenticated as evidence).

12. FED. R. EVID. 901(b)(9); *see also* United States v. Lizarraga-Tirado, 789 F.3d 1107, 1109–10 (9th Cir. 2015) (holding that Google Earth results are not hearsay and are thus subject only to authentication rules).

13. 5 JOHN HENRY WIGMORE, EVIDENCE IN TRIALS AT COMMON LAW § 1367, at 32 (James H. Chadbourn rev. ed. 1974) (1904).

14. *See, e.g.*, FED. R. EVID. 801 advisory committee's note to subdivision (a) of the 1972 proposed rules (explaining that implied assertions are exempt from the definition of hearsay because they are not likely to be insincere); Maryland v. Craig, 497 U.S. 836, 850 (1990) (permitting testimony from child victim outside defendant's physical presence in part because the confrontation right can be overcome "where the reliability of the testimony is otherwise assured").

that such a circular definition of testimony has created gaps in our ability to scrutinize the unreliability of sources of information. As it turns out, that is true with respect to credibility testing of both human and nonhuman sources.

B. Gaps in Credibility Testing of Human Sources

The first gap caused by this circular approach to defining testimony and testimonial safeguards is that it leaves out other methods of testing of human witnesses that might better discover and expose flaws. There are many potential flaws in human testimony beyond insincerity: a witness could misremember or misperceive events, make an analytical error, misspeak, or speak in an ambiguous way that is misunderstood by the jury.[15]

For some relied-upon sources of information—most notably, experts, children, eyewitnesses, and declarants of implied assertions—cross-examination is not a particularly effective means of testing their credibility. In part, this is because these sources' flaws tend to stem from testimonial infirmities other than insincerity, such as misperception, faulty memory, inarticulateness, or ambiguity. If an eyewitness or child is not telling the truth, it is often a result of an honest mistake, a misunderstanding of meaning, or even suggestive questioning, rather than a lie.[16] As Jules Epstein puts it, when it comes to rooting out inaccurate eyewitness identifications, cross-examination is "The Great Engine That Couldn't."[17] Similarly, if an expert's conclusions are faulty, it is likely the result of flawed methodology

15. These infirmities are typically referred to by evidence scholars as the "hearsay dangers," although they lurk to various extents in all human sources of information, not merely those classified as hearsay. *See generally* Edmund M. Morgan, *Hearsay Dangers and the Application of the Hearsay Concept*, 62 HARV. L. REV. 177 (1948) (discussing the classification of hearsay and the consequences of its automatic exclusion).

16. *See* Jules Epstein, *The Great Engine That Couldn't: Science, Mistaken Identifications, and the Limits of Cross-Examination*, 36 STETSON L. REV. 727 (2007) (explaining that flaws in eyewitnesses are difficult to expose through cross-examination because they do not stem from insincerity).

17. *Id.* at 727; *see also* Jacqueline McMurtrie, *The Role of the Social Sciences in Preventing Wrongful Convictions*, 42 AM. CRIM. L. REV. 1271, 1277 (2005) ("Although cross-examination is a powerful tool for exposing lies, it is not particularly effective when used against eyewitnesses who believe they are telling the truth."); Suedabeh Walker, Comment, *Drawing on* Daubert*: Bringing Reliability to the Forefront in the Admissibility of Eyewitness Identification Testimony*, 62 EMORY L.J. 1205, 1205, 1221–24 (2013) ("Further, [eyewitness identification evidence] is not susceptible to the traditional protections of the adversarial system, such as confrontation and cross-examination. These features set eyewitness identification testimony apart from other types of evidence, warranting special attention by courts."); Jonathan Clow, *Throwing a Toy Wrench in the "Greatest Legal Engine": Child Witnesses and the Confrontation Clause*, 92 WASH. U. L. REV. 793, 794 (2015) (noting that cross-examination of child witnesses is often counterproductive in reaching the truth because of capacity and suggestibility issues).

rather than a flat-out lie.[18] For example, the FBI's false allegations against Brandon Mayfield in the 2004 Madrid train bombing were based on an erroneous, but not deliberately so, fingerprint "match."[19] In turn, the types of discovery and exposure tools that would best test these assertions likely are not physical confrontation, cross-examination, and the oath. Instead, tools that reveal more information about the procedures and methodologies that resulted in these expert assertions would be most helpful to fact finders.[20]

Even with respect to witnesses who may be lying, cross-examination is not always the best means of discovering and exposing insincerity. For some litigants, a more empowering alternative might grant them access to witnesses' prior statements and allow them to present any inconsistencies to the jury.[21] A litigant might also value, more highly than cross-examination, access to extrinsic evidence demonstrating the witness's character for untruthfulness or specific prior acts of untruthfulness, such as a relevant prior false allegation.[22]

And yet, these alternative means of testing human witnesses are often not guaranteed to litigants under current rules and doctrines. While the Jencks Act gives federal litigants access to certain prior

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18. *See, e.g.*, Jules Epstein, *Cross-Examination: Seemingly Ubiquitous, Purportedly Omnipotent, and "At Risk,"* 14 WIDENER L. REV. 427, 437–38 (2009):

> Other problematic circumstances [where cross-examination is ineffective] include cases where the witness is lying or mistaken but no impeaching evidence such as a prior inconsistent statement or criminal record exists; where a scientific laboratory has conducted flawed tests or discarded contradictory results; or where an accepted scientific technique is presented as reliable, only to be proved inaccurate years later after further research and new scientific developments;

Douglas M. Lucas, *The Ethical Responsibilities of the Forensic Scientist: Exploring the Limits*, 34 J. FORENSIC SCIS. 719, 724 (1989) ("If cross-examination is to be the only way to discover misleading or inadequate testimony by forensic scientists, then too much is being expected from it . . . ."); Edward K. Cheng & G. Alexander Nunn, *Beyond the Witness: Bringing a Process Perspective to Modern Evidence Law*, 97 TEX. L. REV. 1077, 1091 (2019) (arguing that experts who follow a testable process are better scrutinized through process-based testing beyond cross-examination); David Alan Sklansky, *Hearsay's Last Hurrah*, 2009 SUP. CT. REV. 1, 73 (arguing that cross-examination is not particularly effective as a means of testing the accuracy of forensic experts).

19. *See* OFF. OF THE INSPECTOR GEN., U.S. DEP'T OF JUST., A REVIEW OF THE FBI'S HANDLING OF THE BRANDON MAYFIELD CASE 1–2 (2006), https://oig.justice.gov/sites/default/files/archive/special/s0601/final.pdf [https://perma.cc/Z4GX-5QZS].

20. *See, e.g.*, Cheng & Nunn, *supra* note 18, at 1091 (arguing for process-based discovery rather than cross-examination for experts using testable processes); Sklansky, *supra* note 18, at 73.

21. *See, e.g.*, Andrea Roth, *What Machines Can Teach Us About "Confrontation,"* 60 DUQ. L. REV. 210, 213–14 (2022) (noting the importance of access to prior statements under *Jencks v. United States*, 353 U.S. 657 (1957), as compared to cross-examination).

22. *See id.* at 211 n.6 (discussing prior false allegations); Jackson v. Nevada, 688 F.3d 1091, 1101–04 (9th Cir. 2012) (holding that denial of habeas petitioner's ability to impeach alleged victim with extrinsic evidence of prior false allegation violated the right to present a defense), *rev'd*, 569 U.S. 505 (2013).

statements by witnesses on the same subject matter,[23] the Act does not apply to hearsay declarants,[24] witnesses in civil cases, or state court litigants—many of whom are in jurisdictions with no Jencks analog.[25] Nor is access to prior statements of witnesses deemed constitutionally guaranteed under current doctrine. Instead, the Supreme Court's most recent pronouncement on the subject is that access to prior statements and other impeachment material is not constitutionally guaranteed,[26] and that the Confrontation Clause of the Sixth Amendment is essentially a right of cross-examination, nothing more.[27]

The right to meaningfully scrutinize hearsay declarants' claims is also precarious at best under existing doctrine. Although Federal Rule 806 and its state analogs give litigants the right to impeach a hearsay declarant in any way that would have been available had the declarant testified live, these rules are not constitutionally guaranteed and could be revoked by legislatures at any time.[28] Moreover, Rule 806 and its analogs at most allow the chance to *admit* evidence of a claim's

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23. Jencks Act, 18 U.S.C. § 3500. Congress enacted the Jencks Act to codify (and limit) the Supreme Court's decision in *Jencks v. United States*, 353 U.S. 657 (1957), that "the defendant on trial in a federal criminal prosecution is entitled, for impeachment purposes, to relevant and competent statements of a government witness in possession of the Government touching the events or activities as to which the witness has testified at the trial." Campbell v. United States, 365 U.S. 85, 92 (1961).

24. While a handful of scholars and litigants have argued that the principles of the *Jencks* case should apply to hearsay declarants, courts have rejected all such arguments. *See, e.g.*, John G. Douglass, *Beyond Admissibility: Real Confrontation, Virtual Cross-Examination, and the Right to Confront Hearsay*, 67 GEO. WASH. L. REV. 191, 266 (1999) (arguing that hearsay declarants should be covered by the Jencks Act, and that the rationales underlying the Act's limits on *Jencks* are not inconsistent with this expansion); Roth, *supra* note 3, at 2052 ("The Jencks Act, for example, does not apply to human hearsay accusers, even though access to the prior statements of hearsay declarants to impeach them through inconsistency, even if not on cross-examination, might be critical to the defense."); Watkins v. United States, 846 A.2d 293, 300 (D.C. 2004) (sympathizing with the argument that the Jencks Act should apply to hearsay declarants, but declining to exercise its supervisory power to fill the gap in the absence of congressional action).

25. *See, e.g.*, Pennsylvania v. Ritchie, 480 U.S. 39, 52 (1987) ("If we were to accept this broad interpretation of *Davis*, the effect would be to transform the Confrontation Clause into a constitutionally compelled rule of pretrial discovery. Nothing in the case law supports such a view."); ALA. R. CRIM. P. 16.1 (expressly disallowing discovery of prior statements and having no Jencks analog). Alabama's Rule 16.1 appears to be a mistake; it is fashioned on the Federal Rule of Criminal Procedure 16(a)(2), but that rule simply ensures that federal Jencks material need not be turned over before trial. *See id.*; FED. R. CRIM. P. 16(a)(2). In a state without a Jencks analog, such a rule simply renders prior statements undiscoverable for no apparent reason.

26. The only exception to this is the *Brady* doctrine, under which courts will reverse a conviction or sentence where the government failed to turn over exculpatory or impeachment evidence in its possession if the defendant shows a reasonable probability that nondisclosure was outcome-determinative. *See* United States v. Bagley, 473 U.S. 667, 676 (1985) ("Impeachment evidence . . . as well as exculpatory evidence, falls within the *Brady* rule.").

27. *See Ritchie*, 480 U.S. at 54 (holding that the Confrontation Clause does not guarantee access to prior statements of, or case files related to, a witness about the same subject matter).

28. *See* Douglass, *supra* note 24, at 252 (criticizing confrontation doctrine for focusing on admissibility of hearsay rather than meaningful impeachment of admitted hearsay).

falsehood or a declarant's lack of credibility. They do not offer meaningful ways of *discovering* flaws in hearsay claims the way that cross-examination allows a chance to discover the flaws in a live witness's claims.[29] While access to the declarant's prior statements would be an important step in this direction, litigants lack such access.[30] Even Rule 806's right of impeachment is incomplete, given that some forms of impeachment can be accomplished only through cross-examination. For example, while cross-examining a testifying witness, a criminal defendant can point out that the witness had previously made false reports to police. But if that witness had not testified, and instead were a hearsay declarant, there would be no avenue under the Rules of Evidence to impeach the hearsay declarant with the extrinsic evidence of the false reports, even though the reports are prior bad acts probative of truthfulness. Meanwhile, the Supreme Court has ruled that the ability to impeach an absent hearsay declarant with an inconsistency or prior false allegation is also not constitutionally guaranteed, again relying on the idea that the Confrontation Clause protects only a right of cross-examination and physical confrontation.[31]

Similarly, the ability to scrutinize expert testimony is limited under current doctrine. True, litigants in most states can challenge the admissibility of expert testimony if the proponent fails to show the expert's method is either reliable or generally accepted as reliable in the relevant scientific community.[32] Litigants also have access to certain information about the expert's method and qualifications through

29. *See id.* at 252–53 ("Cross-examination puts both contradictory and impeaching facts before the jury . . . ."); *see also* FED. R. EVID. 806 (offering only the chance to impeach a declarant and not the chance to engage in interrogatories, access to prior statements, or other means of discovery).

30. *See* discussion *supra* note 24 (noting that the Jencks Act does not apply to hearsay declarants).

31. *See* Nevada v. Jackson, 569 U.S. 505, 511 (2013) (holding that an inability to present evidence of prior false allegations did not deny the petitioner's right to present a complete defense); Mattox v. United States, 156 U.S. 237, 250 (1895) (holding the same but for prior inconsistencies).

32. *See* Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 589–95 (1993) (interpreting Rule 702 to require proof of reliability of the expert's method to admit expert testimony); Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) (requiring that a novel scientific method "have gained general acceptance" to be admissible); Edward K. Cheng, *The Consensus Rule: A New Approach to Scientific Evidence*, 75 VAND. L. REV. 407, 410, 438 (2022) (discussing *Daubert* and *Frye* as the dominant frameworks for admissibility of expert testimony). In states that follow *Frye*, reliability requirements only apply to methods deemed novel and scientific, thus excluding methods such as eyewitness-identification testimony or methods deemed non-novel or more an "art" than a science. *See, e.g.*, Kenneth W. Waterway & Robert C. Weill, *A Plea for Legislative Reform: The Adoption of* Daubert *to Ensure the Reliability of Expert Evidence in Florida Courts*, 36 NOVA L. REV. 1, 10–12 (2011) (explaining these limitations of *Frye*).

pretrial discovery.[33] But these rules suffer significant shortcomings: they are not constitutionally guaranteed;[34] they apply only to live witnesses, not expert hearsay affidavits;[35] they require relatively little pretrial disclosure in criminal cases;[36] and they do not require disclosure of error rates or other key impeachment information once a judge deems the method reliable.[37] At the same time, prosecutors around the country have argued that validation and proficiency testing should not be litmus tests for admissibility,[38] and the forensic community has often resisted the introduction of error rates once a method is admitted.[39]

In turn, the inability to more meaningfully scrutinize human testimony matters. Although algorithmic proof has become ubiquitous, humans continue to be integral to trials: eyewitnesses, confessing suspects, jailhouse informants, forensic experts, police officers establishing chain of custody over objects, and more. Each is responsible for wrongful convictions of criminal defendants, as the DNA exoneration movement has shown.[40] Moreover, an exclusive focus on courtroom safeguards—rather than a broader focus on minimizing inferential error from black-box and hearsay dangers—takes a toll on

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33. *See* FED. R. CIV. P. 26(a)(2); FED. R. CRIM. P. 16(a)(1)(G) (establishing the rules governing experts in pretrial discovery).

34. *Frye*, *Daubert*, and rules of discovery concern statutory or common law admissibility requirements, not constitutional requirements.

35. Although expert affidavits are typically inadmissible in lieu of live testimony in criminal trials absent a defense waiver, Melendez-Diaz v. Massachusetts, 557 U.S. 305, 310–11 (2009), they are admissible with a waiver and in civil cases where the Confrontation Clause does not apply. *Id.* at 308, 313 n.3.

36. *Compare* FED. R. CIV. P. 26(a)(2) (requiring written expert reports and other disclosure), *with* FED. R. CRIM. P. 16(a)(1)(G) (requiring minimal expert information). *See generally* Ion Meyn, *The Haves of Procedure*, 60 WM. & MARY L. REV. 1765 (2019) (explaining why criminal prosecutors lack incentives to engage in robust pretrial discovery compared to civil cases).

37. *See, e.g.*, Brandon L. Garrett & Gregory Mitchell, *The Proficiency of Experts*, 166 U. PA. L. REV. 901, 948–49 (2018) (noting the importance of allowing the jury access to proficiency data after an expert's testimony has been admitted).

38. *See, e.g.*, Letter from Nat'l Dist. Att'ys Ass'n to Barack Obama, President of the U.S. (Nov. 16, 2016), www.ciclt.net/ul/ndaajustice/PCAST/NDAA%20PCAST%20Response%20FINAL.pdf [https://perma.cc/YUK9-3PZT] (arguing that "black box" validation testing is not the only way to prove validity of an expert method).

39. *See, e.g.*, Jonathan J. Koehler, *Forensics or Fauxrensics? Ascertaining Accuracy in the Forensic Sciences*, 49 ARIZ. ST. L.J. 1369, 1403–05 (2017) (noting resistance to collection and disclosure of error rates).

40. According to the Innocence Project, there have been 375 DNA exonerations in the United States. *See DNA Exonerations in the United States (1989–2020)*, INNOCENCE PROJECT, https://www.innocenceproject.org/dna-exonerations-in-the-united-states/ (last visited Oct. 24, 2023) [https://perma.cc/X9XT-UBBK]. Sixty-nine percent involved an eyewitness misidentification, twenty-nine percent involved a false confession, forty-three percent involved "misapplication[s] of forensic science," and seventeen percent involved an informant. *Id.* While these numbers do not reveal the prevalence of eyewitness errors, others have posited error rates from 0.5 to five percent. *See* Epstein, *supra* note 16, at 730 (citing several studies).

the prosecution as well. A jury might acquit a factually guilty defendant if it lacks sufficient context to judge defense witnesses' credibility. And if credibility testing and confrontation were equated with a right of meaningful impeachment rather than a sacrosanct right to certain courtroom procedures, the prosecution might be on stronger footing in relying on certain forms of evidence now in constitutional limbo (such as transcripts certified by court reporters and expert reliance on hearsay).

C. Gaps in Credibility Testing of Nonhuman Sources

The second gap in evidence law left by this circular approach to defining and testing "testimony" concerns nonhuman sources of information, such as animal and machine conveyances of information. The complexity of these nonhuman sources runs the gamut. Dog alerts and simple machines like thermometer readings, for example, have been offered as proof for centuries. But modern proof now includes sophisticated software and AI-driven results: IBM Watson's medical diagnoses, ChatGPT conclusions about someone's state of mind based on a set of facts, and machine-learning algorithms' analyses of a suspect's handwriting or a confessor's microexpressions.[41]

While these nonhuman sources can convey false information for any number of reasons,[42] their claims are not subject to the same sorts of testimonial safeguards as human assertions. For example, because the definition of hearsay applies only to statements intended as assertions by human declarants, the definition explicitly excludes information conveyed by nonhumans.[43] As a result, evidence rules do not render machine and animal claims inadmissible by virtue of their sources being unavailable for questioning. Of course, a machine conveyance might contain a human assertion within it, such as a spreadsheet formula based on human-input data. If that input is itself offered for its truth, the human source might be a hearsay declarant

41. *See, e.g.*, Merylin Monaro, Stéphanie Maldera, Cristina Scarpazza, Giuseppe Sartori & Nicolò Navarin, *Detecting Deception Through Facial Expressions in a Dataset of Videotaped Interviews: A Comparison Between Human Judges and Machine Learning Models*, COMPUTS. HUM. BEHAV., Feb. 2022, at 1; ANTONIO THEOPHILO, RAFAEL PADILHA, FERNANDA A. ANDALÓ & ANDERSON ROCHA, EXPLAINABLE ARTIFICIAL INTELLIGENCE FOR AUTHORSHIP ATTRIBUTION ON SOCIAL MEDIA, INST. OF ELEC. & ELECS. ENG'RS (2022), https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9746262 [https://perma.cc/D543-BD8C].

42. *See* Roth, *supra* note 3, at 1978 (noting various "black box dangers" akin to human hearsay dangers that could cause a machine to convey false information).

43. FED. R. EVID. 801. Human assertions conveyed through a mechanical device, such as email, are still hearsay if offered for their truth because the assertion itself is made by the human author, not the machine. *See* Roth, *supra* note 3, at 2001–22 (distinguishing among machine tools, mediums, and "machine testimony").

and might need to testify, assuming a hearsay exception does not apply to the statement. But while a human programmer or dog handler might be able to offer some helpful context on the witness stand, the cross-examination of these people does not allow for meaningful scrutiny of the machine or dog itself.[44]

Because current evidentiary rules so conspicuously fail to address such proof, these gaps are perhaps more obvious than the gaps in human-credibility testing discussed in the last Section. Still, two points about gaps in existing rules are worth making. First, although Federal Rules 901(b)(9) and 902(13), as well as their state analogs, could be read to require that a process like an algorithm be shown to produce an "accurate" result to be admitted,[45] this authentication requirement is a very low bar: it demands only a certification from someone that the process works and sufficient proof to convince a reasonable juror it could be accurate.[46] The rule requires no information or performance data about the process—or access to the process whatsoever. Second, although an expert who uses a software-driven method will be subject to *Frye* and *Daubert*, these rules also provide less than meaningful scrutiny. In particular, they do not guarantee pretrial access to the machine or software; do not offer pretrial discovery about the software other than basic validation testing by the vendor, if it exists; and provide no potential scrutiny beyond the admissibility stage, other than possible cross-examination of a representative of the

44. *See, e.g.*, Cheng & Nunn, *supra* note 18, at 1079–81 (explaining why "process-based" safeguards are necessary for meaningful scrutiny of "process-based" proof like machine conveyances); Rebecca Wexler, *Life, Liberty, and Trade Secrets*: *Intellectual Property in the Criminal Justice System*, 70 STAN. L. REV. 1343, 1353 (2018) (arguing against a trade secret privilege in criminal cases involving machine-generated proof); Roth, *supra* note 3, at 1986–89 (explaining why cross-examination of the programmer is insufficient); Edward J. Imwinkelried, *Computer Source Code: A Source of the Growing Controversy over the Reliability of Automated Forensic Techniques*, 66 DEPAUL L. REV. 97, 101 (2016) (arguing that criminals should be able to access program source codes in some circumstances to assess their validity); Christian Chessman, Note, *A "Source" of Error: Computer Code, Criminal Defendants, and the Constitution*, 105 CALIF. L. REV. 179, 219–21 (2017) (noting the need for the confrontation doctrine to apply to software-generated results); Erin Murphy, *The Mismatch Between Twenty-First-Century Forensic Evidence and Our Antiquated Criminal Justice System*, 87 S. CAL. L. REV. 633, 658–61 (2014) (noting the need for a new confrontation doctrine that takes machine-generated proof and repeatable expert methods into account); People v. Lopez, 286 P.3d 469, 472 (Cal. 2012) (Liu, J., dissenting) (expressing concern with the view that a machine can never be a "witness" under the Confrontation Clause); Curtis E.A. Karnow, *The Opinion of Machines*, 19 COLUM. SCI. & TECH. L. REV. 136, 140 (2017).

45. FED. R. EVID. 902(9) (explaining that "[e]vidence describing a process or system and showing that it produces an accurate result" satisfies the rule's authentication requirements); *id.* at 909(13) (designating "[a] record generated by an electronic process or system that produces an accurate result, as shown by a certification of a qualified person," as self-authenticating evidence).

46. *See id.* at 901(a) (requiring only evidence "sufficient" to convince the fact finder, rather than convincing a judge by a preponderance, as required under Rule 104(a)).

algorithm's vendor.[47] In turn, concerns about the reliability of software-driven information are not merely theoretical; in a recent homicide case, for example, two expert systems reached diametrically opposed results when interpreting the same DNA mixture.[48]

II. THE PATH NOT TAKEN: HOW A RIGHT OF MEANINGFUL IMPEACHMENT LOST OUT TO THE NARROWER RIGHT OF CROSS-EXAMINATION

These gaps in evidence law and confrontation doctrine are not inevitable. While the rise of machine-generated proof might have exposed these gaps in a newly obvious way, there is nothing new about the idea that meaningful credibility testing involves more than just cross-examination, nor that nonhuman sources of information and other evidence incapable of being cross-examined might need credibility testing.

A. Historical Precedent for a Right of Meaningful Impeachment of All Sources of Information—Human and Nonhuman

Early evidence law in England and America did not share the current Rules' obsession with cross-examination and human sincerity. Before the rise of the modern adversarial criminal trial in England, defendants spoke in court without counsel, squaring off with their accusers.[49] Defendants had a right to have their accusers present, but did not enjoy a well-established right of cross-examination.[50] Even Sir Walter Raleigh, whose 1603 conviction for treason at the hands of an absent alleged accomplice looms large over the Supreme Court's Confrontation Clause cases, did not claim a right to *cross-examine* his accuser.[51] Relatedly, English courts may not have routinely enforced

47. *See* Roth, *supra* note 3, 1980–83 (discussing reasons that *Frye* and *Daubert* do not offer sufficient scrutiny).

48. *See id.* at 2019–20 (discussing *People v. Hillary*); *id.* at 1989–99 (discussing various examples of machine errors caused by each black-box danger); People v. Hillary, No. 2015-15 (N.Y. Lawrence Cnty. Ct. Aug. 26, 2016), https://www.northcountrypublicradio.org/assets/files/08-26-16DecisionandOrder-DNAAnalysisAdmissibility.pdf [https://perma.cc/M87P-Q5B8] (decision and order on DNA analysis admissibility) (excluding STRMix probabilistic genotyping results due to lack of internal validation by the New York State Policy crime laboratory).

49. *See generally* JOHN H. LANGBEIN, THE ORIGINS OF ADVERSARY CRIMINAL TRIAL (2005).

50. *See generally* Roth, *supra* note 21, at 217–18 (noting that cross-examination was not a well-recognized right in pre-Founding England (citing LANGBEIN, supra note 49)).

51. Frank R. Herrmann & Brownlow M. Speer, *Facing the Accuser: Ancient and Medieval Precursors of the Confrontation Clause*, 34 VA. J. INT'L L. 481, 545 (1994).

the rule against hearsay until the late eighteenth century.[52] Even as it became more prominent, the hearsay rule had as its primary purpose the enforcement of the *oath* and *physical confrontation* where a witness was otherwise available to be present, and not the enforcement of cross-examination.[53] The rule also conspicuously applied not merely to consciously intended assertions, but also to implied assertions, which are acts and utterances that carry hearsay dangers but not so much the specter of insincerity.[54]

While early English defendants did not have the right of cross-examination, they did have access to prior statements of the witnesses against them. For example, in the sixteenth and seventeenth centuries, English magistrates would conduct sworn ex parte examinations of witnesses before trial for purposes of rendering bail determinations. At the subsequent trial, the committing magistrate would file those pretrial examinations with the judge hearing the defendant's trial.[55] By the mid-eighteenth century, these "pretrial examinations continued to be available at trial for impeachment."[56] Similarly, cross-examination was also not a routine part of Founding-era continental trials; instead, French defendants could offer extrinsic evidence of bad character to "reproach" witnesses before the judge heard their testimony.[57]

Even in the American colonies, where the prominence of defense counsel and public prosecutors, and thus the rise of cross-examination,

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52. *See, e.g.*, T.P. Gallanis, *The Rise of Modern Evidence Law*, 84 IOWA L. REV. 499, 512 (1999) ("Hearsay . . . occupies much of the modern law of evidence but in 1755 was accepted almost without comment."); John H. Langbein, *Historical Foundations of the Law of Evidence: A View from the Ryder Sources*, 96 COLUM. L. REV. 1168, 1189 (1996) ("On the state of the sources, it is hard to believe that the courts of the mid-eighteenth century enforced the hearsay rule . . . .").

53. *See, e.g.*, LANGBEIN, *supra* note 49, at 245–46 ("[Gallanis] finds the turn of the [eighteenth to nineteenth century] as the period in which the dominant rationale for the hearsay rule shifts from oath to cross-examination."); KELLEN R. FUNK, LAW'S MACHINERY: REFORMING THE CRAFT OF LAWYERING IN AMERICA'S INDUSTRIAL AGE (forthcoming); Crawford v. Washington, 541 U.S. 36, 70–71 (2004) (Rehnquist, C.J., concurring in the judgment) ("Without an oath [in the 18th century], one usually did not get to the second step of whether confrontation was required.").

54. *See, e.g.*, Wright v. Tatham (1837) 112 Eng. Rep. 488, 516; 5 Clark & Finelly 670 (treating letters written by relatives to a testator, suggesting that he was competent but not explicitly asserting as much, as hearsay).

55. LANGBEIN, *supra* note 49, at 15.

56. *Id.* at 41 n.156 (noting cases where defendants or accusers were impeached at trial with inconsistent statements from their pretrial depositions). I have been unable to determine whether such a right to prior statements existed at common law in the United States or colonial America, other than Wigmore's claim, without citation, that defendants did not have access to prior statements at "common law." 6 WIGMORE, *supra* note 13, § 1859g, at 596.

57. Bernadette Meyler, *Common Law Confrontations*, 37 LAW & HIST. REV. 763, 769 (2019); *see also* Herrmann & Speer, *supra* note 51, at 521 (noting the right to reproach the witness before the judge received his testimony, but not a right of cross-examination or even presence during testimony).

developed far earlier than in England,[58] cross-examination was not the linchpin of human-credibility testing. Indeed, cross-examination in the early United States "was not necessarily ubiquitous or even commonplace. There are contentions, with documentary support, that cross-examination was either completely absent from or underutilized in many trials in the first years of the republic."[59] Yet, defendants did have a common-law right to impeach both witnesses and absent hearsay declarants with evidence of bias, character for dishonesty, incapacity, or inconsistent statements.[60]

Early commentators also appeared to recognize how the memories of human witnesses are akin to physical-trace evidence's capacity for contamination. Wigmore's 1904 treatise, for example, included an entire subsection on "mental traces."[61] Harvard psychologist Hugo Münsterberg's influential 1908 book *On the Witness Stand* likewise argued that human memory was akin to trace evidence and, further, that scrutiny of such evidence required the assistance of psychologists rather than simply cross-examination before the jury at trial.[62]

Conversely, early courts and commentators also acknowledged that some *nonhuman* evidence was akin to testimony, in that it required the jury to trust information offered by an animal or instrument.[63] In 1903, one American court described dog evidence in testimonial terms, stating that "a certain dog indicated by his conduct that *he believed* the scent of some microscopic particles supposed to have been dropped by the perpetrator . . . was identical with . . . the

58. *See* FUNK, *supra* note 53 (explaining how cross-examination took hold earlier in the United States).

59. Epstein, *supra* note 18, at 431 (citing several sources); *see also* Meyler, *supra* note 57, at 772 (noting that unconfronted pretrial examinations were admissible in colonies near the time of the Framing).

60. *See, e.g.*, Douglass, *supra* note 24, at 240 ("[T]he common-law courts allowed an opponent to present both prior inconsistent statements and adverse character evidence to impeach dying declarations and other hearsay testimony." (citation omitted)); *see also id.* at 256 n.329 (discussing *Carver v. United States*, 164 U.S. 694 (1897), which noted a defendant's right at common law to impeach the declarant of a dying declaration with a prior self-contradictory statement made before she died).

61. 1A WIGMORE, *supra* note 13, § 172, at 1839–40.

62. HUGO MÜNSTERBERG, *The Memory of the Witness*, *in* ON THE WITNESS STAND: ESSAYS ON CRIME AND PSYCHOLOGY 39, 44 (1908) [hereinafter MÜNSTERBERG, *The Memory of the Witness*]; HUGO MÜNSTERBERG, *The Detection of Crime*, *in* ON THE WITNESS STAND: ESSAYS ON CRIME AND PSYCHOLOGY, *supra*, at 109–10.

63. *See, e.g.*, Binyamin Blum, *The Hounds of Empire: Forensic Dog Tracking in Britain and Its Colonies, 1888–1953*, 35 LAW & HIST. REV. 621, 640–41 (2017) (noting colonial courts treated dog scent as hearsay, and expressing concerns that the fact finder has no "independent" grounds to assess the evidence); Roth, *supra* note 3, at 2004 n.150, 2046 & n.397 (discussing courts' treatment of canine witnesses).

scent of the . . . accused."[64] And yet, as the court noted, "[t]he jury cannot know whether the reasons on which he acted were good or bad; whether they were all on one side, or evenly balanced; nor whether his faith in the identity of the scent which he followed was strong or weak."[65]

The 1899 edition of Simon Greenleaf's evidence treatise similarly discussed scientific instruments as testimonial: in noting that "an element of hearsay may enter into a person's sources of belief," he used examples such as "reckoning by a counting-machine."[66] Even Wigmore, cross-examination's most famous promoter, placed his discussion of "scientific instruments" in his treatise under the rubric of hearsay rather than physical evidence.[67]

B. The Rise of Cross-Examination and the Narrowing of "Testimony" and Testimonial Safeguards

The rise of cross-examination, rather than any persuasive logic having to do with verdict accuracy, appears to have been the prologue to courts' and rule drafters' increasingly narrow interpretations of the rights of confrontation and impeachment and the subset of evidence to which those rights apply.

John Langbein has documented how the "primacy of cross-examination in the work of eighteenth-century defense counsel" in England, when lawyers were just beginning to play a role in criminal trials, was in part a product of restrictions on counsel addressing the jury in any other way to argue for the defense.[68] Judges allowed great " 'latitude' in cross-examination," in part to compensate for such

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64. Brott v. State, 97 N.W. 593, 594 (Neb. 1903) (emphasis added).

65. *Id.*

66. 1 SIMON GREENLEAF, A TREATISE ON THE LAW OF EVIDENCE § 430, at 531 (John Henry Wigmore ed., rev. 16th ed. 1899) (1842); *see also* Edmund M. Morgan, *Hearsay and Non-hearsay*, 48 HARV. L. REV. 1138, 1145 (1935):

> Again, nothing is more common than to allow a witness to rely upon a timepiece in stating the time of day when an event happened. If he should testify that he looked at a Western Union clock and noted the time, he would be considered as giving particularly accurate testimony, but would it not be anonymous hearsay upon anonymous hearsay?;

Morgan, *supra*, at 1146 (noting that a sundial or automated weighing machine's assertions are hearsay but that judges can take judicial notice of its reliability).

67. 2 WIGMORE, *supra* note 13, § 665a, at 917:

> The use of *scientific instruments, apparatus, and calculating-tables*, involves to some extent a dependence on the statements of other persons, even of anonymous observers. Yet, on the one hand, it is not feasible for the scientific man to test every instrument himself; while, on the other hand, he finds that practically the standard methods are sufficiently to be trusted. . . . The adequacy of knowledge thus gained is recognized for a variety of standard instruments.

68. LANGBEIN, *supra* note 49, at 296.

restrictions.[69] It was also a reaction to new laws allowing accomplices to testify pursuant to promises of lenience from the Crown and offering rewards to witnesses who come forward, which lead to a wave of judicial and public angst about witness veracity.[70] Even so, according to Langbein, cross-examination did not "replace[ ] oath as the fundamental safeguard for the receipt of oral evidence" until the nineteenth century.[71]

A recent book by historian Wendie Schneider similarly traces the rise of cross-examination in England to forces other than a concern with witness accuracy.[72] She argues, along with Langbein and others,[73] that "[t]he growing confidence in cross-examination [ ] accompanied the steady rise of the legal profession's prestige" in the mid-nineteenth century.[74] While the practice was known at the Old Bailey in the 1700s, it was controversial—viewed widely as a coarse display of gamesmanship.[75] Schneider explains how cross-examination's ultimate ability to overcome this rocky start coincided with the conspicuous failure of a number of other experimental methods of ensuring witness veracity in mid-nineteenth-century England and British colonies: "Out of the welter of experimentation during the Victorian period, cross-examination lasted the longest. Other potential engines of truth—including criminal prosecution, shame sanctions, and the inquisitorial pursuit of perjurers—lay by the wayside."[76]

With respect to the rise of cross-examination in the United States, Kellen Funk argues that the oath and exclusionary witness-competence rules were seen as the primary guarantors of witness

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69. *Id.* at 297 (internal quotation marks omitted).

70. *Id.* at 292.

71. Langbein, *supra* note 52, at 1194.

72. WENDIE ELLEN SCHNEIDER, ENGINES OF TRUTH: PRODUCING VERACITY IN THE VICTORIAN COURTROOM 3 (2015).

73. *See* George Fisher, *The Jury's Rise as Lie Detector*, 107 YALE L.J. 575, 660 (1997) ("With lawyers, of course, came cross-examination, that greatest of tools for the ascertainment of truth."); *cf.* Roger Park, Response, *The Hearsay Rule and the Stability of Verdicts: A Response to Professor Nesson*, 70 MINN. L. REV. 1057, 1060 (1986) (predicting lawyerly opposition to elimination of the hearsay rule, given that "documentary evidence would become more important, sometimes replacing the drama and excitement of live testimony," and because "there would be less opportunity to exercise skills of cross-examination"). *See generally* LANGBEIN, *supra* note 49 (arguing that the law of evidence was largely the result of the rise of defense counsel).

74. SCHNEIDER, *supra* note 72, at 3.

75. *See id.* at 17–99 (explaining in chapters one and two the English view that cross-examination was for low class advocates).

76. *Id.* at 209; *see also id.* at 10 ("Cross-examination may have won out in the end, but it was not the only candidate under consideration."); *id.* at 2 ("Cross-examination, initially reviled for the way in which it seemed to depend on competitive word-twisting rather than a serious concern for the truth, came to supersede perjury prosecutions as the primary means of guaranteeing witness veracity . . . .").

veracity until the mid-nineteenth century.[77] Only after the decoupling of law and religious warnings of damnation, and the post-civil war abandonment of racial exclusion laws, was cross-examination broadly recognized as a sufficient guarantor of veracity.[78] Funk calls the increasing prominence of cross-examination in the mid-nineteenth century "the *lawyer's* rise as lie detector."[79] While cross-examination was accepted as a legitimate and gentlemanly art far earlier in the United States than in England,[80] its dominance even here was unnecessary before the mid-nineteenth century.[81]

In turn, the rise of cross-examination did not merely augment other means of impeachment; it largely replaced them. As cross-examination became more accepted, a "[c]oncern to promote cross-examination," rather than the oath, "became the central justification for the hearsay rule."[82] In turn, because cross-examination was seen largely as a tool to expose dishonesty rather than merely mistaken beliefs,[83] drafters of newly codified rules of evidence began to redefine

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77 *See generally* Kellen Richard Funk, The Lawyers' Code: The Transformation of American Legal Practice, 1828–1938 (2018) (Ph.D. dissertation, Princeton University), https://kellenfunk.org/wp-content/uploads/2018/09/Funk.Lawyers-Code.20180915.pdf [https://perma.cc/L45F-YQKE].

78. *Id.* at 252, 254. As Funk explains, "The conviction that the threat of hell secured the solemnity, and thus truthfulness, of an oath rapidly deteriorated in early nineteenth-century America." *Id.* at 261.

79. *Id.* at 254. According to Funk, "Codifiers expected the ordeal of a lawyerly cross-examination to substitute for the terrors of damnation, whether it was a jury or judge who witnessed the proceedings." *Id.* Funk's thesis stands in contrast to Professor George Fisher's well-known thesis that the system replaced the oath with the jury's opaque fact-finding process as a guarantor of trustworthiness. *See* Fisher, *supra* note 73.

80. *See* Funk, *supra* note 77, at 275 (explaining that class divisions in England delayed the acceptance of cross-examination in a way that did not occur in the "comparatively less stratified" antebellum United States).

81. *See id.* at 289:

> In adapting and applying the code, legislatures and courts . . . le[ft] cross-examination to sift the truth apart from the solemnity of swearing.
>
> Codifiers and trial lawyers eagerly accepted the bargain, content to overlook a rising tide of self-interested perjury so long as their powers of courtroom oratory and examination exposed it to the trier of fact.

82. Langbein, *supra* note 52, at 245; *see also* SCHNEIDER, *supra* note 72, at 60:

> In arguing for the centrality of cross-examination, barristers benefited from changes in the conceptualization of evidence law. By the mid-nineteenth century, jurists had come to accept that cross-examination was essential to establishing the truth of matters before the court. Evidence treatises of the time increasingly settled on the absence of cross-examination as the rationale for the hearsay rule.

83. *See, e.g.*, Epstein, *supra* note 16, at 765 (describing cross-examination as a "Tool to Expose Dishonesty, Not Mistaken Identification"); Funk, *supra* note 77, at 254 (noting that as party testimony became commonplace, "codifiers shifted their theory of cross-examination from deterrence of lying to detection of falsehood"); MÜNSTERBERG, *The Memory of the Witness*, *supra* note 62, at 44 ("[E]ven the cross-examining lawyer is mostly dominated by the idea that a false statement is the product of intentional falsehood.").

testimony to exclude declarants unlikely to be insincere. For example, although Wigmore himself acknowledged the dangers of implied assertions and described them at one point as inadmissible,[84] the coming movement to codify rules of evidence would change that. The Advisory Committee Note to Federal Rule 801 explains the role of "sincerity" in the decision to exclude implied assertions from the federal hearsay ban:

> Other nonverbal conduct, however, may be offered as evidence that the person acted as he did because of his belief in the existence of the condition sought to be proved, from which belief the existence of the condition may be inferred. This sequence is, arguably . . . properly includable within the hearsay concept. *Admittedly evidence of this character is untested with respect to the perception, memory, and narration* (or their equivalents) of the actor, but the Advisory Committee is of the view that these dangers are minimal in the absence of an intent to assert and do not justify the loss of the evidence on hearsay grounds. No class of evidence is free of the possibility of *fabrication, but the likelihood is less* with nonverbal than with assertive verbal conduct. The situations giving rise to the nonverbal conduct are such as *virtually to eliminate questions of sincerity*.[85]

The Federal Rules also adopted Wigmore's proposal for a new hearsay exception for "excited utterances," which was based on his view that such statements were unlikely to be proven insincere through cross-examination.[86]

As for Münsterberg's argument that eyewitness testimony is more akin to physical evidence in its need for safeguards against contamination,[87] only recently—and only rarely—have such arguments held any sway. To be sure, the New Jersey Supreme Court in *State v. Henderson*,[88] reviewing a conviction based solely on a cross-racial eyewitness identification, adopted the findings of a special master (who had the benefit of briefing by the Innocence Project) that:

> [I]t would be both appropriate and useful for the courts to handle eyewitness identifications in the same manner they handle physical trace evidence and scientific evidence, by placing at least an initial burden on the prosecution to produce, at a pretrial

84. *See* 2 WIGMORE, *supra* note 13, §§ 265-267, at 96–105 (advocating the treatment of implied assertions as hearsay and describing this as the rule).

85. FED. R. EVID. 801(a) advisory committee's note to 1972 proposed rules (emphasis added) (citations omitted); *see also* Ted Finman, *Implied Assertions as Hearsay: Some Criticisms of the Uniform Rules of Evidence*, 14 STAN. L. REV. 682, 684 (1962) ("[W]hether implied assertions are to be classified as hearsay should turn on the extent to which cross-examination would provide protection against erroneous reliance on such assertions.").

86. *See* Steven Baicker-McKee, *The Excited Utterance Paradox*, 41 SEATTLE U. L. REV. 111, 111, 116–17 (2017) (describing the exception as "[b]ased on nothing more than John Henry Wigmore's personal belief that a witness under the throes of excitement is unable to fabricate an untruthful statement").

87. *See* MÜNSTERBERG, *The Memory of the Witness*, *supra* note 62, at 63 (commenting that law is interested in close examination of physical evidence, but "no one asks for the striking differences as to those mental details which the psychological experiments . . . have brought out in the last decade").

88. 27 A.3d 872 (N.J. 2011).

> hearing, evidence of the reliability of the evidence. Such a procedure would broaden the reliability inquiry beyond police misconduct to evaluate memory as fragile, difficult to verify and subject to contamination from initial encoding to ultimate reporting.[89]

In a unanimous decision, the *Henderson* court revised the state's framework for evaluating eyewitness identification evidence. The court directed trial courts to "allow all relevant . . . variables to be explored and weighed at pretrial hearings when there is some actual evidence of suggestiveness" and to "develop and use enhanced jury charges to help jurors evaluate eyewitness identification evidence."[90] Still, the vast majority of states have explicitly declined to follow *Henderson*,[91] and most police departments still, more than a decade after *Henderson*, have no written policies to guide their procedures.[92]

The shadow of cross-examination can also be seen in shifts in the Supreme Court's Confrontation Clause jurisprudence, although a comprehensive exploration is beyond the scope of this Essay. Before 1900, at least one Circuit Court had recognized the Sixth Amendment term "witness" (in the Compulsory Process Clause[93]) to mean objects as well as people,[94] and the Supreme Court had recognized a defendant's right to impeach a hearsay declarant with a prior inconsistent statement, suggesting that confrontation is not merely a right of cross-examination and physical confrontation.[95] Yet today, the Clause is viewed primarily as a rule of exclusion of hearsay, enforcing only the right of cross-examination and physical confrontation.[96] The Court has

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89. Report of the Special Master at 84, *Henderson*, 27 A.3d 872 (No. A-8-08); *see also* Brief for the Innocence Project as Amicus Curiae at 27, *Henderson*, 27 A.3d 872 (No. A-8-08) ("[E]yewitness memory is best understood as trace evidence subject to degradation and contamination. . . .").

90. 27 A.3d at 919.

91. *See, e.g.*, Small v. State, 211 A.3d 236, 247 (Md. 2019); United States v. Mustafa, No. 11-CR-234-01, 2012 WL 1904595, at *16 (N.D. Ga. Apr. 12, 2012); People v. Blevins, 886 N.W.2d 456, 462 (Mich. Ct. App. 2016); State v. Moore, No. COA15-52, 2015 WL 4898121, at *4 (N.C. Ct. App. Aug. 18, 2015); Batiste v. State, 121 So. 3d 808, 855 n.7 (Miss. 2013); Gorman v. State, 968 N.E.2d 845, 849 (Ind. Ct. App. 2012); State v. Holmes, No. 11050100172, 2012 WL 4086169, at *13 (Del. Super. Ct. Aug. 23, 2012); People v. McGhee, 964 N.E.2d 715, 729–30 (Ill. App. Ct. 2012); People v. Chuyn, No. 2707/2010, 2011 WL 6187150, at *13–15 (N.Y. Sup. Ct. Dec. 13, 2011).

92. *See* Brandon L. Garrett, *Eyewitness Identifications and Police Practices: A Virginia Case Study*, 2 VA. J. CRIM. L. 1, 5 (2014) ("[L]ess is known about how many police departments still have not adopted improved practices. Surveys that have been conducted strongly indicate that many agencies . . . continue not to have any written policies on the subject of eyewitness identifications, much less policies that comport with best practices.").

93. U.S. CONST. amend. VI.

94. United States v. Burr, 25 F. Cas. 30, 35 (C.C.D. Va. 1807) (No. 14,692); *see also* United States v. Nixon, 418 U.S. 683, 709–11 (1974) (noting that compulsory process right extends not just to testimony but to all "evidence").

95. *See* Carver v. United States, 164 U.S. 694, 697–98 (1897) (holding that contradictory statements of a deceased declarant can be used to contradict their dying declaration).

96. *See generally* Douglass, *supra* note 24 (arguing that Supreme Court precedent affirms a right to confront witnesses but fails to apply the Confrontation Clause to hearsay testimony).

explicitly ruled that the Clause does not guarantee access to prior statements or investigative files on a witness,[97] nor a right to impeach an absent declarant with extrinsic evidence of a prior false allegation.[98]

CONCLUSION—FILLING THE GAPS?

The main aim of this Essay has been to persuade readers that important gaps exist in evidence law that are caused by both an overemphasis on cross-examination as the means of testing credibility and a focus on the possibility of insincerity in defining what evidence ("testimony") is subject to credibility testing. Once we realize this, new possibilities for better regulating evidence and improving verdict accuracy naturally present themselves. While a full proposal for new rules of evidence is beyond the scope of the essay, I present some possibilities here to generate discussion.

With respect to human sources of information, several proposals come to mind. First, states should all have an analog to the Jencks Act,[99] and these analogs should apply not just to testifying witnesses, but also to any source of information capable of inconsistent reports of information, including hearsay declarants (even those whose acts or utterances involve human belief but are not classified as hearsay declarants, as with implied assertions and co-conspirator chatter), animals, and machines.[100] Second, all states and the federal system should adopt safeguards for eyewitness identification procedures and discovery thereof similar to New Jersey's in *Henderson*.[101] Third, litigants should have more robust access to pretrial discovery of

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While Douglass's article predated *Crawford* by five years, nothing in *Crawford* or its progeny has changed the Court's focus on exclusion of hearsay. *See generally* Crawford v. Washington, 541 U.S. 36 (2004). For a discussion about the focus of *Crawford* and its progeny, see David Crump, *Overruling* Crawford v. Washington*: Why and How*, 88 NOTRE DAME L. REV. 115, 118–19 (2012).

97. Pennsylvania v. Ritchie, 480 U.S. 39, 60–61 (1987).

98. Nevada v. Jackson, 569 U.S. 505, 512 (2013).

99. 18 U.S.C. § 3500.

100. *See* Bourjaily v. United States, 483 U.S. 171, 197 (1987) (Blackmun, J., dissenting) (referring to co-conspirator discussion as "idle chatter" that courts have considered unreliable (quotation omitted)). It may be true, as some commentators have argued, that few wrongful convictions can be traced to admission of implied assertions. *See* Roger C. Park, *"I Didn't Tell Them Anything About You": Implied Assertions as Hearsay Under the Federal Rules of Evidence*, 74 MINN. L. REV. 783, 836–37 (1990) ("A review of the published caselaw does not reveal any obvious signs of injustice. . . . Nor are there glaring examples of obviously unreliable hearsay that has been admitted because of lacunae in the assertion definition."). But co-conspirator statements in particular are notoriously unreliable and often are implied assertions. They are admissible under an agency theory but should still be subject to impeachment by inconsistency or otherwise. *See* Keith Spencer, *The Common Enterprise Exception to the Hearsay Rule*, 11 INT'L J. EVIDENCE & PROOF 106, 108 (2007) (discussing agency theory as applied to co-conspirator statements).

101. State v. Henderson, 27 A.3d 872, 928 (N.J. 2011) (creating a "modified framework to evaluate eyewitness identification evidence").

opposition expert witnesses, including bench notes,[102] and judges should require proficiency testing data on experts before deeming them qualified.[103] Next, assuming *Nevada v. Jackson* will not be overturned soon,[104] legislatures and Congress should amend Rule 806 and its analogs to allow for the impeachment of a hearsay declarant through extrinsic evidence of false allegations and other key evidence probative of truthfulness.[105]

With respect to nonhuman sources, legislatures should require that software be subject to freely given research licenses and financially independent testing for its results to be admissible.[106] They should also consider amending evidence or discovery rules to require more information about software, such as the source code or equivalent means[107] of determining key assumptions underlying the results. They could require that software be screened as reliable and listed in the Federal Register (as blood-alcohol analysis systems are) before being used in court cases. They could extend the Jencks Act to machine conveyances, requiring disclosure of prior conveyances of the machine on the same subject matter.[108] One could also imagine other safeguards beyond evidence law to enhance verdict accuracy, such as a two-machine corroboration rule.

Some of these proposals would be a quick legislative fix; others would be a heavier political or doctrinal lift. The point is to begin to envision the next fifty years of evidence law free from an irrational

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102. *See* Paul C. Giannelli, *Expert Testimony and the Confrontation Clause*, 22 CAP. U. L. REV. 45, 52 (1993) (noting that the expert in *Delaware v. Fensterer*, 474 U.S. 15 (1985), had bench notes, but observing those notes were not discoverable under Federal Rule of Criminal Procedure 16, which requires the state to disclose only a summary laboratory report).

103. *See* Garrett & Mitchell, *supra* note 37 (arguing for this testing before qualification); *see also* Murphy, *supra* note 44, at 659 ("Imagine redefining the qualification of experts so that they would be asked relevant questions not only about their qualifications but also about actual performance.").

104. 569 U.S. 505 (2013).

105. *See* FED. R. EVID. 806 (allowing attack on hearsay declarant's credibility).

106. *See* Nathaniel Adams, *What Does Software Engineering Have to Do with DNA?*, CHAMPION, May 2018, at 58 (explaining need for software testing that meets standards like those of the Institute of Electrical and Electronics Engineers).

107. One recent team of scientists has created a prototype voice-activated system called "Glass-Box," which a user can pepper with actual questions and counterfactual hypotheticals to find out more about how a black box AI system reaches its conclusions. Kacper Sokol & Peter Flach, *Glass-Box: Explaining AI Decisions with Counterfactual Statements Through Conversation with a Voice-Enabled Virtual Assistant*, INT'L JOINT CONF. ON A.I. 5868 (July 2018), https://www.ijcai.org/proceedings/2018/0865.pdf [https://perma.cc/8PMF-RY7G].

108. *See* Kathleen E. Watson, Note, *COBRA Data and the Right to Confront Technology Against You*, 42 N. KY. L. REV. 375, 376 (2015) (describing case law on whether defendants charged with driving while intoxicated have a right to "Computer On-Line Breath Records Archive (COBRA) data" consisting of prior intoxilyzer readings from the machines used in their cases); Roth, *supra* note 3, at 1981 (characterizing this data as "prior statements or 'Jencks material' of machines").

fixation on cross-examination as the primary means of credibility testing. Once we do that, we can better identify the diverse ways in which jurors might be misled by incomplete or inaccurate sources of information and better identify meaningful ways to minimize and expose errors in sources of information. The rise of machine-generated proof has rendered the gaps in existing rules newly obvious, given that machine-generated proof is ubiquitous, insufficiently scrutinized, and typically incapable of being cross-examined. But there have been commentators and judges all along who have understood that there is another way to think about both credibility testing and the fluidity of the testimonial-physical divide. Hopefully, as we move forward, we can restore that past understanding and better serve the underlying goals of evidence law.