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The Future of the Confrontation Clause: Semiautonomous and Autonomous Machine Witnesses

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ABSTRACT

How should the Confrontation Clause of the Sixth Amendment be interpreted as to machine witnesses? Courts across the country have resisted efforts to cross-examine the human agents who assist machines that generate data used in criminal trials. Such challenges under the Confrontation Clause have been rejected directly and in great number, and the rules of evidence are largely being read to not require the testimony of those who have the best information about the machine's use for the case at hand. This problem arises in an era of machine exceptionalism and widespread use. From increasingly sophisticated forensic lab tools to crime scene drones, these machines are growing in prevalence. Meanwhile, other machines that operate with little-to-no human assistance, such as surveillance cameras and wearables, are also on the rise. As new technologies creep further into numerous aspects of public and private space, human witnesses are less and less necessary to criminal trials. Increasingly, machines are created for the specific purpose of making assertions about reality in place of humans. Courts, however, have held that the Confrontation Clause largely does not reach those machine accusers. This Article argues that, in light of these changes, courts should reinterpret the Confrontation Clause to provide a right to "confront" machine accusers.

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"A crime lab's reliance on [machine accusers] may be a marked improvement over less accurate or more subjective methods of determining blood-alcohol levels. The allure of such technology is its infallibility, its precision, its incorruptibility. But . . . that allure should prompt us to remain alert to constitutional concerns, lest we gradually recreate through machines instead of magistrates the civil law mode of ex parte production of evidence that constituted the 'principal evil at which the Confrontation Clause was directed.'"[1]

I. INTRODUCTION

Trial by machine is here.[2] Where once an analyst testified in court based on tests conducted by hand, now a sophisticated machine completes the analysis that incriminates the defendant.[3] That is not inherently bad. But the defendant would have been guaranteed a right to cross-examine his human analyst; what rights does the defendant have for the surrogate machine? Because the machine cannot be cross-examined, most courts have concluded that this machine accuser is outside the reach of the Confrontation Clause of the Sixth

1. People v. Lopez, 286 P.3d 469, 494 (Cal. 2012) (Liu, J., dissenting) (quoting Crawford v. Washington, 541 U.S. 36, 50 (2004)).

2. Hat tip to Andrea Roth, *Trial by Machine*, 104 GEO. L.J. 1245 (2016), for this excellent phrasing.

3. *See infra* Part II; *see also* United States v. Bursten, 560 F.2d 779, 785 (7th Cir. 1977); Roth, *supra* note 2, at 1247 (citing *Bursten*, 560 F.2d at 785).

Amendment's guarantee that "the accused shall enjoy the right . . . to be confronted with the witnesses against him."[4] For some courts, it does not matter how human-like the machine acts; even when the machine-generated accusation contains the signature of a human and "an oath under penalty of perjury," it remains beyond the reach of hearsay and Confrontation Clause principles.[5] The result is a growing realm of testimonial evidence that accuses without judicial accountability.[6]

The rules of evidence could help protect defendants' rights in this realm, but many courts have surrendered their gatekeeping role for machine accusers and are not enforcing evidentiary rules.[7] Perhaps most egregious, courts commonly require no testimony from the only person who knows if the test that produced the accusation at issue was run properly—the analyst who operated the forensic machine. Instead, they accept the testimony of the analyst's supervisors who, on the basis of the machine-generated data, testify to results from tests they never witnessed.[8] As machine accusers increasingly replace human witnesses,[9] the right to cross-examine and confront one's accuser is declining conversely.

Like any tool, "machine accusers" are both fallible and susceptible to human influence. Machines already serve as witnesses against criminal defendants in innumerable contexts: they describe crime scenes;[10] they identify people via facial recognition programs[11]

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4. U.S. CONST. amend. VI; *see, e.g.*, United States v. Washington, 498 F.3d 225, 230 (4th Cir. 2007).

5. *See, e.g.*, BMG Rights Mgmt. (US) LLC v. Cox Commc'ns, Inc., 881 F.3d 293, 313 (4th Cir. 2018) (copyright infringement notices were generated by machine and thus were not hearsay).

6. *Cf.* State v. Salamone, No. 1 CA-CR 16-0204, 2017 WL 2875096, at *4 (Ariz. Ct. App. July 6, 2017) ("Although the chromatograms are certainly evidence against Salamone, as exclusively-machine-generated data they are not out-of-court statements by any person, and thus are not subject to confrontation or hearsay analysis.").

7. *See, e.g.*, Brian Sites, *Machines Ascendant: Robots and the Rules of Evidence*, 3 GEO. L. TECH. REV. 1 (2018).

8. *See, e.g.*, *id.* at 7.

9. Andrea Roth, *Machine Testimony*, 126 YALE L.J. 1972, 1975 (2017) ("[T]he past century has witnessed a noteworthy rise in the 'silent testimony' of instruments.") (quoting MIRJAN R. DAMAŠKA, EVIDENCE LAW ADRIFT 143 (1997)).

10. Mauricio Marin, *NLV Police Have New Crime-Solving Tool*, LAS VEGAS NOW (June 23, 2017, 6:32 PM), http://www.lasvegasnow.com/news/nlv-police-have-new-crime-solving-tool/749450915 [https://perma.cc/MT56-GK6P].

11. *See, e.g.*, Natasha Singer, *Never Forgetting a Face*, N.Y. TIMES (May 17, 2014), https://www.nytimes.com/2014/05/18/technology/never-forgetting-a-face.html [https://perma.cc/UCZ3-AHHW] (noting use of facial recognition in law enforcement in New York, Pennsylvania, and California, and also by casinos, grocery stores, and others); Andrew Flanagan, *Thanks to AI, a 3rd Person Is Arrested Following a Pop Superstar's Concert*, NPR (May 23, 2018,

and other biometric recognition tools;[12] they state where people were by locating phones;[13] they identify vehicles via license plate readers;[14] they analyze and report crimes via drug, firearm, and general crime-detecting devices;[15] they provide opinions in sentencing and parole decisions;[16] and they provide expert analysis on a variety of topics ranging from DNA to drugs via forensic laboratory machines.[17] Some machine accusers replace human witnesses; others offer testimony that humans could not offer themselves.[18]

4:15 PM), https://www.npr.org/sections/therecord/2018/05/23/613692526/thanks-to-ai-a-3rd-person-is-arrested-following-a-pop-superstars-concert [https://perma.cc/Y94Y-EJXQ] (describing facial recognition software's use in China and noting that "Amazon has been shopping its own facial recognition technology . . . to U.S. law enforcement").

12. *See, e.g.*, *Street-Level Surveillance: Tattoo Recognition*, ELEC. FRONTIER FOUND. (Nov. 30, 2017), https://www.eff.org/pages/tattoo-recognition [https://perma.cc/UV54-EW69] (describing the tattoo-recognition technology as "still in its infancy, [but] . . . being actively developed by private companies with the support of federal agencies, state law enforcement, and universities").

13. *See, e.g.*, Tom Jackman, *Police Use of 'StingRay' Cellphone Tracker Requires Search Warrant, Appeals Court Rules*, WASH. POST (Sept. 21, 2017), https://www.washingtonpost.com/news/true-crime/wp/2017/09/21/police-use-of-stingray-cellphone-tracker-requires-search-warrant-appeals-court-rules/ [https://perma.cc/XMQ4-Z4EA] (discussing StingRay usage as widespread).

14. *See, e.g.*, Josh Shannon, *Newark Police Expanding Network of Automatic License Plate Readers*, NEWARK POST (Mar. 14, 2018), http://www.newarkpostonline.com/news/newark-police-expanding-network-of-automatic-license-plate-readers/article_cb2b9a42-4efc-50ce-ba49-7822c8e89877.html [https://perma.cc/58AT-2MK7].

15. *See, e.g.*, *Future Attribute Screening Technology Fact Sheet*, DEP'T HOMELAND SEC. (July 31, 2015), https://www.dhs.gov/publication/future-attribute-screening-technology [https://perma.cc/R2RB-WUUC]; Lexy Savvides, *Crime-Fighting Robot Can Detect Weapons in a Crowd*, CNET (Sept. 21, 2017, 10:00 AM), https://www.cnet.com/news/knightscope-security-robot-can-detect-weapons-in-a-crowd [https://perma.cc/D6AK-K5M8]; Sharon Weinberger, *Terrorist 'Pre-Crime' Detector Field Tested in United States*, NATURE (May 27, 2011), https://www.nature.com/news/2011/110527/full/news.2011.323.html [https://perma.cc/LYT7-U94W]; Chris Weller, *There's a Secret Technology in 90 US Cities that Listens for Gunfire 24/7*, BUS. INSIDER (June 27, 2017, 10:59 AM), http://www.businessinsider.com/how-shotspotter-works-microphones-detecting-gunshots-2017-6 [https://perma.cc/9CJ5-Q87J].

16. *See, e.g.*, CHRISTOPHER SLOBOGIN, PROVING THE UNPROVABLE: THE ROLE OF LAW, SCIENCE, AND SPECULATION IN ADJUDICATING CULPABILITY AND DANGEROUSNESS 101–14 (2007) (discussing future dangerousness); *see generally* Brian Sites, *The Danger of Future Dangerousness in Death Penalty Use*, 34 FLA. ST. U. L. REV. 959, 963–65 (2007) (discussing future dangerousness analyses).

17. *See generally* Brian Sites, *Rise of the Machines: Machine-Generated Data and the Confrontation Clause*, 16 COLUM. SCI. & TECH. L. REV. 36, 51–57 (2014) (describing cases and various forensic tools in the context of the Confrontation Clause).

18. *See, e.g.*, Joe Palazzolo, *Defense Attorneys Demand Closer Look at Software Used to Detect Crime-Scene DNA*, WALL ST. J. (Nov. 18, 2015, 5:17 PM), https://www.wsj.com/articles/defense-attorneys-demand-closer-look-at-software-used-to-detect-crime-scene-dna-1447842603 [https://perma.cc/Y45G-5FC9] (discussing TrueAllele, "a program that untangles DNA when humans can't" and citing as an example "a recent Commerce Department study of more than 100 crime labs around the country, [which found that] only seven of them were able to correctly untangle a complex DNA mixture"); *see also* Jessica Pishko, *The Impenetrable Program*

These issues grow in importance as true artificial intelligence (AI) inches toward reality. Even in the interim, however, this threat is not abated by the "dumb" nature of today's merely semiautonomous machines. As noted above, non-AI machines routinely provide statements against criminal defendants now. They have been doing so for years. Courts have largely failed to recognize this threat and adopt suitable rights for criminal defendants. Machines become increasingly autonomous each week, and with the power of many of today's algorithmic predictions, it is no stretch to say that "nearly artificially intelligent" machines are already on the scene.

How, then, should society and the courts respond? In a world where machines increasingly assume the "accuser" roles previously filled by human agents, what rights should a criminal defendant have? Any expansion of the Confrontation Clause's protection will come at a price paid by the criminal justice system and society at large.[19] But the absence of that protection increases the risk of false positives (wrongful convictions), and it does so against a backdrop of innumerable laboratory scandals involving errors, sample contamination, faked test results, and outright fraud.[20] In that balancing, if an acceptable center position cannot be found, the rights of criminal defendants and the integrity of the criminal justice system must win out.

In two earlier articles, I discussed how existing Confrontation Clause jurisprudence and the rules of evidence apply to machine accusers.[21] This Article argues that the Confrontation Clause right must evolve beyond existing interpretations in response to machine accusers. Part II highlights important portions of the history of the Confrontation Clause, including a brief foray into recent jurisprudence. Part III then highlights the current machine-generated evidence jurisprudence across the nation. Finally, Part IV considers how the Confrontation Clause should respond to the rise of new technologies.

Transforming how Courts Treat DNA Evidence, WIRED (Nov. 29, 2017, 7:00 AM), https://www.wired.com/story/trueallele-software-transforming-how-courts-treat-dna-evidence/ [https://perma.cc/5H2W-QKRW] (describing TrueAllele as a program that can "make connections that elude humans").

19. *See, e.g.*, Commonwealth v. Yohe, 79 A.3d 520, 542 (Pa. 2013) (concluding that a system using fewer analysts would cause more errors than an assembly line process); Jennifer Mnookin & David Kaye, *Confronting Science: Expert Evidence and the Confrontation Clause*, 2012 SUP. CT. REV. 99, 154 (2013) ("[D]raconian Confrontation Clause rules might well motivate laboratories to make . . . modifications [such as reducing the number of analysts]. But if these modifications took laboratories in directions inconsistent with the practices of science more generally, it is far from clear that these would be positive developments.").

20. *See* sources cited *infra,* notes 122–25 (citing examples of lab scandals).

21. Sites, *supra* note 7 (discussing this issue under the rules of evidence); Sites, *supra* note 17 (discussing existing Confrontation Clause jurisprudence).

This Article advocates for restoring the Confrontation Clause to the important role it had before the rise of machine-generated witnesses. Supplemental solutions, such as the rules of evidence, are also discussed.

II. THE ROAD TO THE CONFRONTATION CLAUSE

Compared to the robust history surrounding many other important rights, little is known about the origin of the Confrontation Clause. As Justice Haran phrased it, "The Confrontation Clause comes to us on faded parchment."[22] The lack of information surrounding the Clause's adoption makes determining its application to machine accusers (and other witnesses against the accused) challenging. That difficulty is exacerbated by confusion about other, related rights, including the "continuing confusion about the very nature of the law of evidence at the end of the eighteenth century."[23]

A. The Right to Confrontation: An Abbreviated Origin Story

Although parts of the modern Clause's history are unclear, the right to confront one's accusers is of ancient lineage. There are indications that a right of confrontation existed at least as early as under Roman law.[24] It may have existed in England before even the right to jury trial.[25] Many of the terms of the modern Confrontation Clause retain substantially the same meaning now as they had in 1791. For example, "witness" meant, both then and now, "one who gives testimony or who testifies, i.e., in judicial proceedings, one who makes a solemn declaration under oath, for the purpose of establishing or making proof of some fact to a court."[26]

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22. California v. Green, 399 U.S. 149, 173–74 (1970) (Harlan, J., concurring) ("History seems to give us very little insight into the intended scope of the Sixth Amendment Confrontation Clause."); *see* Jules Epstein, *Cross-Examination: Seemingly Ubiquitous, Purportedly Omnipotent, and 'at Risk'*, 14 WIDENER L. REV. 429, 430 n. 7 (2009) (collecting sources and noting "the lack of contemporaneous documentation of the Framers' motivations and intentions regarding [the Confrontation Clause]").

23. JOHN H. LANGBEIN, THE ORIGINS OF ADVERSARY CRIMINAL TRIAL 248 (2003).

24. *See, e.g.*, *Acts* 25:16 (The Roman Governor Festus stated, "It is not the manner of the Romans to deliver any man to die, before that he which is accused have the accusers face to face, and have license to answer for himself concerning the crime laid against him."); Coy v. Iowa, 487 U.S. 1012, 1015–16 (1988) (quoting Acts 25:16 for this same point).

25. *See, e.g.*, Daniel H. Pollitt, *The Right of Confrontation: Its History and Modern Dress*, 8 J. PUB. L. 381, 384–87 (1959); *Coy*, 487 U.S. at 1016 (making this same observation).

26. Maryland v. Craig, 497 U.S. 836, 864 (1990) (Scalia, J., dissenting) (internal quotation and modification marks omitted) (quoting NOAH WEBSTER, AN AMERICAN DICTIONARY OF THE ENGLISH LANGUAGE (1828) (citing JAMES BUCHANAN, LINGUAE BRITANNICAE VERA PRONUNCIATIO

Although courts now place great emphasis on the right to be in the physical presence of one's accuser, early forms of the confrontation right seem to have prioritized the cross-examination aspect of the right. For example, Wigmore concluded that common law did not recognize an "indispensable thing called confrontation *as distinguished from cross-examination*." [27] Although there was a right to cross-examination, and it was viewed as indispensable, "that right was involved in and secured by confrontation; it was the same right under different names."[28] Beyond this, the Clause's history provides little guidance regarding the proper application to machine accusers.

Some important details, however, are clear; the simplest of these start with the text. The Confrontation Clause states that "[i]n all criminal prosecutions, the accused shall enjoy the right . . . to be confronted with the witnesses against him."[29] It applies in both state and federal prosecutions.[30] Its text is susceptible to multiple interpretations, including that the Clause embraces "those who actually testify at trial, those whose statements are offered at trial, or something in-between."[31] Importantly, it is presented as a strong right—it applies "[i]n all criminal prosecutions."[32] The Confrontation Clause guarantees the opportunity for effective cross-examination, but it does not guarantee that the opportunity will bear fruit and actually *be* effective.[33] As the US Supreme Court noted in 1895:

> The primary object of [the Confrontation Clause] was to prevent depositions or *ex parte* affidavits, such as were sometimes admitted in civil cases, being used against the prisoner in lieu of a personal examination and cross-examination of the witness, in which the accused has an opportunity, not only of testing the recollection and sifting the conscience of the witness, but of compelling him to stand face to face with the jury in order that they may look at him, and judge by his demeanor upon the stand and the manner in which he gives his testimony whether he is worthy of belief.[34]

(1757)). As Justice Scalia noted, the quoted text has a second meaning of "witness," but it is a meaning inapplicable in this context given the Confrontation Clause's phrasing, "witnesses *against* [the defendant]." *Id.* at 864–65.

27. 5 WIGMORE ON EVIDENCE § 1397 (Chadbourn rev. 1974) (emphasis in original).

28. *Id.*

29. U.S. CONST. amend. VI.

30. Pointer v. Texas, 380 U.S. 400, 406 (1965); *see also* Crawford v. Washington, 541 U.S. 36, 42 (2004) (citing *Pointer*, 380 U.S. at 406).

31. *Crawford*, 541 U.S. at 42–43 (citations omitted).

32. U.S. CONST. amend. VI.

33. *See, e.g.*, U.S. v. Owens, 484 U.S. 554, 559 (1988); 2 DAVID LAURENCE FAIGMAN, MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 14:1.3 (2002).

34. Mattox v. United States, 156 U.S. 237, 242–43 (1895) (quoted in California v. Green, 399 U.S. 149, 157–58).

For those reasons, unconfronted witnesses, unsworn witnesses, and testimony by affidavits were recognized as especially problematic.[35]

B. Modern Confrontation Clause Jurisprudence

The best known influence on the origins of the modern Confrontation Clause is the trial of Sir Walter Raleigh for treason in 1603, and his experience served as a central framework for the Court's modern jurisprudence.[36] Sir Raleigh's accuser, an alleged accomplice, had implicated him through out-of-court statements that were repeated against Sir Raleigh at trial.[37] Sir Raleigh pleaded to have his accuser brought "before [his] face" but to no avail; Sir Raleigh was subsequently convicted, sentenced to death, and eventually executed.[38]

In recent decades, the Court has issued numerous Confrontation Clause decisions. Perhaps the most important of them is *Crawford v. Washington*, because in it the Court essentially rewrote the governing Confrontation Clause standard.[39] In *Crawford*, a husband stabbed a man and claimed self-defense, but the wife's recounting of the event to police was arguably inconsistent with a self-defense theory.[40] The wife refused to testify, asserting a state marital privilege, so the state introduced her prior out-of-court statement.[41] The Court held that admitting the statement violated the husband's Confrontation Clause right.[42]

In so holding, the Court rewrote the prior standard,[43] which focused on hearsay law and the reliability of the evidence.[44] The Court concluded in *Crawford* that this approach failed to adequately address the core concerns of the Confrontation Clause: "Where testimonial statements are involved, we do not think the Framers meant to leave the Sixth Amendment's protection to the vagaries of the rules of evidence, much less to amorphous notions of 'reliability.'"[45]

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35. *See generally* JOSEPH STORY, COMMENTARIES ON THE CONSTITUTION § 1786 (1833) (discussing risks of false testimony).

36. *See* Roger W. Kirst, *The Procedural Dimensions of Confrontation Doctrine*, 66 NEB. L. REV. 485, 490 (1987).

37. *See, e.g.*, Crawford v. Washington, 541 U.S. 36, 44 (2004).

38. *Id.*

39. *Id.*

40. *Id.* at 38–39.

41. *Id.* at 40.

42. *See id.* at 68.

43. *See id.* at 60–68 (citing the prior test, established in Ohio v. Roberts, 448 U.S. 56 (1980)).

44. *See id.* at 62–67.

45. *Id.* at 51, 61.

Instead, the Court concluded that while the Confrontation Clause serves as a shield against the admission of unreliable testimony, it does so as "a procedural rather than a substantive guarantee. It commands, not that evidence be reliable, but that reliability be assessed in a particular manner: by testing in the crucible of cross-examination."[46] In sum, "[w]here *testimonial evidence* is at issue . . . the Sixth Amendment demands what the common law required: *unavailability* and *a prior opportunity for cross-examination*."[47]

In *Davis v. Washington*, the Court elaborated on what "testimonial" means.[48] *Davis* involved two consolidated cases. In the first case, a woman called 911 to report an ongoing emergency. In the second case, police officers responded to an alleged act of domestic abuse that had already occurred.[49] At trial, the prosecution sought to introduce the 911 call in the former case and the victim's statements collected by the police at the scene in the latter.[50] The Court reiterated that only testimonial statements trigger the Confrontation Clause and explained that statements are testimonial when "the primary purpose of the interrogation is to establish or prove past events potentially relevant to later criminal prosecution."[51] The *Davis* Court held that the statements made during an ongoing emergency were not testimonial; they were statements intended to help resolve that emergency rather than just to learn about a potential past crime, and they were part of an exchange that was not formal.[52] However, in the second case, the Court found that the victim's statements were testimonial because they were made in the context of an investigation into alleged criminal conduct, were not casual remarks but instead somewhat formal statements to government officials, and "the primary, if not indeed the sole, purpose of the interrogation was to investigate a possible crime."[53] In short, the statements "d[id] precisely *what a witness does* on direct examination."[54]

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46. *Id.* at 61.

47. *Id.* at 68 (emphasis added) (footnote omitted); *see also* Richard D. Friedman, *Confrontation and Forensic Laboratory Reports, Round Four*, 45 TEX. TECH L. REV. 51, 57 (2012).

48. *See* Davis v. Washington, 547 U.S. 813, 822 (2006).

49. *See id.* at 818.

50. *See id.*

51. *Id.* at 821–22; *see also* Michigan v. Bryant, 562 U.S. 344, 1157 (2011).

52. *See Davis*, 547 U.S. at 827 (discussing each of these factors).

53. *Id.* at 829–30.

54. *Id.* at 830 (emphasis in original).

A case decided in 2011 provided additional clarity as to the meaning of "testimonial," *Michigan v. Bryant*.[55] In *Bryant*, the victim was shot outside a home and drove to a gas station where police found him mortally wounded.[56] The officers asked the victim "what had happened, who had shot him, and where the shooting had occurred."[57] The victim answered and died shortly afterwards. The prosecution tried to introduce these answers at trial by asking the officers who spoke with him.[58] The Court concluded that these statements were not testimonial.[59] Instead, they were statements made to resolve an ongoing emergency—the victim's shooter still being at large.[60] The Confrontation Clause analysis, the Court held, required an objective evaluation of the circumstances in which the statements were made.[61] That objective analysis looks at both the declarant and the interrogator: "[T]he relevant inquiry is not the subjective or actual purpose of the individuals involved in a particular encounter, but rather the purpose that reasonable participants would have had, as ascertained from the individuals' statements and actions and the circumstances in which the encounter occurred."[62] Finally, the Court reiterated that the analysis includes consideration of whether "state actors are involved in a formal, out-of-court interrogation of a witness to obtain evidence for trial."[63]

The Court has also addressed whether forensic evidence is testimonial. In *Melendez-Diaz v. Massachusetts*, the Court considered a case involving three "certificates of analysis" that stated the results of forensic tests performed on certain seized substances.[64] Those documents contained various details, including the date the bags were analyzed, an identification number, the name of the officer who submitted the bags, a certification by the analysts that the substance was found to contain cocaine, the weight of the samples, the defendant's name, the analysts' signatures, and a notarization.[65] The analysts who

55. *Bryant*, 562 U.S. at 361.

56. *See id.* at 348–49.

57. *Id.* at 349.

58. *See id.* at 350.

59. *See id.* at 378.

60. *See id.*

61. *See id.* at 359.

62. *See id.* at 360.

63. *See id.* at 358.

64. Melendez-Diaz v. Massachusetts, 557 U.S. 305, 307–08 (2009).

65. Appendix A, Memorandum and Order Pursuant to Rule 1:28 at 24a–29a, Commonwealth v. Melendez-Diaz, 921 N.E.2d 108 (Mass. App. Ct. 2010) (No. 05-P-1213), available at http://www.scotusblog.com/wp/wp-content/uploads/2008/02/07-591_ob.pdf [https://perma.cc/X6ZA-GNZS] (last visited Feb. 11, 2020).

signed the reports did not testify at trial, despite the defendant's objection under the Confrontation Clause.[66]

The Court held that the lab reports were "within the core class of testimonial statements" under *Crawford* and *Davis*.[67] The Court first noted that they were "functionally identical to live, in-court testimony, doing 'precisely what a witness does on direct examination.'"[68] Writing for the Court, Justice Scalia explained:

> [N]ot only were the affidavits "made under circumstances which would lead an objective witness reasonably to believe that the statement would be available for use at a later trial," but under Massachusetts law the *sole purpose* of the affidavits was to prove prima facie evidence of the composition, quality, and the net weight of the analyzed substance.[69]

Thus, the affidavits were the analysts' testimonial statements, and the analysts who prepared them were witnesses for purposes of the Sixth Amendment.[70] *Melendez-Diaz* is thus highly relevant to machine accusers, but because the case centered on the analysts' formal confirmation of the lab results, it does not address the core question of *machine-generated* accusations and the role of testimony from lab analysts who operate them (but who did not certify the results of the test or the analysis the machine conducted).

Bullcoming v. New Mexico took the Court one step closer to addressing machine accusers but ultimately did not resolve that issue.[71] The prosecution charged the defendant in that case with driving while intoxicated and submitted the defendant's blood sample for analysis.[72] The resulting report listed the defendant's blood-alcohol content (BAC) as determined via a forensic lab machine (a gas chromatograph), certified that the analyst received the sample with the seal unbroken, affirmed that the analyst followed lab procedures listed on the back of the report, and certified the analyst's findings.[73] The supervising lab employee certified that the analyst was qualified to conduct the BAC test and that the "established procedure" for handling and analyzing the sample had been followed.[74] Finally, the report identified the analyst who conducted the test, the date and time the sample was

66. *See Melendez-Diaz*, 557 U.S. at 309.

67. *See id.* at 310 (internal quotation marks omitted).

68. *See id.* at 310–11 (quoting Davis v. Washington, 547 U.S. 813, 830 (2006)).

69. *See id.* at 311 (internal quotation marks omitted) (quoting Crawford v. Washington, 541 U.S. 36, 52 (2004)).

70. *See id.*

71. Bullcoming v. New Mexico, 564 U.S. 647, 661, 673–74 (2011).

72. *See id.* at 652.

73. *See id.* at 653–54.

74. *See id.* at 653.

drawn, and the reason for the defendant's detention ("Accident"), and it contained certifications from the nurse and officer as to the blood drawn and chain-of-custody information.[75]

At trial, the prosecution did not call the analyst who conducted the analysis to testify because the analyst had, for reasons unstated, recently been placed on unpaid leave.[76] Instead, the prosecutor called a different analyst and introduced the BAC report through that surrogate witness.[77] The New Mexico Supreme Court concluded that the on-leave analyst who prepared the report "was a mere scrivener" who "simply transcribed the results generated by the gas chromatograph machine."[78] That court further explained that the "true 'accuser' was the gas chromatograph machine"[79] and noted that the substitute analyst who testified in court could be cross-examined about the machine, the lab's procedures, and the BAC results.[80] Thus, the New Mexico court held that a machine had testified, but the Confrontation Clause was not violated.

The US Supreme Court disagreed. The primary holding in *Bullcoming* was that the analyst certified *more* than the BAC data: the analyst also certified, via the report, that he received the defendant's sample intact and sealed, that he performed a specific test by following lab protocols, and that there were no anomalies in that process that might have "affect[ed] the integrity of the sample or . . . the validity of the analysis."[81] The Court also concluded that the prosecution could not enter the testimonial report through the substitute testimony of another analyst that was familiar with the process.[82]

Justice Sotomayor provided the fifth vote in *Bullcoming*, but she did so with reservations. In her concurrence, she highlighted that *Bullcoming* did not present the question of whether one expert could offer his or her opinion in court based on underlying testimonial records that were not themselves admitted.[83] Justice Sotomayor also noted that the Court "[did] not decide whether . . . a State could introduce (assuming an adequate chain of custody foundation) raw data generated by a machine in conjunction with the testimony of an expert

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75. *See id.*

76. *See id.* at 655.

77. *See id.*

78. State v. Bullcoming, 226 P.3d 1, 8–9 (N.M. 2010).

79. *Id.* at 9.

80. *Id.*

81. *Bullcoming*, 564 U.S. at 659–60 (alteration in original) (internal quotation marks omitted) (quoting the lab procedures).

82. *See id.* at 661.

83. *See id.* at 673 (Sotomayor, J., concurring in part).

witness."[84] Thus, on the pivotal question of machine accusers, the path ahead for the Clause remains uncharted.

C. Related Confrontation Clause Jurisprudence

Finally, four other cases warrant mention.[85] In *Ohio v. Clark*, the Court held that statements of a three-year-old child to his teachers about marks on his body were not testimonial.[86] The majority concluded that "[i]n the end, the question is whether, in light of all the circumstances, viewed objectively, the 'primary purpose' of the conversation was to 'creat[e] an out-of-court substitute for trial testimony.'"[87] The Court held that the young child's statements—made to a teacher in a lunchroom and then in a classroom, and made in the context of the ongoing emergency of suspected child abuse—were not made with that primary purpose.[88] In reaching that conclusion, the Court noted that

> [c]ourts must evaluate challenged statements in context, and part of that context is the questioner's identity. Statements made to someone who is not principally charged with uncovering and prosecuting criminal behavior are significantly less likely to be testimonial than statements given to law enforcement officers. . . . We do not ignore that reality.[89]

As discussed further in Part IV, just as the context and questioner's identity were important in *Clark*, they are important when machine accusers—for example, forensic machines creating statements with the purpose of investigating crimes—provide testimony.

In a second case, *Giles v. California*, the Court addressed the doctrine of forfeiture by wrongdoing.[90] The Court ultimately held that the doctrine could exempt statements from the Confrontation Clause, but that to do so the defendant must have made the declarant unavailable *for the purpose* of avoiding the declarant's testimony at

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84. *Id.* at 674.

85. Williams v. Illinois, 567 U.S. 50 (2012) (plurality opinion), offers little help to the modern analysis. *Williams* was a fractured decision that is deeply inconsistent with the Court's prior cases. Justice Thomas, concurring in result only and providing the fifth vote, recognized this: he rejected the plurality's reasoning in full and, under his own test, concluded that the results were not sufficiently formal and thus did not trigger the Confrontation Clause. The four dissenting justices agreed with Justice Thomas that the plurality's test was flawed analytically and a departure from the Court's Confrontation Clause jurisprudence, but they also rejected Justice Thomas's formality test.

86. *See* Ohio v. Clark, 135 S. Ct. 2173, 2176 (2015).

87. *Id.* at 2180 (quoting Michigan v. Bryant, 562 U.S. 344, 358).

88. *See id.* at 2181.

89. *Id.* at 2182.

90. *See* Giles v. California, 554 U.S. 353, 358 (2008).

trial.[91] The Court reached that outcome over a strong dissent, and in responding to that dissent, Justice Scalia noted that "the guarantee of confrontation is no guarantee at all if it is subject to whatever exceptions courts from time to time consider 'fair.'"[92] Justice Scalia's concern over maligning the Clause's analysis with exceptions illustrates one risk also posed by categorically exempting machine accusers from the right of confrontation.

Finally, in two pre-*Crawford* cases that are still generally applicable,[93] the Court considered the Confrontation Clause's face-to-face confrontation right. Because testifying can be potentially traumatizing for children, especially when it includes having to "face" the child's alleged tormenter, courts have employed various tools to protect the defendant's confrontation right while mitigating the stress for the child witness. In one such case, *Coy v. Iowa*, the Court considered whether a screen separating the child witnesses from the defendant violated the Confrontation Clause.[94] The screen "enable[d] the [defendant] to dimly perceive the witnesses, but the witnesses to see him not at all."[95] The Court held it was unconstitutional,[96] concluding that "[i]t is difficult to imagine a more obvious or damaging violation of the defendant's right to a face-to-face encounter."[97]

In characterizing the legal error at hand, the Court contrasted it with other Confrontation Clause rights that were merely "reasonably implicit" in the Clause—"namely, the right to cross-examine; the right to exclude out-of-court statements; and the asserted right to face-to-face confrontation at some point in the proceedings other than the trial itself."[98] Thus, not only did the Court find the right of face-to-face confrontation essential, it elevated it potentially above other lofty rights such as the right to cross-examine adverse witnesses.

Additionally, the Court noted that it was conceivable a right to confrontation error was harmless, but the Court cautioned on how to conduct such an analysis: "An assessment of harmlessness cannot include consideration of whether the witness' testimony would have been unchanged, or the jury's assessment unaltered, had there been confrontation; such an inquiry would obviously involve pure

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91. *See id* at 354.

92. *Id.* at 375.

93. *See, e.g.*, FAIGMAN ET AL., *supra* note 33, at § 16:10 ("Indeed, lower courts have held that *Crawford* did not affect the continuing validity of the rule set forth in [*Maryland v.*] *Craig*.").

94. Coy v. Iowa, 487 U.S. 1012, 1020 (1988).

95. *Id.* at 1015.

96. *See id.* at 1021–22.

97. *Id.* at 1020.

98. *Id.* (citation omitted).

speculation, and harmlessness must therefore be determined on the basis of the remaining evidence."[99] This holding proves important to the machine-accuser analysis because, where the defendant has had no opportunity to confront the analyst who actually operated the machine, any harmless error analysis would similarly be ill-advised to focus on—i.e., speculate about—how that analyst might have testified.

Justice O'Connor and Justice White provided the fifth and sixth votes in *Coy*, but Justice O'Connor also wrote separately.[100] She noted that, though the screen used in *Coy* was problematic, it was one of multiple ways to shield witnesses from courtroom trauma, and the Court was not addressing those other options.[101] One such alternative she mentioned was videotaped testimony.[102] She also emphasized that the right to confront, while at the core of the Clause, was not absolute, and it should bend when balanced against other important public policy–based rationales.[103]

Justice O'Connor's balancing test won the day in the Court's subsequent case, *Maryland v. Craig*.[104] *Craig* involved the testimony of a six-year-old via one-way closed-circuit television through which the child, prosecutor, and defense counsel were in one room (where the child delivered testimony), and video of that room was relayed to the courtroom where the defendant, judge, and jury remained.[105] The Court held that the procedure did not violate the Clause because "[t]he central concern of the Confrontation Clause" was "to ensure the reliability of the evidence against a criminal defendant by subjecting it to rigorous testing in the context of an adversary proceeding before the trier of fact," and this method accomplished that objective.[106]

Notably, to use such modifications to face-to-face confrontation, the trial court must find that the modification "is necessary to further an important public policy and only where the reliability of the testimony is otherwise assured."[107] If such a finding is needed to merely *modify* the right to confront in a child-accuser case, the outright denial of the confrontation right in machine-accuser cases would seem to at least mandate a similar result. But courts have generally made no such findings in denying defendants the right to confront the operators of

99. *Id.* at 1021–22.
100. *See id.* at 1022 (O'Connor, J., concurring).
101. *See id.* at 1022–23.
102. *See id.* at 1023.
103. *See id.* at 1024–25.
104. *See* Maryland v. Craig, 497 U.S. 836, 836 (1990).
105. *See id.* at 840–43.
106. *Id.* at 845.
107. *Id.* at 850.

machines used to generate accusations. Thus, although the four cases discussed in this Section do not expressly chart the path for machine accusers under the Confrontation Clause, they point toward a common destination: the categorial exemption of machine accusers from the Confrontation Clause is problematic.

III. MACHINE-ACCUSER IMMUNITY UNDER THE CONFRONTATION CLAUSE

Against this backdrop of Supreme Court jurisprudence, federal and state courts have wrestled with how to protect criminal defendants in an era of machine accusers. In that battle, machine accusers have repeatedly triumphed. This doctrine has come to be called the "machine-generated testimony doctrine."[108] The consensus from courts in at least four circuits and numerous states is that machine-generated data—absent separate certifications from lab analysts—do not trigger the Confrontation Clause because it is the machines, not the analysts operating them, that make the statements at issue.[109] This leads to multiple problems. First, since the machine operator is not seen as making any statement in connection with the machine's results, the defendant has no right under the Clause to confront the operator, even though the operator is often the only person in the world who knows whether the machine was used properly. Second, because the machine's statement is treated as outside the scope of the Clause, a critical constitutional right inches toward extinction as machine accusers increasingly replace human witnesses.

The result is a persistent trend of courts admitting expert testimony about results from tests that the testifying expert never ran, never witnessed being run, and often has no ability to even confirm actually derive from the laboratory sample. As described in the next Part, that problematic result is arguably correct under current Confrontation Clause principles. Because the rules of evidence do not

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108. *See* Sites, *supra* note 17; text accompanying notes 89–117; *see also* Peter Nicolas, *But What if the Court Reporter Is Lying? The Right to Confront Hidden Declarants Found in Transcripts of Former Testimony*, 2010 B.Y.U. L. REV. 1149, 1192–93 (2010) (noting, while addressing a different issue, that "the Confrontation Clause encompasses only statements by people").

109. Four circuits have held that machine-generated data are not hearsay and do not trigger the Confrontation Clause. *See, e.g.*, United States v. Lizarraga-Tirado, 789 F.3d 1107, 1110 (9th Cir. 2015); United States v. Lamons, 532 F.3d 1251, 1262–63 (11th Cir. 2008); United States v. Moon, 512 F.3d 359, 362 (7th Cir. 2008); United States v. Washington, 498 F.3d 225, 321 (4th Cir. 2007). Other circuits have intimated they might agree. *See, e.g.*, Patterson v. City of Akron, 619 F. App'x 462, 479–480 (6th Cir. 2015); United States v. Hamilton, 413 F.3d 1138, 1142 (10th Cir. 2005).

offer a sufficient basis for protection against the risks posed by machine accusers,[110] Confrontation Clause jurisprudence must evolve to fill the gap forming with the rise of machine witnesses. Reserving for Part IV the question of how it must evolve,[111] this Part briefly reiterates the history leading to the current state of machine-witness immunity.

A. Machine Accusers Arrive: United States v. Washington

The best known example of the machine-generated testimony doctrine is the case that effectively created it: *United States v. Washington*.[112] In *Washington*, a police officer pulled over an individual for erratic driving and obtained a blood sample.[113] After forensic analysis, and based on approximately twenty pages of data printed by a forensic machine, the lab director concluded that the blood sample contained intoxicants.[114] The lab director, however, had not run, assisted with, or otherwise observed any of the tests producing the underlying data. Further, the three analysts who did so—i.e., the only people who actually used the machines in connection with the defendant's sample—did not testify in court. Instead, their supervisor did.[115]

At trial, the defendant claimed a right to cross-examine the three analysts pursuant to the Confrontation Clause.[116] The trial court disagreed.[117] On appeal, the US Court of Appeals for the Fourth Circuit affirmed[118] and concluded that the defendant had no such right under the Confrontation Clause because "the inculpating 'statement'—that [the defendant]'s blood sample contained PCP and alcohol—was made by the machine . . . . [and thus was not subject to] the Confrontation Clause."[119] Thus was born the doctrine of machine-accuser immunity.

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110. *See infra* Part IV; *see also* Sites, *supra* note 7.

111. *See infra* Part IV.

112. *See Washington*, 498 F.3d at 321. Though other cases preceded *Washington*, in the post-*Crawford* world, *Washington* functions as the first test to adopt this analysis. *See, e.g.*, Joe Bourne, *Prosecutorial Use of Forensic Science at Trial: When Is a Lab Report Testimonial?*, 93 MINN. L. REV. 1058, 1079–80 (2009) (describing *Washington* as "an analytical angle from which no other court had approached a *Crawford* issue pertaining to forensic science").

113. *See Washington*, 498 F.3d at 227–28.

114. *See id.* at 228.

115. *See id.*

116. *See id.* at 229.

117. *See id.*

118. *See id.* at 232.

119. *Id.* at 230.

Suppose, despite their best intentions and efforts, the three analysts in *Washington* had not used the lab equipment correctly.[120] Or suppose, instead, that one of the analysts intentionally[121] or accidentally[122] altered the sample. With no ability to cross-examine the analysts, how would the trial court ascertain these facts? It could not. What if the analysts never actually ran the test at all and instead falsified the results?[123] If the analysts in *Washington* were just another example of the "major failures [that] have occurred in more than 100 U.S. labs" over the years,[124] the trial court's refusal to muster either the rules of evidence or Confrontation Clause against them left the defendant nearly powerless to safeguard his rights. "Just as human sources potentially suffer the so-called 'hearsay dangers' of insincerity, ambiguity, memory loss, and misperception, machine sources [immune from confrontation] potentially suffer 'black box' dangers that could lead a factfinder to draw the wrong inference from information

120. *See, e.g.*, Chuck Lindell, *Court: Examine if Austin Crime Lab Botched Death Penalty Evidence*, STATESMAN (Sept. 22, 2018, 4:39 AM), https://www.statesman.com/news/20171018/court-examine-if-austin-crime-lab-botched-death-penalty-evidence [https://perma.cc/9JS5-CMWP].

121. *See, e.g.*, Rebecca Everett, *Future Cloudy for Thousands of Drug Cases Tested by Sonja Farak, Records Show Tampering Went On for Nearly Nine Years*, DAILY HAMPSHIRE GAZETTE (July 9, 2015), http://www.gazettenet.com/Archives/2015/07/druglabfolo-hg-070815 [https://perma.cc/7NP5-GU6W]; Roma Khanna & Steve McVicker, *Probe Finds Crime Lab Faked Results in 4 Cases*, HOUS. CHRONICLE (June 1, 2005, 5:30 AM), https://www.chron.com/news/houston-texas/article/Probe-finds-crime-lab-faked-results-in-4-cases-1494739.php [https://perma.cc/P24T-4XQ2].

122. *See, e.g.*, Tracey Kaplan, *Crime Lab Uses Wrong Chemical in 2,500 Methamphetamine Tests in Santa Clara County*, MERCURY NEWS (May 5, 2014), https://www.mercurynews.com/2014/05/05/crime-lab-uses-wrong-chemical-in-2500-methamphetamine-tests-in-santa-clara-county/ [https://perma.cc/6JXA-LH6S]; Allison Manning, *Columbus Crime-Lab Error Might Affect 38 Cases*, COLUMBUS DISPATCH (Aug. 8, 2014), https://www.dispatch.com/content/stories/local/2014/08/08/lab-error-might-affect-38-cases.html [https://perma.cc/E9BB-BGV3].

123. *See, e.g.*, Katie Mettler, *How a Lab Chemist Went from 'Superwoman' to Disgraced Saboteur of More than 20,000 Drug Cases*, WASH. POST (Apr. 21, 2017, 4:23 AM), https://www.washingtonpost.com/news/morning-mix/wp/2017/04/21/how-a-lab-chemist-went-from-superwoman-to-disgraced-saboteur-of-more-than-20000-drug-cases/ [https://perma.cc/GJ7C-LTYD] (describing a Massachusetts forensic analyst who falsified results by "not actually testing all the drugs that came before her, forging her co-workers' initials and mixing drug samples so that her shoddy analysis matched the results she gave prosecutors," leading to the dismissal of 21,587 drug cases "tainted by [her] misconduct"); Justin Zaremba, *Lab Tech Allegedly Faked Result in Drug Case; 7,827 Criminal Cases Now in Question*, NJ.COM (Jan. 16, 2019), http://www.nj.com/Passaic-county/index.ssf/2016/03/state_police_lab_tech_allegedly_faked_results_in_p.html [https://perma.cc/FUS2-LWGS].

124. Jordan Michael Smith, *Forget CSI: A Disaster Is Happening in America's Crime Labs*, BUS. INSIDER (Apr. 30, 2014), http://www.businessinsider.com/forensic-csi-crime-labs-disaster-2014-4 [https://perma.cc/UDF7-F4KE]; *see also Crime Lab and Forensic Scandals*, KOMORN L., http://komornlaw.com/crime-lab-and-forensic-scandals/ [https://perma.cc/KH87-SNPW] (last visited Oct. 17, 2018) (listing numerous alleged forensic lab scandals).

conveyed by a machine source."[125] In the world of machine-accuser testimonial immunity, courts largely sacrifice sacrosanct rights of criminal defendants in the name of lab convenience.

B. Machine Accusers Unite: Responses to Washington

Many courts have found *Washington*'s rationale persuasive.[126] In *United States v. Blazier*, the Court of Appeals for the Armed Forces went so far as to state that "it is well-settled that under both the Confrontation Clause and the rules of evidence, machine-generated data and printouts are not statements and thus not hearsay—machines are not declarants—and such data is therefore not 'testimonial.'"[127] In *United States v. Moon*, the Seventh Circuit endorsed *Washington*'s approach in a case involving raw data from an infrared spectrometer and a gas chromatograph.[128] As in *Washington*, *Moon* involved one expert testifying in court based on the raw data produced by a different analyst.[129] The Seventh Circuit held that the conclusions the nontestifying chemist came to were testimonial but the raw data from the machines were not.[130] Thus, as in *Washington*, if the nontestifying analyst had erred or committed fraud, the defendant had little ability to demonstrate his innocence in the face of the machine accuser and its surrogate witness-analyst.

Similarly, in *United States v. Lamons*, the Eleventh Circuit cited both *Washington* and *Moon* approvingly, holding that data produced by a machine memorializing telephone calls made were not testimonial because "the witnesses with whom the Confrontation Clause is concerned are *human* witnesses."[131] In *United States v. Lizarraga-Tirado*, the Eleventh Circuit reached an analogous result in a case involving a defendant arrested for illegally crossing the

125. Roth, *supra* note 9, at 1977 (internal footnotes and citations omitted). *But see* Stephen A. Saltzburg, *Equipment, Hearsay, and Authentication*, 22 CRIM. JUST. 38, 41 (2008) (arguing the absence of Confrontation Clause or hearsay problems and that authentication is sufficient on bases other than actual testing of analysts' testimony).

126. *See, e.g.*, United States v. Drayton, No. PWG-13-0251, 2014 WL 2919792, *6 (D. Md. June 26, 2014) ("[A] machine cannot bear witness against an accused within the meaning of the Confrontation Clause. [O]nly a human may be a declarant."). *But see* United States v. Ramos-Gonzalez, 664 F.3d 1, 6–7 (1st Cir. 2011) (concluding, without analyzing the machine-generated testimony doctrine, that the testimony of one analyst about, *inter alia*, the results of a test violated the Confrontation Clause).

127. United States v. Blazier, 69 M.J. 218, 224 (C.A.A.F. 2010).

128. United States v. Moon, 512 F.3d 359, 360–62 (7th Cir. 2008).

129. *Id.* at 360–61.

130. *Id.* at 361.

131. United States v. Lamons, 532 F.3d 1251, 1260–61, 1263 (11th Cir. 2008) (emphasis in original).

US-Mexico border. The case turned in part on whether he was arrested in the United States or Mexico.[132] Important evidence on that point was provided in the form of the government agents' assertion that they "contemporaneously recorded the coordinates of defendant's arrest using a handheld GPS device."[133] In assessing that claim, the court held the evidence (the coordinates, etc.) was generated by a machine (Google Earth), and, thus, it could not be hearsay because it was not a statement by a person.[134]

The list of such cases goes on,[135] and on,[136] and on,[137] both in state courts[138] and federal courts.[139] Courts have reached analogous conclusions for DNA results,[140] breathalyzer results,[141] urinalysis

132. United States v. Lizarraga-Tirado, 789 F.3d 1107, 1108 (9th Cir. 2015).

133. *Id.*

134. *Id.* at 1109–10 (citing United States v. Washington, 498 F.3d 225, 230 (4th Cir. 2007) and several other cases discussed herein).

135. State v. Buckland, 96 A.3d 1163, 1172 (Conn. 2014) ("We hold that the machine generated data is not subject to the restrictions imposed by *Crawford*, *Melendez–Diaz* and *Bullcoming*.").

136. *See, e.g.*, Leger v. State, 732 S.E.2d 53, 60 (Ga. 2012) (supervisor may testify about data generated by other analysts); People v. Brown, 918 N.E.2d 927, 931 (N.Y. 2009) ("The . . . report, furthermore, was not 'testimonial' . . . because it consisted of merely machine-generated graphs, charts and numerical data."); State v. Keck, No. 09CA50, 2011 WL 1233196, at *5–6 (Ohio Ct. App. Mar. 30, 2011) (no Confrontation Clause violation where one analyst testified to her analysis, which was based in part on the apparently machine-generated DNA results that another analyst produced); *cf.* State v. Ortiz-Zape, 743 S.E.2d 156, 162 (N.C. 2013) (citing *Washington* and *Moon* approvingly), *cert. denied*, 134 S. Ct. 2660 (2014); State v. Dilboy, 48 A.3d 983, 989 (N.H. 2012) (noting that testimony based on "raw data, such as graphic or numerical computer printouts . . . [might] not . . . violat[e] . . . the Confrontation Clause").

137. Hamilton v. State, 300 S.W.3d 14, 21–22 (Tex. Ct. App. 2009) (raw data produced by DNA analysis were machine-generated statements, and "[t]he Confrontation Clause implicates statements made by persons, not machines").

138. People v. Lopez, 286 P.3d 469, 478 (Cal. 2012) ("Because, unlike a person, a machine cannot be cross-examined, here the prosecution's introduction into evidence of the machine-generated printouts . . . did not implicate the Sixth Amendment's right to confrontation.").

139. United States v. Crockett, 586 F. Supp. 2d 877, 885 (E.D. Mich. 2008) ("[t]he instrument readouts and printouts" resulting from analysis of cocaine did not implicate the Confrontation Clause or hearsay rule); *see also* Adams v. United States, No. 09-6152 (GEB), 2011 WL 1792562, at *3–4 (D.N.J. May 10, 2011) (addressing, as an alternative basis for the court's ruling, the merits of a 28 U.S.C. § 2255 habeas corpus claim that alleged error under the Confrontation Clause, and citing as examples *Washington* and *Moon*).

140. *See, e.g.*, State v. Gomez, 244 P.3d 1163, 1166 (Ariz. 2010); People v. Arauz, 2d Crim. No. B242843, 2013 WL 3357931, at *5 (Cal. Ct. App. July 3, 2013), *cert. denied*, 134 S. Ct. 2664 (2014).

141. *See* Cranston v. State, 936 N.E.2d 342, 345 (Ind. Ct. App. 2010); People v. Dinardo, 801 N.W.2d 73, 79 (Mich. Ct. App. 2010); Wimbish v. Commonwealth, 658 S.E.2d 715, 719–20 (Va. Ct. App. 2008).

results,[142] machine-generated data from equipment outside the lab,[143] and so on. Some courts reach this conclusion and expressly name the machine-generated testimony rationale, like in the aforementioned cases, while others reach it on more subtle grounds focusing on the ability of supervisors to testify to what their supervisees analyzed.[144]

Washington is weathering the passage of time and intervening US Supreme Court cases well; it was decided in 2007, before *Melendez-Diaz*, *Bullcoming*, and *Williams*, and the petition for certiorari was still pending when the Court issued *Melendez-Diaz*.[145] Though the Court granted petitions for certiorari in other cases and remanded them for reconsideration in light of *Melendez-Diaz*, the Supreme Court denied the petition in *Washington*.[146] In the wake of these various decisions, the Fourth Circuit has upheld *Washington*,[147] and several courts have held that *Washington*'s approach is still

142. *See* Marshall v. People, 309 P.3d 943, 945–47 (Colo. 2013); United States v. Bradford, 2009 WL 4250093, at *9 (A.F. Ct. Crim. App. Nov. 23, 2009); United States v. Anderson, 2009 WL 4250095, at *5 (A.F. Ct. Crim. App. Nov. 23, 2009); United States v. Skrede, 2009 WL 4250031, at *3 (A.F. Ct. Crim. App. Nov. 23, 2009).

143. *See, e.g.*, Stultz v. Artus, No. 04-CV-3170 (RRM), 2013 WL 937830, at *9–10 (E.D.N.Y. Mar. 8, 2013) (automated message stating a payphone's phone number was a statement by a machine, which falls outside the scope of the Confrontation Clause); *cf.* Robertson v. Comonwealth, 738 S.E.2d 531, 532–33 (Va. Ct. App. 2013) (en banc) (involving, but not addressing as such, machine-generated prices from a cash register).

144. *See* Smith v. State, 28 So. 3d 838, 854–55 (Fla. 2009) (per curiam) (discussing this issue and citing *Washington* and *Moon* approvingly); *id.* at 878–79 (Canady, J., concurring) (disagreeing with the court's opinion on only other issues); Rector v. State, 681 S.E.2d 157, 160 (Ga. 2009) (holding that a toxicologist could testify about tests and results obtained by another doctor because the toxicologist "reviewed the data and testing procedures" and "[a]n expert may base [his] opinions on data gathered by others") (second alteration in original) (citation omitted); State v. Roach, 95 A.3d 683, 694–99 (N.J. 2014) (an analyst who tested one DNA sample may testify about a DNA match based on results that depended, in part, on testing for a second DNA sample that another analyst generated); Commonwealth v. Yohe, 79 A.3d 520, 540 (Pa. 2013) ("[W]e hold that [the reviewing supervisor] is the analyst who determined Appellant's BAC. Although he relied on the raw data produced by the lab technicians [who ran the machines] . . . he is the only individual who engaged in the critical comparative analysis of the results of the . . . tests . . . and determined Appellant's BAC."); *see also id.* at 541–42 (collecting cases); *cf.* United States v. Hamilton, 413 F.3d 1138, 1142–43 (10th Cir. 2005) (computer-generated header "was generated instantaneously by the computer without the assistance or input of a person," and so, in the context of the hearsay rules, there was no "statement" or "declarant") (collecting cases).

145. *See* United States v. Washington, 498 F.3d 225, 225 (4th Cir. 2007), *cert. denied*, 557 U.S. 934 (2009).

146. *See* Washington v. United States, 557 U.S. 934 (2009) (denial of cert petition). This does not mean that the Supreme Court necessarily approved of the result in *Washington*, as there are many reasons a court of discretionary jurisdiction might deny review. The point only is that the Court had an opportunity to address the doctrine post-*Melendez-Diaz*, or at least to require the Fourth Circuit to reconsider in light of *Melendez-Diaz*, but declined to do so.

147. *See, e.g.*, United States v. Summers, 666 F.3d 192, 202–03 (4th Cir. 2011) (alleles were machine-generated data; distinguishing *Bullcoming* and *Melendez-Diaz*).

sound.[148] The votes are in, and it is a landslide: raw data are not testimonial under the new post-*Crawford* line of cases, and machine accusers remain largely immune to Confrontation Clause–based challenges.[149]

There is, however, a vocal dissent.[150] A scarce few have recognized the dangers inherent in machine-accuser immunity and enforced the Confrontation Clause's requirements.[151] In *Young v. United States*, the DC Circuit found a Confrontation Clause violation where a supervisor gave surrogate testimony about DNA tests that she neither conducted nor was present for. In doing so, the court "emphasize[d] . . . that it is too simplistic to say that the DNA profiles and the [random-match probability] were not hearsay because they were 'nothing more than the raw data produced by a machine.'"[152] But such results are few and far between.

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148. *See, e.g.*, United States v. Darden, 656 F. Supp. 2d 560, 563–64 (E.D. Ma. 2009); Hamilton v. State, 300 S.W.3d 14, 21 (Tex. App. 2009); United States v. Anderson, No. 2009-06, 2009 WL 4250095, at *5 (A.F. Ct. Crim. App. Nov. 23, 2009); United States v. Maxwell, 724 F.3d 724, 726–27 (7th Cir. 2013); Oliver v. State, No. 14-09-00690-CR, 2010 WL 3307391, at *4 (Tex. App. Aug. 24, 2010); United States v. Drayton, Criminal No. PWG-13-0251, 2014 WL 2919792, at *8–9 (D. Md. June 26, 2014); People v. Lopez, 286 P.3d 469, 478 (Cal. 2012); People v. Revill, No. B233987, 2013 WL 6094307, at *9–13 (Cal. Ct. App. Nov. 20, 2013).

149. *See, e.g.*, United States v. Bradford, Misc. Dkt. No. 2009-07, 2009 WL 4250093, at *5 (A.F. Ct. Crim. App. Nov. 23, 2009) (not reported) ("A survey of the case law following the issuance of *Melendez-Diaz* reveals [that] the courts are focusing on the requirement that an expert testify and that he or she do so using the data produced by the labs as the basis for his or her testimony. The lab technicians were not required to be produced as witnesses."), *rev'd on other grounds by* 68 M.J. 371 (C.A.A.F. 2010).

150. *See, e.g.*, *Washington*, 498 F.3d at 232 (Michael, J., dissenting); State v. Roach, 95 A.3d 683, 698–701 (N.J. 2014) (Albin, J., dissenting); *cf.* Pendergrass v. State, 913 N.E.2d 703, 711 (Ind. 2009) (Rucker, J., dissenting) (not addressing the machine-generated testimony doctrine but stating, "despite whatever ambiguity *Melendez–Diaz* may have created on the question of who must testify at trial, it appears to me the opinion is clear enough that a defendant has a constitutional right to confront at the very least the analyst that actually conducts the tests").

151. *See, e.g.*, Young v. United States, 63 A.3d 1033, 1046 (D.C. Cir. 2013); United States v. Ramos-González, 664 F.3d 1, 6 (1st Cir. 2011) (concluding, without analyzing the machine-generated testimony doctrine, that the testimony of one analyst about, *inter alia*, the results of a test violated the Confrontation Clause); *cf.* Martin v. State, 60 A.3d 1100, 1106 (Del. 2013) (lending some support to the right to cross-examine the operating analyst in machine-generated data contexts).

152. *Young*, 63 A.3d at 1046 (quoting *Summers*, 666 F.3d at 202). The DC Circuit went on to state that

> the [data at issue] do[es] not stand on [its] own but, instead, ha[s] meaning because [it] amount[s] to a communication by the scientists who produced [it]—the assertion, essentially, that the scientists generated these specific results by properly performing certain tests and procedures on particular, uncorrupted evidence and correctly recording the outcomes.

Id.

IV. READYING THE CONFRONTATION CLAUSE FOR MACHINE ACCUSERS

The rise in semiautonomous machines is generally a boon to society. Among other things, it enhances police protection and crime prevention. The above cases, however, are troubling because they illustrate that, as machine accusers arise, courts are permitting them to erode constitutional rights crafted in a prior age. The baseline position under the Confrontation Clause is a right of confrontation when statements are made for use in a criminal trial. And yet, for machine accusers, there is no right to confront the machine or the machine operator.

Machine accusers should be viewed as falling within the core of the Clause's concerns. For example, the Court has explained that "the most important instances in which the Clause restricts the introduction of out-of-court statements are those in which state actors are involved in a formal, out-of-court interrogation of a witness to obtain evidence for trial."[153] Machine-generated data from forensic labs consist, broadly, of an analogous investigation, undertaken by an analyst outside the presence of the defendant for the purpose of obtaining evidence for trial. It should trigger some form of cross-examination or confrontation right under the Clause. If it does not—if machines are an exception by nature—that result is problematic. As Justice Scalia noted in *Giles*, "[T]he guarantee of confrontation is no guarantee at all if it is subject to whatever exceptions courts from time to time consider 'fair.'"[154] As described below, machines speak in a manner that is often testimonial, and they should trigger the requirements of the Clause.

Support for a machine-accuser confrontation right permeates the Court's decisions. For example, the Court noted in *Ohio v. Clark* that "[c]ourts must evaluate challenged statements in context, and part of that context is the questioner's identity."[155] The Court made a similar observation in *Bryant* when it noted that the relevant inquiry looks at both who is answering and who is asking the questions.[156] Yet when a forensic machine is used to make assertions in the context of a criminal investigation—contexts in which the person "asking" the question is doing so for a primary purpose that relates to a future or present trial—the machine and its analyst are somehow immune to the Clause.

In this analysis, it is immaterial that machines act without their own motivations and purposes. First, the Court has already noted that

153. Michigan v. Bryant, 562 U.S. 344, 358 (2011).
154. Giles v. California, 554 U.S. 353, 375 (2008).
155. Ohio v. Clark, 135 S. Ct. 2173, 2182 (2015).
156. *Bryant*, 562 U.S. at 360.

"the relevant inquiry is not the subjective or actual purpose of the individuals involved in a particular encounter, but rather the purpose that reasonable participants would have had, as ascertained from the individuals' statements and actions and the circumstances in which the encounter occurred."[157] Just as a court ascribes a primary purpose to "reasonable participants," it can ascribe a primary purpose to the creation of machine accusations based on the myriad objective facts surrounding the creation of such evidence.

Second, the Court defined testimony in this context as a "'solemn declaration or affirmation made for the purpose of establishing or proving some fact,' . . . a fact 'potentially relevant to later criminal prosecution.'"[158] Numerous machine accusations fit that bill, especially those created in a forensic setting—an environment directed at formal inquiries into, for example, criminal acts. Further, it is not difficult, in most situations, to assess why the machine accusation was generated—the machine did not have a purpose, but a purpose was nevertheless present. In the case of nonautonomous machines, a human agent activated, directed, or otherwise used the machine to create the data. That operator had a purpose, and that purpose, as a guiding element of the machine's activation, should control. When a police officer directs a driver to use a breathalyzer, and the machine produces a resulting statement of the driver's BAC, the purpose is usually clear: to prove facts "potentially relevant to later criminal prosecution."

If machine accusers trigger no right of confrontation as to their statements or their analysts, it must be as an exclusion by category. But no such exception is warranted simply because the accuser, a machine (or as discussed below, a machine and human operator) is different from a traditional accuser (a human agent). Other constitutional rights do not balk in the face of machine actors. When the government uses advanced technology to intrude into the privacy of the home, for example, it is not rendered outside the protections of the Fourth Amendment because of the machine's vital role—e.g., where it perceived and translated the infrared spectrum.[159] If the government had a series of drones patrolling an area in pursuit of a suspect, and one errantly flew into a home and took pictures, this would still be a Fourth Amendment violation—that it was a machine would not alter the governmental intrusion into a private place without a warrant. So, too,

157. *Id.*

158. *Clark*, 135 S. Ct. at 2184 (Scalia, J., concurring in judgment) (quoting Davis v. Washington, 547 U.S. 813, 822 (2006)).

159. Kyllo v. United States, 533 U.S. 27, 40 (2001).

should accusations leveled at criminal defendants by machines trigger a right of confrontation.

The Court described the purpose of the Confrontation Clause in *Crawford* and *Davis* as grounded in the history of the common-law right to confrontation, which was particularly concerned with the "use of *ex parte* examinations as evidence against the accused."[160] The Court made that same observation at least as early as 1895 as well: "The primary object of [the Confrontation Clause] was to prevent depositions or *ex parte* affidavits . . . being used against the prisoner in lieu of a personal examination and cross-examination of the witness."[161]

That is what many machine-generated accusations are: evidence against the accused generated by a machine in private, away from the defendant's observation, that is then used against her at trial. Ironically, when a court accepts such machine accusations without empowering the defendant to cross-examine someone with firsthand knowledge of the statement's creation, it only illustrates their ex parte nature by further reducing the defendant's ability to test its accuracy, legitimacy, and truth. Even if the defendant can submit the evidence to testing to rival the prosecution's results—an option defendants often will be unable to pursue because of resources and other limitations—absent the ability to cross-examine the creator of the prosecution's results, the defendant at best achieves a he-said-she-said battle instead of what the Clause commands: a chance to confront his accuser.

Machine accusers would also be subject to confrontation under Justice Thomas's separate analytical model for the Clause. Justice Thomas has repeatedly addressed whether the Confrontation Clause applies by "assessing whether [the] statements bear sufficient indicia of solemnity to qualify as testimonial."[162] The Court has not adopted this test as a stand-alone analysis, but, ironically, many machine accusations would meet even that requirement as well. Most machine accusers are not creating evidence in a casual manner—they are sophisticated tools built for the purpose of making formal declarations about reality, such as whether DNA matches. The data generated by forensic machines are rarely informal. They are often a calculated determinations made in connection with a criminal investigation. In those situations, they should be viewed as testimonial.

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160. *Davis*, 547 U.S. at 835 (internal quotation marks omitted).

161. Mattox v. United States, 156 U.S. 237, 242–43 (1895) (quoted in California v. Green, 399 U.S. 149, 157–58 (1970)).

162. *Clark*, 135 S. Ct. at 2186 (Thomas, J., concurring in judgment) (citing Crawford v. Washington, 541 U.S. 36, 51 (2004)); *see also Davis*, 547 U.S. at 836–37 (Thomas, J., concurring in judgment in part and dissenting in part).

A confrontation right in this area is consistent with the Court's approach to the history and practice of the Confrontation Clause. Statements by machine accusers are novel as to the roots of the Clause's origin, but that should be no obstacle to recognizing a right to confront machine accusers.

> Defendants may invoke their Confrontation Clause rights once they have established that the state seeks to introduce testimonial evidence against them in a criminal case without unavailability of the witness and a previous opportunity to cross-examine. The burden is upon the prosecutor who seeks to introduce evidence over this bar to prove a *long-established practice* of introducing specific kinds of evidence, such as dying declarations for which cross-examination was not typically necessary.[163]

Of course, there is no long-established practice in the history of the Clause's origins of recognizing machine-generated accusations as outside the reach of confrontation. Thus, the Clause's default position—a right of confrontation—controls. Further, the Court noted in *Crawford* that "[r]estricting the Confrontation Clause to the precise forms against which it was originally directed is a recipe for its extinction."[164] The current jurisprudence on machine accusers does just that; it has set the Clause down the green mile.

The first step forward is clear: the Clause must evolve. In making the above comment about extinction, the Court cited *Kyllo v. United States*, a Fourth Amendment case. There, the Court concluded that the police's use of a thermal imaging device to replace or enhance traditional human observation and investigation was an unlawful search.[165] The Court did not "restrict" the Fourth Amendment's protection to the "precise forms" of search that existed at the time of the amendment's drafting. The Court recognized that constitutional rights must evolve. Machines are increasingly built to do the testifying for humans; forensic machines are one such example. Where once a chemist would mix reagents and write a report, now machines conduct the analysis and generate the statement. In other words, the machines are creating reports that are the functional substitute for what an expert witness would have done at trial. Such out-of-court testimony is precisely what the Court in *Crawford* and *Davis* indicated would trigger the Sixth Amendment right. In a world where society engineers machine accusers to testify in place of human witnesses, it is natural that the Confrontation Clause reach those replacement witnesses.[166]

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163. *Clark*, 135 S. Ct. at 2185 (Scalia, J., concurring in judgment).

164. *Davis*, 547 U.S. at 830 n.5.

165. Kyllo v. United States, 533 U.S. 27, 27 (2001).

166. This Article does not suggest here that the intent in making forensic and other machines that make assertions about reality is to escape the right of confrontation. That is,

It bears repeating that criminal defendants need these protections. Courts are simply incorrect in concluding that "[w]hether the machines properly reported" on their tasked analyses is "dependent solely on the machine . . . [and the] raw data generated by the machines."[167] Most machine accusers do not act sua sponte. Machines are vulnerable to manipulation, intentional or accidental, requiring the following:

1. The technician operating the machine must use the machine correctly,[168]
2. The technician must not intentionally tamper with the sample,[169]
3. The analyst must not accidentally alter the sample or err otherwise,[170] and
4. The analyst must actually run the test instead of falsifying the results.[171]

Decades of forensic lab scandals demonstrate that even if machine accusers could operate independently, they cannot be assumed to do so. The reality is that major errors have occurred in over one hundred labs in the United States alone.[172] These same concerns can arise in the programming of machines despite well-intended efforts to avoid that.[173] And as another commentator summarized:

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however, the outcome at hand, and criminal defendants should not pay the price of that valuable innovation.

167. United States v. Washington, 498 F.3d 225, 230 (4th Cir. 2007).

168. *See, e.g.*, Lindell, *supra* note 120.

169. *See, e.g.*, Everett, *supra* note 121; Seth Augenstein, *Oregon State Crime Lab Analyst Under Investigation for Evidence Tampering*, FORENSIC MAG. (Sept. 17, 2015), https://www.forensicmag.com/article/2015/09/oregon-state-crime-lab-analyst-under-investigation-evidence-tampering [https://perma.cc/K6PZ-P2DC]; Khanna & McVicker, *supra* note 121.

170. *See, e.g.*, Kaplan, *supra* note 122; Manning, *supra* note 122.

171. *See, e.g.*, Mettler, *supra* note 123 (describing a Massachusetts forensic analyst who falsified results by "not actually testing all the drugs that came before her, forging her co-workers' initials and mixing drug samples so that her shoddy analysis matched the results she gave prosecutors," leading to the dismissal of 21,587 drug cases "tainted by [her] misconduct"); Zaremba, *supra* note 123.

172. Smith, *supra* note 124; *see also Crime Lab and Forensic Scandals*, *supra* note 124 (listing numerous alleged forensic lab scandals).

173. *See, e.g.*, Mike Isaac, *Facebook 'Trending' List Skewed by Individual Judgment, Not Institutional Bias*, N.Y. TIMES (May 20, 2016), https://www.nytimes.com/2016/05/21/technology/facebook-trending-list-skewed-by-individual-judgment-not-institutional-bias.html [https://perma.cc/J2FB-MVP5]; David Murray, *Queensland Authorities Confirm 'Miscode' Affects DNA Evidence in Criminal Cases*, COURIER MAIL (Mar. 20, 2015),

> Just as human sources potentially suffer the so-called "hearsay dangers" of insincerity, ambiguity, memory loss, and misperception, machine sources potentially suffer "black box" dangers that could lead a factfinder to draw the wrong inference from information conveyed by a machine source. A machine does not exhibit a character for dishonesty or suffer from memory loss. But a machine's programming, whether the result of human coding or machine learning, could cause it to utter a falsehood by design. A machine's output could be imprecise or ambiguous because of human error at the programming, input, or operation stage, or because of machine error due to degradation and environmental forces. And human and machine errors at any of these stages could also lead a machine to misanalyze an event. Just as the "hearsay dangers" are believed more likely to arise and remain undetected when the human source is not subject to the oath, physical confrontation, and cross-examination, black box dangers are more likely to arise and remain undetected when a machine utterance is the output of an "inscrutable black box."[174]

The Confrontation Clause is the appropriate place to root protections against these risks. Though helpful in some ways, the rules of evidence should not alone protect defendants from machine accusers—nor have they, in practice, adequately succeeded in doing so.[175] The Supreme Court made clear in *Crawford* and *Davis* that the critical rights the Confrontation Clause protects were not to be left to the "vagueries of evidence."[176] Protecting the right of confrontation through evidence rules is also undesirable because alleged violations of evidence rules are subject to a lower level of review. On appeal, Confrontation Clause claims are generally reviewed de novo, whereas evidentiary rulings are reviewed only for an abuse of discretion.[177] A Sixth Amendment–based right will also better reach the state courts than one grounded in the Federal Rules of Evidence. Finally, courts also seem to regard the right to confront and cross-examine under the Confrontation Clause with more onus than the hearsay rules of evidence.[178] Given the powerfully incriminating evidence machine

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http://www.couriermail.com.au/news/queensland/queensland-authorities-confirm-miscode-affects-dna-evidence-in-criminal-cases/news-story/833c580d3f1c59039efd1a2ef55af92b [https://perma.cc/N2DK-N6D9].

174. Roth, *supra* note 9, at 1977–78 (internal footnotes and citations omitted). *But see* Saltzburg, *supra* note 125 (arguing the absence of Confrontation Clause or hearsay problems and that authentication is sufficient on bases other than actual testing of analysts' testimony).

175. *See, e.g.*, Sites, *supra* note 17, at 45.

176. Crawford v. Washington, 541 U.S. 36, 61–62 (2004).

177. *See, e.g.*, United States v. Suhl, 885 F.3d 1106, 1115 (8th Cir. 2018), *cert. denied*, 139 S. Ct. 172 (2018); United States v. Kizzee, 877 F.3d 650, 656 (5th Cir. 2017); United States v. Townley, 472 F.3d 1267, 1271 (10th Cir. 2007); United States v. Johnson, 440 F.3d 832, 842 (6th Cir. 2006).

178. *See, e.g.*, United States v. Landerman, 109 F.3d 1053, 1061–63 (5th Cir. 1997), *opinion modified on reh'g*, 116 F.3d 119 (5th Cir. 1997) ("Although the scope of cross examination is within the discretion of the district court, that discretionary authority comes about only after sufficient cross examination has been granted to satisfy the Sixth Amendment. . . . [U]ntil we determine that the cross examination satisfied the Sixth Amendment, the district court's discretion does not come into play.").

accusers generate, the Confrontation Clause is the most appropriate source of protection for criminal defendants.

A. Confronting Which Machines?

It remains to be determined what this right would be. Assuming a constitutional right does exist, what does it mean to confront a machine? There is little utility in putting the machine in the witness chair. But even that question skips the essential prior inquiry: To which machines would it apply? This Section addresses both questions. As a general matter, though, like the Confrontation Clause rule generally,[179] this right should be limited to testimonial accusations made by machines. And like the traditional Confrontation Clause protections, it would be a guarantee of "an opportunity for effective cross-examination, not cross-examination that is effective in whatever way, and to whatever extent, the defense might wish."[180]

As a starting point, it is important to note that not all statements generated by or in connection with a machine require any new rule—they are already subject to the Clause because they are purely human statements. For example, a statement made by a human but then inputted into a word processor would not, by virtue of the use of a printer and word processing software, become a machine's statement. Similarly, human assertions that are reduced to a machine record are also clearly subject to the Clause. For example, a printout of prior driving infractions—i.e., statements by human agents reporting that the driver had prior infractions entered into a database by a human agent—does not become "machine generated" merely because a printer, a computer, and database software generated it after someone manually inputted that data.[181] These are simply human reports repeated by a machine, and they are already subject to the Clause if the original human reports were testimonial.

Similarly, if an analyst writes down data displayed by a machine—or other facts about what the machine did related to testing (the noises it made, error lights that did or did not illuminate, etc.)—that record is still human generated and subject to the

179. *See Crawford*, 541 U.S. at 60–62.

180. Delaware v. Fensterer, 474 U.S. 15, 20 (1985).

181. *But see* Commonwealth v. Carter, 80 Va. Cir. 527, 534–35 (Va. Cir. Ct. 2010) (concluding that a transcript of driving records that were entered by DMV clerks was not the statement of a witness because it was "generated by a machine and presented without human analysis or interpretation"). The transcript was also admissible because, *inter alia*, it was not created in anticipation of a trial but instead for normal DMV purposes, such as issuing driver's licenses and tax assessments. *See id.*

Confrontation Clause if testimonial.[182] The mere fact that a machine was involved in the process does not alter that, ultimately, a human created the assertion about what happened. In essence, the human scrivener is serving as an eyewitness to the machine's actions. The report of an eyewitness, when testimonial, is classic Confrontation Clause territory.

The same holds true when an analyst is entering testimonial information into a forensic tool. Just as the report of a traffic officer remains the statement of a human even when entered into a traffic offense database, so too are assertions by lab analysts entered into forensic equipment. For example, if an analyst using a machine enters an identification number for the defendant's sample, that entry is the analyst's statement even when a machine later repeats it in the final report. For all of these areas, machine assistance notwithstanding, the human statements repeated by a machine are subject to the Confrontation Clause. This is not the machine-testimony doctrine or a new test for machine accusers: it is the present test applied in a manner that recognizes that the mere presence of a machine does not constitute a machine statement.

B. Machine Accusers: Distinguishing Categories

Machine accusers operate across a spectrum of autonomy: some require significant human direction and control, but others operate more independently. For many devices, a human will have virtually no involvement in the generation of its data once the machine is set in motion. An increasingly wide variety of devices make assertions about reality with no ongoing human assistance, including digital thermometers and weather-tracking devices, license plate scanners, GPS devices, and so forth. They require the assistance of their human progenitors to come into being, but as detailed elsewhere,[183] the assertions produced by autonomous machines should be treated as the machine's "statements."[184] Though there is no right to cross-examine a

182. *See, e.g.*, Robertson v. Commonwealth, 738 S.E.2d 531, 562–63 (Va. Ct. App. 2013) (en banc) (prices of stolen items reported by a cash register but written down by a human).

183. *See* Sites, *supra* note 17, at 55, 71–72.

184. *Id.* at 71–72. It is not hard to imagine exceptions to this conclusion, nor is it hard to imagine situations in which the programmers of the independent machine would be subject to the Confrontation Clause's reach. *See id.* at 76. For example, if a machine or software was designed, programmed, or otherwise calibrated to investigate a particular event or entity, that could be a formal action undertaken with the primary purpose of generating evidence. *See id.* That could be sufficient involvement to consider the statements also attributable, in part, to the progenitor and could also be considered testimonial. *See id.* In that case, the human who unleashed the machine

human operator in this case (as there is no such person present), and there is also no right to cross-examine the progenitors,[185] there should still be a right of confrontation pertaining to the machine itself; this Article returns to that question momentarily.

But many other machines are not autonomous. They require the assistance of a human agent to set parameters or otherwise operate the machine. For these semiautonomous machines, the relationship is almost symbiotic: the machine and operator work in tangent, to varying degrees, to produce an assertion. Thus, the Confrontation Clause analysis for machine accusers must have at least two categories: one for machines that speak with human involvement, and another for the confrontation right as to machine accusers that speak on their own.[186]

C. Category I: Symbiotic Statements for Assertive Machines

The first category contains assertive data generated by a machine with nontrivial human involvement in the machine's present operation. For example, if a technician uses a machine with the goal of making an assertion about reality, the resulting assertion (i.e., the accusation) is computed by the machine, but only at the direction of its operator. Given the significant rights of the criminal defendant, the human's nontrivial involvement in the machine's actions, and the substantial risks of fraud and error demonstrated above, the human should be considered a coauthor of the resulting statement. After all, the human used a machine built to functionally replace human agents, used it with the intent of making an assertion with its assistance, and ultimately created the sought-after assertion. It is unjust to restrict the defendant's constitutional right to cross-examination merely because the state has replaced human witnesses with machine accusers.

In using the assertive machine, the analyst need not have intended to reach a particular outcome (e.g., "the DNA *does/does not* match" or "the sample *is/is not* cocaine"). It is sufficient that the analyst intended to make an assertion in the same manner that prior-era analysts would, for example, have mixed reagents to produce data and then reported them afterwards. If the resulting statement was made

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on the target would be subject to cross-examination about "the machine's" conclusions. That possibility and others are discussed in "Rise of the Machines." *See id.*

185. *See id.* at 90–91.

186. There are other kinds of statements besides these two categories, such as maintenance records, calibration records, and assertions related only to chain of custody. *See id.* at 76–78. As this Author has detailed elsewhere, these are usually sufficiently removed from the machine statements so as to be regarded as outside the scope of a right to confront machine accusers (many of these, for example, are simply not testimonial or are too removed from assertive conduct to trigger the Clause). *See id.* at 71, 76–78.

with a primary purpose of use at a future trial, it is a testimonial assertion, and the human operator should be subject to the requirements of the Confrontation Clause.[187] The same should be true when a semiautonomous machine built to make assertions about reality in place of human agents is used to do precisely that. This evolution would not only breathe life into the Clause in an era of semiautonomous machines, it would also restore an important disincentive against the lab scandals that have plagued criminal cases.

Triggering this right should require only minimal oversight or input on the part of the human agent. First, a broad right triggered by minimal human involvement will better protect defendants against falsified results and significant testing errors. Second, as described above, where an assertive machine is replacing a human witness, it is unjust to deny the defendant the constitutional right that would otherwise attach. Third, even if that rationale is rejected and the analyst's operation of the machine is not deemed sufficient to attribute the machine accusation to the human operator, the analyst has functionally adopted the machine's statement by proceeding with it. When the human's operation of the machine is nontrivial and the operator submits the results to a supervisor, the operator inherently asserts that they are valid, truthful, accurate results about the sample at issue.[188] That assertion—whether treated as a separate assertion that the results are accurate or seen as an adoption of the machine's conclusion—should subject the operator to the requirements of the Confrontation Clause. As a result, the human operator, even when playing a minor role in the machine's assertions, should be treated as a functional coauthor of the machine's accusation. The result is that the Confrontation Clause requires operators exerting nontrivial control over an assertive machine to testify when they together generate a

187. The machine will also be subject to the Clause, as detailed *infra*, but that will of course not consist of on-the-stand cross-examination.

188. *See* Young v. United States, 63 A.3d 1033, 1048 (D.C. Cir. 2013) (quoting EDWARD J. IMWINKELRIED, THE NEW WIGMORE: A TREATISE ON EVIDENCE § 4.12.5 (2019)) (making a similar point); *cf.* United States v. Curbelo, 726 F.3d 1260, 1272–73 (11th Cir. 2013) (addressing this point as to an interpreter's implicit assertions in proffering a translation). This Author acknowledges, in making this point, that he is arguing against himself. *See* Sites, *supra* note 17, at 67, 97–98 (arguing the implicit-assertion theory would reach too far). The examples this Author offered previously, in hindsight, are actually reasonable bases to trigger the Confrontation Clause since they are assertions about matters in a testimonial capacity. *See id.* at 67. The implicit-assertion theory would not reach calibration and maintenance technicians because, as described previously, their actions are undertaken without any nonhypothetical use at trial on the horizon. *See id.* at 97–98. Thus, the implicit-assertion component is a valid basis to subject machine operators to the Clause. *See id.*

testimonial report (unless they are unavailable and there was a prior opportunity).

Adapting to this requirement will likely be a significant challenge for many entities in the criminal justice system, including forensic labs, but it should not be an unreasonable strain on state and federal resources because it is what courts should be requiring entities to do already. Many of these analysts should already be subject to confrontation on the basis of their assertion—entered into the machine or otherwise logged—that the data the machine produced were about the defendant's actual sample (or whatever the sample's origin, including the crime scene, the victim, the murder weapon, etc.). An assertion that "test results 123 came from sample ABC" is essential to most lab results, and it is an assertion made where "the primary, if not indeed the sole, purpose of the [interaction] was to investigate a possible crime."[189] Thus, the analyst should already be one the Confrontation Clause requires to testify.[190] Courts should have been requiring such testimony from the beginning, and the above-described coauthor analysis simply restores that balance. Without support that the test results actually correspond to the sample collected from the crime scene or from the defendant, the data are functionally useless to the factfinder. It is an integral aspect of the accusation against the defendant: the lab results are incriminating because the lab results are actually about the defendant.

This analysis strikes a balance between protecting defendants and setting a reasonable number of machine operators that are subject to confrontation. Not all machines will fall under this test because it focuses on the use of machines to make assertions about reality. To trigger confrontation under this analysis, four requirements must be met:

1. A human operator must have exercised some minimal level of control over the machine's operation,
2. The machine must be one intended to make assertions about reality,
3. The machine must have been used in that assertive capacity for the data at issue, and

189. Davis v. Washington, 547 U.S. 813, 815 (2006).

190. *See, e.g.*, Richard Friedman, *Thoughts on Melendez-Diaz: The Product of Machines*, CONFRONTATION BLOG, (Dec. 18, 2008, 1:43 AM), http://confrontationright.blogspot.com/2008/12/thoughts-on-melendez-diaz-product-of.html [https://perma.cc/D7NK-CYLE] (discussing these problems as "the input proposition" and "the output proposition").

4. The context surrounding the use of the machine must have been for a primary purpose of use at trial.

To exempt machine accusations made in these circumstances is to ignore the reality that society is creating machines to replace the assertive role humans have occupied in criminal trials for centuries and, ultimately, to set the Confrontation Clause on a path to virtual extinction. That outcome is inconsistent with the Court's concerns in *Crawford*, *Bullcoming*, and *Melendez-Diaz*, it ignores the decades of lab scandals that continue to jeopardize the rights of (potentially innocent)[191] criminal defendants, and it disregards the reality that many forensic machines require human guidance.

This rule, however, would represent a sea change in the current jurisprudence, since most courts have concluded that the machine is the speaker and the operator need not be subject to confrontation.[192] Relying instead on testimony from surrogate analysts and supervisors, courts have broadly accepted a some-testimony-is-good-enough approach to machine accusations and the Confrontation Clause. But testimony from surrogate analysts is not a reliable way to catch forensic errors: unless the surrogates are complicit in the malfeasance, they will be unaware of it and thus largely unable to fulfill the rationale for the crucible of cross-examination. Accepting surrogate testimony ultimately serves as a shield against cross-examining the only people who are likely to know about errors—the original machine operator.[193]

The Confrontation Clause ensures reliability through a specific lens: confrontation. The right to force an accuser to stand before the factfinder for his or her credibility and believability to be assessed is antediluvian. It is that process to which lab analysts using assertive machines should be subject. The analyst and the machine are, in the

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191. *See* Bullcoming v. New Mexico, 564 U.S. 647, 651–52 (2011); Melendez-Diaz v. Massachusetts, 557 U.S. 305, 318 (2009); Crawford v. Washington, 541 U.S. 36, 61–62 (2004). A guilty defendant, of course, has the same rights under the Confrontation Clause. Bryan H. Wildenthal, *The Right of Confrontation, Justice Scalia, and the Power and Limits of Textualism*, 48 WASH. & LEE L. REV. 1323, 1367 (1991). This Author makes this parenthetical point only to remind that the powerfully incriminating data machines produce will inevitably lead to the conviction of additional innocent individuals if courts broadly shield machine operators from cross-examination, as most courts have done thus far. *Cf.* Heather Murphy, *A Leading Cause for Wrongful Convictions: Experts Overstating Forensic Results*, N.Y. TIMES (Apr. 20, 2019) https://www.nytimes.com/2019/04/20/us/wrongful-convictions-forensic-results.html [https://perma.cc/D5MD-MPBU]; Jon Schuppe, NBC NEWS, *Epic Drug Lab Scandal Results in More than 20,000 Convictions Dropped* (Apr. 18, 2017, 9:50 PM) https://www.nbcnews.com/news/us-news/epic-drug-lab-scandal-results-more-20-000-convictions-dropped-n747891 [https://perma.cc/4CW5-ZZZV].

192. *See supra* Part II.

193. *See, e.g.*, *Melendez-Diaz*, 557 U.S. at 318–19 (2009); *Bullcoming*, 564 U.S. 647, 659–61.

case of accusatory results, leveling powerfully incriminating tools against the defendant. Just as the defendant has a right to put a human accuser to the stand—to gauge his reactions and eye contact and to let the jury see if the operator "m[ight] feel quite differently when he has to repeat his story looking at the man whom he will harm greatly by distorting or mistaking the facts"—so too does a defendant accused by a machine have the right to test the operator's claims of diligence and truthfulness.[194]

Recognizing the role of the operator does not fully address semiautonomous machine accusers; however, the machine, even though not fully autonomous, plays an essential role in the accusation generated with its handler. Thus, in addition to the ability to confront the operator, courts must adopt a right to "confront" the semiautonomous machine as well. It is to that question that this Article turns next.

D. Category II: AI, NAI, and True Machine Accusers

How should courts address the assertions made by machines, both those that are fully autonomous after initial human setup and those that speak with nontrivial assistance from operators? As machines become increasingly automated and perform increasingly more assertive tasks once undertaken by human witnesses, the accused's right "to be confronted with the witnesses against him" will recede further toward extinction unless the Sixth Amendment, like other constitutional rights, evolves with societal changes.[195] Although the Confrontation Clause seeks to ensure reliability through confrontation and cross-examination, where those tools are not feasible in the traditional sense, the Clause must promote its goal of reliability through other methods. Thus, in addition to the right to confront operators in Category I, criminal defendants should have the right to ensure not only that the operator used the machine correctly but also that the machine produced a reliable accusation.

Such an approach is not without precedent. For example, courts have adopted special requirements under the Confrontation Clause and rules of evidence for admission of canine evidence (e.g., the dog must be shown to possess sufficient skill in tracking/substance detection, the handler must be shown to have sufficient proficiency, the canine

194. Jay v. Boyd, 351 U.S. 345, 375–376 (Douglas, J., dissenting) (quoting ZECHARIAH CHAFEE, THE BLESSINGS OF LIBERTY 35 (1956)).

195. *See supra* Part IV.

handler must testify, etc.)[196] and translations by interpreters (e.g., the interpreter must be shown to have sufficient skill, the interpreter must be shown to have no motive to mislead, the interpreter must testify, etc.).[197] So, too, should there now be special requirements for reports generated by semiautonomous and autonomous machine accusers. The contours of the right are, in many ways, less important than the recognition that such a right must exist, and there are innumerable ways this could be achieved.

Familiar rules are often the most effective, and a potential starting point would be constitutionalizing evidentiary requirements.[198] The evidentiary right of authentication is one such option in that it would demand assurance that the machine "produced scientifically sound results" and it would inquire directly whether the sample tested was actually the sample at issue.[199] Many evidence codes already require that "the proponent must produce evidence sufficient to support a finding that the item is what the proponent claims it is."[200] The court is to "[serve] as [a] gatekeeper in assessing whether the proponent has offered a satisfactory foundation from which the jury could reasonably find that the evidence is authentic."[201] Thus, this approach would simply be empowering that evidence-based right by embedding it in the Sixth Amendment. To the extent courts have not been enforcing this evidence-based rule for machine accusers thus far,[202] it would provide a more potent version demanding future enforcement.

A central objection to this approach is that it is too close to the approach the Court rejected in *Crawford* and subsequent cases. *Crawford* and *Davis* made clear that the Confrontation Clause was not to be left to the "vagueries of evidence."[203] Elevating evidence-based rules for machine accusers falls within that ambit. Thus, even assuming

196. *See, e.g.*, Sites, *supra* note 17, at 63–65 (discussing Confrontation Clause cases involving canines).

197. *See id.* at 61. (collecting and discussing cases in both areas and analyzing their role in interpreting the machine-generated testimony doctrine).

198. *Cf.* United States v. Budziak, 697 F.3d 1105, 1112 (9th Cir. 2012).

199. United States v. Crockett, 586 F. Supp. 2d 877, 886 (E.D. Mich. 2008).

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

201. United States v. Kaixiang Zhu, 854 F.3d 247, 257 (4th Cir. 2017) (quoting United States v. Vidacak, 553 F.3d 344, 349 (4th Cir. 2009)) (internal quotation marks and citations omitted).

202. *See, e.g.*, United States v. Savarese, 686 F.3d 1, 11 (1st Cir. 2012). *But see* State v. Brown, 818 S.E.2d 735, 740–41 (2018) (general acceptance of GPS technology "does not . . . translate to the State getting a pass from making a minimum showing that the GPS records it seeks to introduce into evidence are accurate" where testimony of GPS operator "shed no light on the accuracy of the GPS records").

203. Crawford v. Washington, 541 U.S. 36, 61–62 (2004).

courts were persuaded to reinterpret the Confrontation Clause, doing so in this manner could be undesirable.

With that concern in mind, the Court could adopt a literal version of confrontation and cross-examination. Because it is often impracticable to bring the machine accuser to the defendant's trial, courts could permit the defendant to "confront" the machine where it resides (i.e., in a lab, etc.)—presumably this would occur through an expert witness, though the defendant would have a right to be present. In this sense, "confront" does not have the same dignitary function that requiring one's accuser to stand face-to-face at trial has for eyewitnesses and the like. However, it would still serve the Clause's reliability-based concerns through the cross-examination it would enable.

Cross-examination in this format would have to evolve in response to the nature of the machine accuser. Since many machine accusers currently cannot be cross-examined through speech about their skill and expertise, the defendant would have the right to test that proficiency through the language the machine speaks. For example, breathalyzers could be tested using known samples so as to demonstrate their accuracy; DNA equipment could be required to show its ability to match samples from the same source, and so on. And since the defendant cannot question the machine about the evidence incriminating him or her, the defendant would have a right to submit the samples for independent testing at a facility the defendant selected. Finally, since the machine could not be questioned about its motive, its diligence, or its calibration, the prosecution would be required to show that the machine was programmed and built in a manner that did not evidence bias and was maintained and operated in a manner that produced reliable results. Failure on any of these prongs would, as under the Clause, normally require exclusion of the evidence. As with many other rights, defendants could waive these requirements.

Running extra tests, inquiring into a machine's programming, and studying a machine's accuracy are not what the Confrontation Clause was envisioned to provide when it was adopted. But neither was it likely envisioned that humans would build machines en masse to assume the mantle of witness. Given that development and the vital rights the Clause protects, protections such as these are the best available equivalents for autonomous machine accusers to the crucible of cross-examination.

Both approaches—constitutionalizing evidentiary rules and adopting a more literal confrontation right for machines—will require

labs to restructure their testing procedures,[204] and like many improvements in recognizing the rights of criminal defendants, they will come at a cost. But "[i]t is a truism that constitutional protections have costs."[205] In addition, the relevant parties can mitigate that burden. For example, states can adopt statutory schemes that require the defendant to assert these rights by a certain stage of trial or waive them automatically. Forensic labs can also adjust their procedures to address the need for in-court appearances. Recognizing and restoring the rights of criminal defendants as to machine accusers will impose a strain on multiple parties, especially in the period of transition away from the current model where multiple technicians or analysts are involved in the development of test results. But forensic labs stand on tenuous ground in broadly objecting to a right to confront machine accusers: the need for these protections comes in part from labs' failure to police their analysts and avoid the tide of scandals plaguing the nation.[206]

In summary, for assertive machines that are semiautonomous where the operator exercises nontrivial control—and in this sense, "nontrivial" is a very low threshold—the operator would be subject to the Confrontation Clause's requirements. For the machine accusers themselves, both autonomous and not, where the statement was generated with a primary purpose of use at a future trial, the defendant would be entitled to the functional equivalents of confrontation and cross-examination described above.

V. CONCLUSION

This is just the beginning of trial by machine. In an era of machine accusers, to ignore that reality is to sacrifice the rights of criminal defendants in the name of technology and efficiency. Humankind has a penchant for building machines to do what was once its own province, and machines that make assertions about reality are just the latest iteration. When those assertions are leveled against a defendant in a criminal case, they become machine accusations—statements that, if made by humans, would have been squarely within the bounds of the Confrontation Clause.

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204. *See, e.g.*, Melendez-Diaz v. Massachusetts, 557 U.S. 305, 332–33 (2009) (Kennedy, J., dissenting) (discussing the various individuals involved in forensic drug analysis and arguing that a rule requiring calling all of them to testify "for all practical purposes, forbid[s] the use of scientific results in criminal trials").

205. Coy v. Iowa, 487 U.S. 1012, 1020 (1988).

206. *Crime Lab and Forensic Scandals*, *supra* note 124 (listing numerous alleged forensic lab scandals); *see also supra*, Part IV (citing examples of lab scandals).

Courts must respond to these developments. Many courts have held that the rules of evidence are the proper tool to protect a defendant's rights as to machine testimony, but the jurisprudence in that area indicates that either the rules are not up to the challenge or courts are unwilling to hold litigants to the task. The Confrontation Clause is the proper place to ground protections against machine accusers given its historical importance in the realm of human witnesses. Constitutionalizing familiar but strengthened evidentiary protections is one compromise to restore the rights of criminal defendants, but adopting more stringent confrontation and cross-examination equivalents is the best path forward. Again, however, the contours of the right are less important than the recognition that such a right must exist. Whatever approach courts adopt, it will come at a cost, but that is the nature of constitutional protections.

The need for the Confrontation Clause to play its role in protecting criminal defendants does not mean that it must do so alone. Other improvements—such as improved regulation of forensic labs and machines—are welcome.[207] But "[j]ust as reliability was neither the touchstone nor constitutionally sufficient in *Crawford*, so too is regulation an inadequate substitute for what the Constitution commands: the right to confront one's accusers."[208] The Confrontation Clause should empower defendants to confront machine accusers just as it empowers defendants to confront the human accusers the machines replaced. Forensic labs, law enforcement, and innumerable others increasingly direct machines to assume the mantle of accuser; the natural response is that the right to confront one's accuser reach them as well.

207. *See, e.g.*, Roth, *supra* note 9, at 2023–25 (discussing "front-end design, input, and operation protocols," such as "requir[ing] any software-driven system used in litigation to be certified as having followed software industry standards in design and testing").

208. Sites, *supra* note 7, at 26.