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KAHN, J., concurring. I agree with and join in full the majority opinion. I write separately to clarify the intersection of evidence based on DNA analysis and the constitutional right to confrontation.

During oral argument, each party was asked which individuals involved in DNA analysis were required to testify pursuant to the confrontation clause of the sixth amendment to the United States constitution, especially in light of *State v. Walker*, 332 Conn. 678, 212 A.3d 1244 (2019). Each party gave a very different response. The state read *Walker* to stand for the proposition that, to satisfy the requirements of the confrontation clause, the state was required to call only the person or persons who conducted the critical, interpretive part of the DNA analysis involving the calling of the alleles, which gives rise to a numerical DNA profile. Furthermore, the state argued that the technicians involved in the preliminary stages including extraction, quantitation, and amplification are not necessary witnesses. The defendant interpreted precedent, including *Walker*, to not only apply to analysts as described by the state, but also to the technician who put the DNA sample into the electrophoresis machine<sup>1</sup> and, potentially, any other person that could have contaminated the sample at any stage. Although it is certainly not uncommon for opposing parties to interpret precedent differently, the wide gulf between these responses illustrates a continuing uncertainty in this critical area of constitutional rights, despite recent decisions from this court. See, e.g., *State v. Lebrick*, 334 Conn. 492, 223 A.3d 333 (2020); *State v. Walker*, supra, 678; *State v. Sinclair*, 332 Conn. 204, 210 A.3d 509 (2019); *State v. Buckland*, 313 Conn. 205, 96 A.3d 1163 (2014), cert. denied, 574 U.S. 1078, 135 S. Ct. 992, 190 L. Ed. 2d 837 (2015); *State v. Smith*, 289 Conn. 598, 960 A.2d 993 (2008).

DNA analysis is a powerful tool that has become a staple in both the scientific community and trial courts since DNA fingerprinting was first invented in 1984. See P. Gill et al., “Forensic Application of DNA ‘Fingerprints,’ ” 318 *Nature* 577, 577 (1985). This methodology allows us to determine—from blood, skin, sweat, semen, hair, or other DNA-containing cells—the likelihood that an individual is reasonably tied to a crime scene, victim, weapon, or other object. A mere four decades ago, the use of DNA sequencing and comparison as an evidentiary tool in the courtroom was not even an option. Since it was first used to convict a Florida defendant of a sexual offense in 1987; see A. Adema, “DNA Fingerprinting Evidence: The Road to Admissibility in California,” 26 *San Diego L. Rev.* 377, 385 and n.52 (1989); *Andrews v. State*, 533 So. 2d 841, 842, 850–51 (Fla. App. 1988), review denied, 542 So. 2d

1332 (Fla. 1989); DNA analysis has rapidly evolved to include improved methodologies. It has not only been used in contemporary trials to inculcate defendants, but also to exonerate wrongly convicted individuals who spent years, and even decades, incarcerated. See generally Innocence Project, DNA's Revolutionary Role in Freeing the Innocent (April 18, 2018), available at <https://www.innocenceproject.org/dna-revolutionary-role-freedom> (last visited September 22, 2020).

Although the last forty years have seen rapid evolution of DNA analysis in the field of science, the jurisprudence regarding constitutionally permissible use of DNA evidence has evolved at a more staid pace. Scant binding precedent from the United States Supreme Court, combined with a lack of cohesion and clarity in the available precedent, has resulted in uncertainty in both state and federal jurisdictions. This lack of guidance has not gone unnoticed by this court; see *State v. Walker*, supra, 332 Conn. 706 (“[d]ue to the fractured nature of [*Williams v. Illinois*, 567 U.S. 50, 132 S. Ct. 2221, 183 L. Ed. 2d 89 (2012)], courts have struggled to determine the effect of *Williams*, if any, on the legal principles governing confrontation cause claims”); by federal courts of appeals; see *Washington v. Griffin*, 876 F.3d 395, 409 (2d Cir. 2017) (“[w]e have already noted the difficulty in identifying a single holding of principle from the several opinions of the fractured *Williams* [c]ourt, using the analytic approach that the Supreme Court recommends”), cert. denied, U.S. , 138 S. Ct. 2578, 201 L. Ed. 2d 299 (2018); and even by ideologically distinct members of the United States Supreme Court. See *Stuart v. Alabama*, U.S. , 139 S. Ct. 36, 37, 202 L. Ed. 2d 414 (2018) (Gorsuch, J., dissenting from the denial of certiorari) (“Respectfully, I believe we owe lower courts struggling to abide our holdings more clarity than we have afforded them in this area. *Williams* imposes on courts with crowded dockets the job of trying to distill holdings on two separate and important issues from four competing opinions. The errors here may be manifest, but they are understandable and they affect courts across the country in cases that regularly recur.”).<sup>2</sup>

In an effort to provide comprehensive guidance, this concurrence (1) illustrates the DNA analysis process as described to the United States Supreme Court, (2) details the requirements of the confrontation clause as established by *Crawford*<sup>3</sup> and how it applies to forensic reports for non-DNA substances, and (3) explains which stages of DNA analysis I believe are subject to the requirements of the confrontation clause in light of this court's precedent.

## I

### DNA ANALYSIS

When *Williams* was before the United States

Supreme Court in December, 2011, the New York County District Attorney's Office and the New York City Office of the Chief Medical Examiner (OCME) submitted an amici curiae brief that, in part, described the DNA testing process at the OCME. *Williams v. Illinois* (No. 10-8505), United States Supreme Court Briefs, October Term, 2011, Amicus Brief of the New York County District Attorney's Office et al., pp. 7–8. I find their description of DNA analysis as it is performed at the OCME to be informative and reiterate it here in order to provide clear context for the remainder of this concurrence.<sup>4</sup>

“At the OCME, the testing of each item involves five distinct stages, each of which is performed by one or more different persons. The first stage is *evidence examination*, in which a technician (technician 1) examines the sample for biological fluids and takes cuttings for DNA extraction. The second stage is *extraction*, in which a technician (technician 2) adds chemical reagents to the sample that break open the cells and free up the DNA so it is accessible for testing. The third stage is *quantitation*, in which a technician (technician 3) measures the amount of DNA that is present in the sample. If there is a sufficient amount of DNA, the testing proceeds to stage four, *amplification*, in which another technician (technician 4) uses a highly automated process to target, tag, and copy [sixteen] specific locations ('loci'), thereby raising them to a detectable level. The fifth stage is *electrophoresis*, or DNA typing, in which two more technicians (technicians 5 and 6) run the amplified DNA through machines that illuminate the tagged areas and separate, label, and display each locus. The result—an electropherogram—is a genetic DNA profile that is ready for comparison. Notably, each technician in stages one through five prepares worksheets contemporaneously with each task that is performed, which enable subsequent reviewers to verify that each step was conducted in accordance with established procedures.” (Emphasis added.) *Id.*, p. 7; see also M. Chin et al., *Forensic DNA Evidence: Science and the Law* (2019) § 3:4, pp. 3-20 through 3-35.

The amici also highlighted that “each case involves the separate testing of a minimum of two different samples (a crime scene sample and a suspect exemplar), and each process requires the participation of at least six different technicians. That means that each case will involve at least [twelve] technicians. Only at the end of these processes does an analyst, who routinely will testify in court about the case, compare the two electropherograms and prepare a report setting forth her conclusions.” *Williams v. Illinois* (No. 10-8505), United States Supreme Court Briefs, *supra*, pp. 7–8.<sup>5</sup>

The first four stages described above are conducted by technicians who each complete a discrete step of the DNA sample preparation, following highly proscribed

methods. A technician then loads the sample into the electrophoresis machine that, in step five, produces raw data that describe the genotype of the DNA sample. It is at this point that an analyst becomes involved. The analyst uses her skilled judgment—either through manual computation or computer software—to conduct an interpretive analysis of the raw data to call the alleles and generate a numerical DNA profile that is used for comparison. See, e.g., *People v. John*, 27 N.Y.3d 294, 300, 52 N.E.3d 1114, 33 N.Y.S.3d 88 (2016). At a minimum, there are two DNA profiles: one generated from an unknown sample—commonly collected from a crime scene, weapon, or victim that potentially came from a then unknown perpetrator—and another from a known sample, commonly DNA collected from a suspect, often via a buccal swab, pursuant to a warrant. The analyst then compares these DNA profiles to determine if they match, which is “measured by a statistic expressing the rarity of that shared profile, known as the random match probability statistic.” M. Chin et al., *supra*, p. 5-1. Ultimately, the analyst states the probability that a person chosen at random from a population of unrelated people will possess a DNA profile that matches the DNA profile collected as evidence. *Id.*

## II

### CONFRONTATION CLAUSE

In 2004, the United States Supreme Court rejected the then accepted view “that the [c]onfrontation [c]lause applies of its own force only to in-court testimony, and that its application to out-of-court statements introduced at trial depends upon the law of [e]vidence . . . .” (Internal quotation marks omitted.) *Crawford v. Washington*, 541 U.S. 36, 50–51, 124 S. Ct. 1354, 158 L. Ed. 2d 177 (2004). Instead, the United States Supreme Court determined that “[the confrontation clause] applies to ‘witnesses’ against the accused—in other words, those who ‘bear testimony.’ . . . ‘Testimony,’ in turn, is typically ‘[a] solemn declaration or affirmation made for the purpose of establishing or proving some fact.’ . . . An accuser who makes a formal statement to government officers bears testimony in a sense that a person who makes a casual remark to an acquaintance does not.” (Citations omitted.) *Id.*, 51; see also *State v. Walker*, *supra*, 332 Conn. 690.

This was a sea change in confrontation clause jurisprudence. Out-of-court statements that were typically admitted under hearsay exceptions; see, e.g., *Ohio v. Roberts*, 448 U.S. 56, 66, 100 S. Ct. 2531, 65 L. Ed. 2d 597 (1980); were now constitutionally inadmissible if they were testimonial. Put another way, even if a statement falls under a valid hearsay exception under the rules of evidence, it will nonetheless be inadmissible under the confrontation clause if that statement is testimonial in nature and the defendant’s right to cross-examination remains unsatisfied;<sup>6</sup> hearsay safeguards

are not adequate to protect confrontation clause rights.

When assessing whether a statement is admissible under the confrontation clause, the first, most basic question is whether the witness is available. If the witness is available, then the defendant has an opportunity to cross-examine, thereby satisfying the requirements of the confrontation clause. In addition, if the witness is unavailable but the defendant had a prior opportunity to cross-examine that witness, then the confrontation clause is also satisfied. In those instances, the admissibility of the witness' individual statements, whether testimonial or not, is governed by the rules of evidence. However, if the witness is unavailable and there was no prior opportunity to cross-examine that witness, then the court must determine whether the statement is testimonial. If the statement is not testimonial, then admission of the statement does not violate the confrontation clause and its admissibility is, once again, determined by the rules of evidence. If the statement is testimonial, then its admission violates the confrontation clause and the statement is inadmissible, even if it would otherwise be admissible under the rules of evidence. The entire analysis to determine if the protections offered by the confrontation clause apply turns on what it means for a statement to be *testimonial*.

The United States Supreme Court has described various formulations of this core class of "testimonial" statements, including "[1] ex parte in-court testimony or its functional equivalent—that is, material such as affidavits, custodial examinations, prior testimony that the defendant was unable to cross-examine, or similar pretrial statements that declarants would reasonably expect to be used prosecutorially . . . [2] extrajudicial statements . . . contained in formalized testimonial materials, such as affidavits, depositions, prior testimony, or confessions . . . [3] statements that were made under circumstances which would lead an objective witness reasonably to believe that the statement would be available for use at a later trial . . . ." (Citation omitted; internal quotation marks omitted.) *Crawford v. Washington*, supra, 541 U.S. 51–52. The United States Supreme Court has held, for example, that interrogations by law enforcement officers solely directed at establishing the facts of a past crime, in order to identify or provide evidence to convict the perpetrator, fall squarely within the class of testimonial hearsay. See *Davis v. Washington*, 547 U.S. 813, 826, 126 S. Ct. 2266, 165 L. Ed. 2d 224 (2006); *Crawford v. Washington*, supra, 53. *Crawford*, however, "[left] for another day any effort to spell out a comprehensive definition of 'testimonial.'" *Crawford v. Washington*, supra, 68.

Subsequent United States Supreme Court decisions began to clarify what qualified as "testimonial" statements in a piecemeal fashion, each focusing on whether the specific statement at issue was testimonial rather

than attempting to provide a comprehensive definition of “testimonial” that could be applied in any type of case. Statements made in the course of a police interrogation, for example, “are nontestimonial when made . . . under circumstances objectively indicating that the primary purpose of the interrogation is to enable police assistance to meet an ongoing emergency. They are testimonial when the circumstances objectively indicate that there is no such ongoing emergency, and that the primary purpose of the interrogation is to establish or prove past events potentially relevant to later criminal prosecution.” *Davis v. Washington*, supra, 547 U.S. 822; see also id., 822 n.1 (noting that this conclusion does not imply “that statements made in the absence of any interrogation are necessarily nontestimonial”).

The results of forensic analysis are testimonial when, regardless of the official title on the document, “[t]hey are incontrovertibly a solemn declaration or affirmation made for the purpose of establishing or proving some fact.” (Internal quotation marks omitted.) *Melendez-Diaz v. Massachusetts*, 557 U.S. 305, 310, 129 S. Ct. 2527, 174 L. Ed. 2d 314 (2009). Under these circumstances, a forensic report provides “the precise testimony the analysts would be expected to provide if called at trial” and is “functionally identical to live, in-court testimony, doing ‘precisely what a witness does on direct examination.’” Id., 310–11. The absence of an oath, however, “[i]s not dispositive in determining if a statement is testimonial.” (Internal quotation marks omitted.) *Bullcoming v. New Mexico*, 564 U.S. 647, 664, 131 S. Ct. 2705, 180 L. Ed. 2d 610 (2011). The formality of a forensic report “suggests its evidentiary purpose,” but it is “not the sole touchstone of our primary purpose inquiry . . . .” (Internal quotation marks omitted.) Id., 671 (Sotomayor, J., concurring in part).

From the triumvirate of *Davis*, *Melendez-Diaz*, and *Bullcoming*, we can glean one clear rule: a statement is testimonial when it has the “primary purpose of establish[ing] or prov[ing] past events potentially relevant to a later criminal prosecution.” (Internal quotation marks omitted.) Id., 659 n.6 (opinion announcing judgment); *State v. Sinclair*, supra, 332 Conn. 220. This doctrine may be applied in a relatively straightforward manner when a single individual makes a statement or a single expert conducts an analysis and issues a forensic report. In such cases, the person who made the statement or authored the report that had the primary purpose of establishing a fact to be used in a criminal prosecution would need to be present at the trial and subject to cross-examination, or, if unavailable for trial, the defendant must have had a previous opportunity to cross-examine the witness regarding the statement. See *Crawford v. Washington*, supra, 541 U.S. 68 (“Where testimonial evidence is at issue . . . the [s]ixth [a]mendment demands what the common law required: unavailability and a prior opportunity for cross-exami-

nation”). This doctrine, on the other hand, becomes less clear when it is applied to more complicated scientific processes, such as DNA analysis, where multiple technicians complete the procedural steps that produce an amplified DNA sample, an electrophoresis machine generates raw data based on the sample, and analysts subjectively apply their scientific expertise to interpret the raw data and generate a DNA profile.

### III

#### IMPLICATIONS FOR DNA EVIDENCE

The United States Supreme Court addressed forensic analyses, i.e., analysis of seized substances and analysis of blood alcohol content, in *Melendez-Diaz* and *Bullcoming*, and DNA analysis came into the limelight soon after. See, e.g., *Williams v. Illinois*, supra, 567 U.S. 50. The complexity of DNA analysis and the uncertainty of how the primary purpose test applied to its myriad discrete analytical steps resulted in severely fractured opinions in *Williams*, a plurality opinion with concurrences and a dissent, and “no clear consensus as to what constitute[s] a testimonial statement in this context.” (Internal quotation marks omitted.) *Washington v. Griffin*, supra, 876 F.3d 406; see also *Young v. United States*, 63 A.3d 1033, 1042–43 (D.C. 2013). Ordinarily, “[w]hen a fragmented [c]ourt decides a case and no single rationale explaining the result enjoys the assent of five [j]ustices, the holding of the [c]ourt may be viewed as the position taken by those members who concurred in the judgments on the narrowest grounds.” (Internal quotation marks omitted.) *United States v. James*, 712 F.3d 79, 95 (2d Cir. 2013), cert. denied, 572 U.S. 1134, 134 S. Ct. 2660, 189 L. Ed. 2d 208 (2014). “As we recently observed, the court in *Williams* made it impossible to identify the narrowest ground [on which the justices agreed] because the analyses of the various opinions are irreconcilable. . . . Consequently . . . we must rely on Supreme Court precedent before *Williams* to the effect that a statement triggers the protections of the [c]onfrontation [c]lause when it is made with the primary purpose of creating a record for use at a later criminal trial.” (Citation omitted; internal quotation marks omitted.) *State v. Walker*, supra, 332 Conn. 706; see *State v. Sinclair*, supra, 332 Conn. 225; see also *United States v. James*, supra, 95–96.

Despite a lack of clear guidance from *Williams* as to what aspects of DNA analysis trigger the protections of the confrontation clause, one common theme has risen to the surface: “neither *Melendez-Diaz* nor *Bullcoming* require[s] every witness in the chain of custody to testify.” *State v. Buckland*, supra, 313 Conn. 214; see also *Washington v. Griffin*, supra, 876 F.3d 407 (“the Supreme Court has never held that the [c]onfrontation [c]lause requires an opportunity to [cross-examine] each lab analyst involved in the process of generating a DNA profile and comparing it with another”). *Melendez-*



*Diaz* made this explicitly clear, stating: “[W]e do not hold, and it is not the case, that anyone whose testimony may be relevant in establishing the chain of custody, authenticity of the sample, or accuracy of the testing device, must appear in person as part of the prosecution’s case. While . . . [i]t is the obligation of the prosecution to establish the chain of custody . . . this does not mean that everyone who laid hands on the evidence must be called. . . . [G]aps in the chain [of custody] normally go to the weight of the evidence rather than its admissibility.” (Citations omitted; internal quotation marks omitted.) *Melendez-Diaz v. Massachusetts*, supra, 557 U.S. 311 n.1. This court has recently reinforced that view, observing that “[not] all analysts who participate in the process of generating a DNA profile necessarily must testify,” and concluding that “where the generation of a DNA profile is testimonial, at least one analyst with the requisite personal knowledge must testify.” (Internal quotation marks omitted.) *State v. Walker*, supra, 332 Conn. 719.

Although trial courts have general guidance that not every witness must testify, there remains a woeful paucity of specificity as to which technicians or analysts are required to testify under the confrontation clause. In order to provide some clarity as to when and how the confrontation clause applies in such cases, I review the following three types of “statements” that come from the process of DNA analysis: (1) technicians who are involved in the preliminary stages to prepare a sample for analysis, (2) electrophoresis machines that generate raw data, and (3) analysts who apply their expertise to draw conclusions based on the raw data and inculcate—or exculpate—suspects. Of these three categories, it is only the third category of analysts that triggers the protections afforded by the confrontation clause of the sixth amendment.

## A

### Technicians

Technicians—whether referred to as technicians or analysts in a specific laboratory—are the individuals who start with a known or unknown DNA sample that was collected outside of the laboratory and who thereafter prepare that sample to be placed into an electrophoresis machine. Sample preparation is often conducted by several individuals, each of whom follows detailed standard operating procedures to conduct a discrete step of the process. In many instances, laboratory protocol requires that technicians document their steps in writing for quality control and quality assurance purposes. See, e.g., A.B.A., *Standards for Criminal Justice: DNA Evidence* (3d Ed. 2007) standard 16-3.2, p. 70. In conducting his or her individual step in the larger sample preparation process, each individual technician is making a narrow “statement,” e.g., “I received the sample following the quantification stage conducted by

technician X, conducted amplification pursuant to the standard operating procedure of this laboratory, and then provided the amplified sample to technician Y in order for her to load it into the electrophoresis machine.” Even when considered together, the cumulative “statement” of the technicians involved in the preparatory stages is, at most, that the DNA sample loaded into the electrophoresis machine was extracted from the original sample delivered to the laboratory for analysis.

The United States Supreme Court, however, has not concluded whether the confrontation clause applies to “statements” made by technicians. In the absence of clear guidance, I am persuaded by the plurality in *Williams*, which reasoned that, “[w]hen lab technicians are asked to work on the production of a DNA profile, they often have no idea what the consequences of their work will be. . . . It is also significant that in many labs, numerous technicians work on each DNA profile. . . . When the work of a lab is divided up in such a way, it is likely that the sole purpose of each technician is simply to perform his or her task in accordance with accepted procedures.” (Citations omitted.) *Williams v. Illinois*, supra, 567 U.S. 85 (plurality opinion); see also *Melendez-Diaz v. Massachusetts*, supra, 557 U.S. 357 (Kennedy, J., dissenting) (“[l]aboratory analysts who conduct routine scientific tests are not the kind of conventional witnesses to whom the [c]onfrontation [c]lause refers”). Even when a technician may have “mixed motives”—to simply perform his or her task and to be a link in the chain that will eventually lead to evidence that may be used at trial—a court must “examin[e] the statements and actions of all participants” to determine the primary purpose of a statement. *Michigan v. Bryant*, 562 U.S. 344, 368, 370, 131 S. Ct. 1143, 179 L. Ed. 2d 93 (2011). “*Melendez-Diaz* and *Bullcoming* together suggest that a laboratory analysis is testimonial *only* when the circumstances under which the analysis was prepared, viewed objectively, establish that the primary purpose of a reasonable analyst in the declarant’s position would have been to create a record for use at a later criminal trial” (Emphasis in original; internal quotation marks omitted.) *Washington v. Griffin*, supra, 876 F.3d 405.

In my view, the “statements” made by technicians fall short of providing testimony against the petitioner because, in and of themselves, they do not have the primary purpose of “establish[ing] or prov[ing] past events potentially relevant to later criminal prosecution” and, therefore, are not subject to the requirements of the confrontation clause. (Internal quotation marks omitted.) *Bullcoming v. New Mexico*, supra, 564 U.S. 659 n.6 (opinion announcing judgment).<sup>7</sup> This court has previously indicated its agreement with this reasoning, stating that “the analysts involved in the preliminary testing stages, specifically, the extraction, quantitation

or amplification stages, are not necessary witnesses.” (Internal quotation marks omitted.) *State v. Walker*, supra, 332 Conn. 719; see also *People v. John*, supra, 27 N.Y.3d 313 (“[m]ore succinctly, nothing in this record supports the conclusion that the analysts involved in the preliminary testing stages, specifically, the extraction, quantitation or amplification stages, are necessary witnesses”).

As statements made by technicians regarding the preparation of samples for DNA analysis constitute non-testimonial hearsay and, therefore, are not subject to the requirements of the confrontation clause, courts should turn to evidentiary rules to determine if those statements are admissible to establish that the DNA loaded into the electrophoresis machine was extracted and analyzed from the known or unknown sample delivered to the laboratory. Requiring the prosecution to establish the chain of custody should, in a typical case, be sufficient to meet its evidentiary burden for this portion of the DNA analysis. See *State v. Rosado*, 107 Conn. App. 517, 532, 945 A.2d 1028, cert. denied, 287 Conn. 919, 951 A.2d 571 (2008). In determining whether the prosecution meets its burden, “[t]he court must consider the nature of the article, the circumstances surrounding its preservation and custody and the likelihood of intermeddlers tampering with it . . . .” (Internal quotation marks omitted.) *State v. Cocomo*, 302 Conn. 664, 685, 31 A.3d 1012 (2011); see also *State v. Pettitt*, 178 Conn. App. 443, 452, 175 A.3d 1274 (2017) (“[a]s a general rule, it may be said that the prosecution is not required or compelled to prove each and every circumstance in the chain of custody beyond a reasonable doubt; the reasonable doubt must be to the whole evidence and not to a particular fact in the case” (internal quotation marks omitted)), cert. denied, 327 Conn. 1002, 176 A.3d 1195 (2018). In addition, the complexity of DNA itself acts as an inherent check on chain of custody because when an inadvertent error in sample preparation occurs, “any hypothetical missteps of the [technicians] in the multiple stages preliminary to the DNA typing at the electrophoresis stage would result in either no DNA profile or an incomplete DNA profile, or one readily inconsistent with [the known sample].” *People v. John*, supra, 27 N.Y.3d 313; see also *Williams v. Illinois*, supra, 567 U.S. 86 (plurality opinion) (“it is inconceivable that shoddy lab work would somehow produce a DNA profile that just so happened to have the precise genetic makeup of [the] petitioner”).

I do not dismiss concerns that the defendant’s goals of cross-examining each technician are “to weed out not only the fraudulent analyst, but the incompetent one as well”; *Melendez-Diaz v. Massachusetts*, supra, 557 U.S. 319; and to determine “whether crime labs have properly stored, extracted, and labeled DNA samples, particularly where a single lab contains and tests samples from the victim, the crime scene, and the accused

. . . .” (Citation omitted.) *Washington v. Griffin*, supra, 876 F.3d 411 (Katzmann, C. J., concurring). These concerns, however, are not unique to DNA analysis, but are common concerns in the authentication of any piece of physical evidence and are properly addressed through chain of custody analysis. See, e.g., *State v. Cocco*, supra, 302 Conn. 694 (establishing chain of custody for defendant’s blood drawn for blood alcohol content analysis). The mere fact that the physical evidence in these cases is DNA is not sufficient to subject nontestimonial statements to the strictures of the confrontation clause. See *Bullcoming v. New Mexico*, supra, 564 U.S. 669 (Sotomayor, J., concurring in part) (“[w]hen the primary purpose of a statement is not to create a record for trial . . . the admissibility of [the] statement is the concern of state and federal rules of evidence, not the [c]onfrontation [c]lause” (citation omitted; internal quotation marks omitted)). Defendants seeking to elicit testimony from technicians are not left without recourse, however; they retain the power to subpoena technicians to testify about specific aspects of the chain of custody that the defendant believes cast doubt on its reliability and, therefore, supports his or her argument that the DNA that was prepared and loaded in to the electrophoresis machine did not originate from the sample provided to the laboratory. Cf. *Melendez-Diaz v. Massachusetts*, supra, 313–14 (“The text of the [sixth amendment] contemplates two classes of witnesses—those against the defendant and those in his favor. The prosecution *must* produce the former; the defendant *may* call the latter.” (Emphasis in original; footnote omitted.)).

## B

### Machine Generated Raw Data

Having concluded that statements made by technicians are nontestimonial and, therefore, not subject to the requirements of the confrontation clause, I now turn to the next stage in the DNA analysis: raw data produced by an electrophoresis machine. The United States Supreme Court has not issued a decision directly related to machine generated raw data in this particular context, but its silence provides insight as to how it could resolve this issue. In 2007, the United States Court of Appeals for the Fourth Circuit held that “the raw data generated by the [chromatograph] machines do not constitute ‘statements,’ and the machines are not ‘declarants.’ As such, no out-of-court statement implicating the [c]onfrontation [c]lause was admitted into evidence through the [expert testimony]. Any concerns about the reliability of such machine-generated information is addressed through the process of authentication not by hearsay or [c]onfrontation [c]lause analysis.” *United States v. Washington*, 498 F.3d 225, 231 (4th Cir. 2007), cert. denied, 557 U.S. 934, 129 S. Ct. 2856, 174 L. Ed. 2d 600 (2009). “[T]he petition for certiorari

[in *Washington*] was still pending when the [United States Supreme] Court issued *Melendez-Diaz*. Though the [c]ourt granted petitions for certiorari in other cases and remanded them for reconsideration in light of *Melendez-Diaz*, the [United States] Supreme Court denied the petition in *Washington*. In the wake of these various decisions, the [United States Court of Appeals for the] Fourth Circuit has not overruled *Washington*. Several courts have held that *Washington*'s approach is still sound after *Melendez-Diaz*, *Bullcoming*, and *Williams*." (Footnotes omitted.) B. Sites, "Rise of the Machines: Machine-Generated Data and the Confrontation Clause," 16 Colum. Sci. & Tech. L. Rev. 36, 55–56 (2014).

Furthermore, the United States Supreme Court also indicated in *Bullcoming* that its holding did not apply to machine generated raw data. *Bullcoming v. New Mexico*, supra, 564 U.S. 660–61; see also id., 673–74 (Sotomayor, J., concurring in part) ("[T]his is not a case in which the [s]tate introduced only [machine generated] results, such as a printout from a gas chromatograph. . . . Thus, we do not decide whether . . . a [s]tate could introduce (assuming an adequate chain of custody foundation) raw data generated by a machine in conjunction with the testimony of an expert witness." (Citation omitted.)) Noting that "the United States Supreme Court has not addressed the issue of whether the introduction of raw data generated by a machine falls within the confines of *Crawford* or *Melendez-Diaz* [and that] [b]oth the majority and the concurrence in *Bullcoming* emphasized . . . that the holding of that case was limited to human statements and actions and did not necessarily apply to raw, machine produced data," this court has held that "machine generated data [are] not subject to the [restriction] imposed by *Crawford*, *Melendez-Diaz*, and *Bullcoming*." *State v. Buckland*, supra, 313 Conn. 216, 221.

Other reports and documentation could be offered at trial related to the calibration and maintenance of an electrophoresis machine that are also not subject to the requirements of the confrontation clause. "Maintenance and calibration records fall in the portion of the spectrum in which humans play an active role in the day-to-day operation of machines, but where courts should still have no difficulty concluding that they generally are not subject to the [c]onfrontation [c]lause. . . . Though these records are made as formal assertions that would normally be used for their truth at trial, courts should conclude that they generally will not trigger a [c]onfrontation [c]lause right because the statements in them are not testimonial. Many courts that have considered the issue have come to this conclusion. Maintenance and calibration records, when made as part of a routine process, are created 'to ensure the reliability of such machines—not to secure evidence for use in any *particular* criminal proceeding. The fact

that the scientific test results and the observations of the technicians might be relevant to future prosecutions of *unknown* defendants [is], at most, an ancillary consideration . . . .’” (Emphasis in original; footnote omitted.) B. Sites, *supra*, 16 Colum. Sci. & Tech. L. Rev. 76–77, quoting *People v. Pealer*, 20 N.Y.3d 447, 455, 985 N.E.2d 903, 962 N.Y.S.2d 592, cert. denied, 571 U.S. 846, 134 S. Ct. 105, 187 L. Ed. 2d 77 (2013); see also *Melendez-Diaz v. Massachusetts*, *supra*, 557 U.S. 311 n.1 (“[a]dditionally, documents prepared in the regular course of equipment maintenance may well qualify as nontestimonial records”); *State v. Swinton*, 268 Conn. 781, 833–36, 847 A.2d 921 (2004) (error in admission of bite mark overlays created through Adobe Photoshop because state did not present foundation testimony of adequacy of programs did not violate defendant’s confrontation rights but, rather, was evidentiary in nature); *People v. Pealer*, *supra*, 456 (“[w]e endorse this [widely held view] and hold that documents pertaining to the routine inspection, maintenance and calibration of breathalyzer machines are nontestimonial under *Crawford* and its progeny”).

## C

### Analysts

Having concluded that both technicians’ “statements” and machine generated raw data are not testimonial and, therefore, that their admissibility is governed by the rules of evidence (e.g., chain of custody or authentication) and not the confrontation clause, I now turn to statements made by the third category of witnesses, the analysts. To be clear, I describe analysts as the individuals who take raw data produced by an electrophoresis machine and, applying their scientific training and expertise, make subjective conclusions on the basis of this raw data, which are often referred to as generating numerical identifiers and/or the calling of the alleles. See M. Chin et al., *supra*, § 3:4, pp. 3-31 through 3-35. Once this step has occurred, the resulting conclusions are referred to as the DNA profile. The statements made by analysts about how the DNA profile was developed from the raw data and the conclusions that can be drawn from the DNA profile—which may also be included in a written report—are clearly testimonial as they have the primary purpose of creating a record for use at trial that conveys the likelihood that the source of DNA found at the crime scene came from the defendant. *State v. Walker*, *supra*, 332 Conn. 710. This is the step of DNA analysis that is subject to the strict requirements of the confrontation clause, and these are the individuals who the prosecution must call as witnesses. See *People v. John*, *supra*, 27 N.Y.3d 313 (“we conclude that it is the generated numerical identifiers and the calling of the alleles at the final stage of the DNA typing that effectively accuses [the] defendant of his role in the crime charged”).

There could be up to three analysts in even a straightforward case involving one known and one unknown DNA sample: (1) the analyst who develops the DNA profile for the known sample, (2) the analyst who develops the DNA profile for the unknown sample,<sup>8</sup> and (3) the analyst who compares the two DNA profiles to determine if they match.<sup>9</sup> For cases involving more DNA samples, the number of analysts could be even greater. State prosecutors have argued that requiring multiple analysts to testify at a criminal trial is overly burdensome on a laboratory. See, e.g., *Williams v. Illinois*, supra, 567 U.S. 117–18 (Thomas, J., concurring in the judgment). It is only the analysts, however, who perform the calling of the alleles and compare the DNA profiles, which, in turn, leads to the accusation against the defendant, and the defendant’s sixth amendment right to confront his or her accusers outweighs any burden on the laboratory or the prosecution. “[A] laboratory that uses a . . . multiple-analyst model may adapt its operation so that a single analyst is qualified to testify as to the DNA profile testing.” *People v. John*, supra, 27 N.Y.3d 313. First, and perhaps most effective, a laboratory could assign a single analyst to a case to draw all conclusions that would require testimony to comply with the confrontation clause, thereby necessitating only a single witness to testify about all DNA profiles and comparisons at the defendant’s trial. Second, an analyst could observe the final stage of analysis for each DNA profile which he or she did not personally conduct, which would enable him or her to be cross-examined at trial as to why certain subjective, scientific decisions were made that led to the specific conclusions in the DNA profile developed and its comparison. Finally, in recognition that analysts leave employment, move away, or regrettably pass away before a case gets to trial, a testifying analyst could conduct his or her own, independent analysis of the raw data and draw independent conclusions about the DNA profiles.<sup>10</sup> See, e.g., *State v. Lebrick*, supra, 334 Conn. 528 (“[w]here [an] [expert witness] present[s] [her] own independent [judgments], rather than merely transmitting testimonial hearsay, and [is] then subject to cross-examination, there is no [c]onfrontation [c]lause violation” (internal quotation marks omitted)); *People v. John*, supra, 27 N.Y.3d 315 (“[w]e conclude that an analyst who witnessed, performed or supervised the generation of defendant’s DNA profile, or who used his or her independent analysis on the raw data, as opposed to a testifying analyst functioning as a conduit for the conclusions of others, must be available to testify”). Under each of these three scenarios, at least one analyst would be available to testify at trial about the DNA profiles, and a defendant could effectively cross-examine the analyst to elicit details regarding the subjective, scientific decisions that resulted in their development and comparison.<sup>11</sup>

## IV

### CONCLUSION

The confrontation clause does not require that evidence be infallible or even reliable, but guarantees a defendant the right to assess the reliability of hearsay statements that are testimonial in nature through cross-examination. See *Williams v. Illinois*, supra, 567 U.S. 113 (Thomas, J., concurring in the judgment); *State v. Walker*, supra, 332 Conn. 690. Courts around the country have grappled with the application of confrontation clause precedent established by *Melendez-Diaz*, *Bullcoming*, and *Williams* to DNA evidence, and have sought to satisfy a defendant's right to confrontation while sensibly placing some limit on the number of analysts that are necessary to testify at trial. See *Williams v. Illinois*, supra, 89 (Breyer, J., concurring); *People v. John*, supra, 27 N.Y.3d 314. Despite the sheer number of judges and justices dedicating time and effort to this complex area of the law, a major issue remains: "How does the [c]onfrontation [c]lause apply to crime laboratory reports and underlying technical statements made by laboratory technicians?" *Williams v. Illinois*, supra, 89 (Breyer, J., concurring).

While no single opinion from either the United States Supreme Court or this court states in a comprehensive manner which stages of DNA analysis do or do not implicate the confrontation clause, recent decisions from this court clearly dictate that the technicians "involved in the preliminary testing stages, specifically, the extraction, quantitation or amplification stages, are not necessary witnesses [because their statements do not violate the confrontation clause]. . . . Rather, it is the generated numerical identifiers and the calling of the alleles at the final stage of the DNA typing that effectively accuses [the] defendant of his role in the crime charged." (Citation omitted; internal quotation marks omitted.) *State v. Walker*, supra, 332 Conn. 719. Those witnesses, more specifically, must have personal knowledge relating to the analysis conducted in the calling of the alleles and the comparison of the DNA profiles that result.

For these reasons, I offer the following guidance when applying the confrontation clause to DNA evidence: (1) hearsay statements made by technicians involved in the preliminary stages of sample preparation are nontestimonial and, therefore, not subject to the confrontation clause; (2) machine generated raw data produced by electrophoresis machines are not subject to the confrontation clause; and (3) analysts involved in the calling of the alleles and in generating numerical identifiers to develop a DNA profile for known and unknown samples, as well as analysts who compare those two profiles, are subject to the confrontation clause, and the defendant must have an opportunity to



cross-examine these declarants.

For the foregoing reasons, I respectfully concur.

<sup>1</sup> I refer to the scientific instrument that analyzes the DNA sample as the electrophoresis machine throughout this concurrence, but I acknowledge that the instrument may have different names depending on its capabilities. For example, a laboratory may instead use a genetic analyzer. See, e.g., M. Chin et al., *Forensic DNA Evidence: Science and the Law* (2019) § 3:4, pp. 3-28 through 3-31. Regardless of its name, the instrument is one that produces raw data regarding the genotype of the DNA sample.

<sup>2</sup> Justice Sotomayor joined Justice Gorsuch in the dissent from the denial of certiorari.

<sup>3</sup> *Crawford v. Washington*, 541 U.S. 36, 124 S. Ct. 1354, 158 L. Ed. 2d 177 (2004).

<sup>4</sup> Methodologies vary among types of DNA samples (i.e., single source or mixtures) and analytical labs. This description is intended for illustrative purposes and to serve as a point of comparison based on the character of the activity, regardless of the exact process or technical descriptors employed.

<sup>5</sup> The expert witness in *Walker* testified that a similar DNA typing process was used at the laboratory run by the Division of Scientific Services of the Department of Emergency Services and Public Protection. “She testified that the process involves four steps: (1) extracting DNA from the sample and purifying it of contaminants; (2) quantitating the DNA, i.e., determining the amount of DNA that has been extracted; (3) amplifying the DNA using a thermal cycler machine, i.e., creating many copies of different regions of the DNA; and (4) interpreting the data generated from these steps and constructing the numerical DNA profile, which consists of a series of numbers to designate the ‘alleles.’” *State v. Walker*, supra, 332 Conn. 684–85.

<sup>6</sup> A defendant’s right to cross-examine a witness regarding testimonial statements may be satisfied in one of two ways. First, the defendant’s right may be satisfied if the witness is available to testify and can be cross-examined at trial. Second, the defendant’s right may be satisfied if the witness is unavailable to testify at trial but the defendant had a prior opportunity to cross-examine her or him about the testimonial statements. See *Crawford v. Washington*, supra, 541 U.S. 68. For clarity, this concurrence assumes that a witness is unavailable and that the defendant has not been afforded a prior opportunity to cross-examine her or him.

<sup>7</sup> This scenario is distinguishable from that presented in *Melendez-Diaz v. Massachusetts*, supra, 557 U.S. 313. In that case, the statement made by the unavailable analyst that a substance found on the defendant was cocaine, an illegal substance, was itself inculpatory and was an essential fact to be proven at trial. *Id.*

<sup>8</sup> The *Williams* plurality, which, for the reasons stated in the body of this opinion is not binding precedent, concluded that DNA profiles and reports regarding unknown samples collected from crime scenes or victims are not testimonial when they are produced before any suspect was identified. In that case, “[t]he report [on a vaginal swab from a rape victim of an unknown assailant] was sought not for the purpose of obtaining evidence to be used against [the] petitioner, who was not even under suspicion at the time, but for the purpose of finding a rapist who was on the loose. And the profile that [was produced from the semen on the vaginal swab] was not inherently inculpatory.” *Williams v. Illinois*, supra, 567 U.S. 58. (plurality opinion). This distinction is puzzling. While one purpose of conducting DNA analysis may be to identify a rapist who is at large, a purpose of at least equal importance is to generate a DNA profile that will be used at a future criminal trial once the rapist is apprehended. The DNA profile from the vaginal swab, or other unknown DNA collected in connection with a crime, will eventually be the evidence that directly links the defendant to the crime, and, yet, the rationale in *Williams* would exclude DNA profiles of unknown samples from the requirements of the confrontation clause in all instances in which there is no identified suspect. For this reason, I am persuaded that the confrontation clause requirements apply equally to analysts who create DNA profiles for both known and unknown samples. See *id.*, 135 (Kagan, J., dissenting) (“We have previously asked whether a statement was made for the primary purpose of establishing past events potentially relevant to later criminal prosecution—in other words, for the purpose of providing evidence. . . . None of our cases has ever suggested that, in addition, the statement must be meant to accuse a previously identified individual . . . .” (Citations omitted; internal quotation marks omitted)).

<sup>9</sup> The *Williams* plurality concluded that expert testimony regarding statements in a DNA report produced by an outside laboratory, and relied on by an expert witness in forming his testimony, but when the report itself was not introduced into evidence, “does not violate the [c]onfrontation [c]lause because that provision has no application to out-of-court statements that are not offered to prove the truth of the matter asserted.” *Williams v. Illinois*, supra, 567 U.S. 57–58 (plurality opinion). Claiming that the expert witness did not vouch for the accuracy of the report from the outside laboratory but, instead, testified that it matched the known profile so that the fact finder could assess the accuracy of the expert’s statement, the plurality based its conclusion on the long accepted exception to hearsay evidence that “an expert witness may voice an opinion based on facts concerning the events at issue in a particular case even if the expert lacks firsthand knowledge of those facts.” *Id.*, 67. Hearsay exceptions, however, do not satisfy the confrontation clause. “[W]here the testifying expert explicitly refers to, relies on, or vouches for the accuracy of the other expert’s findings, the testifying expert has introduced out-of-court statements that, if offered for their truth and are testimonial in nature, are subject to the confrontation clause.” *State v. Walker*, supra, 332 Conn. 694; see also *State v. Sinclair*, supra, 332 Conn. 226 (“[B]usiness and public records are generally admissible absent confrontation not because they qualify under an exception to the hearsay rules, but because—having been created for the administration of an entity’s affairs and not for the purpose of establishing or proving some fact at trial—they are not testimonial. . . . Nonetheless, such records will be deemed testimonial if they were created for the purpose of establishing or proving some fact at trial.” (Citations omitted; internal quotation marks omitted.)). In situations such as those present in *Williams*, there is “no plausible reason for the introduction of [the out-of-court] statements other than to establish their truth.” *Williams v. Illinois*, supra, 104 (Thomas, J., concurring in the judgment).

<sup>10</sup> This third manner in which to comply with the confrontation clause is particularly significant when a DNA profile is produced from an unknown sample and there are no immediately identifiable suspects. In some cases, it may be years or even decades before a suspect is identified, and then years from that point until the suspect is arrested, charged, and tried. In those cases, it is highly likely that the original analyst who created the DNA profile from the unknown sample is not available to testify, but another analyst who will testify can use his or her independent analysis to draw independent conclusions about the DNA profile. See, e.g., *State v. Lebrick*, supra, 334 Conn. 527 (second analyst who did not produce original ballistics report “applied his training and experience to the sources before him and reach[ed] an independent judgment, the basis of which could be tested through cross-examination” (internal quotation marks omitted)); *Young v. United States*, supra, 63 A.3d 1049 (“the prosecution may be allowed to call a substitute expert to testify when the original expert who performed the testing is no longer available (through no fault of the government), retesting is not an option, and the original test was documented with sufficient detail for another expert to understand, interpret, and evaluate the results” (internal quotation marks omitted)). In such cases, “neither [the original DNA report] nor any of the statements or conclusions contained therein [are] admitted into evidence, either as an exhibit or through the conduit of [the testifying expert’s] live, in-court testimony. . . . [T]he jury [is] not informed of the nature of the reports on which [the testifying witness] relied, who generated the [original DNA] reports, what information they contained, or whether [the testifying expert’s] opinions [are] consistent with the [original DNA] reports.” *State v. Lebrick*, supra, 527.

<sup>11</sup> This application of the confrontation clause to the conclusions of analysts in the final stages of DNA analysis is consistent with this court’s conclusions and holding in *State v. Walker*, supra, 332 Conn. 678. In that case, the expert witness developed a DNA profile by interpreting raw data generated from DNA extracted from an unknown sample collected from the crime scene, and she conducted the ultimate comparison of that DNA profile with the DNA profile from the known DNA extracted from the defendant’s buccal swab. *Id.*, 696. The expert witness “was not, however, involved in the analysis of the buccal swab, which was an essential component of the comparison making her opinion possible. There was no comparison without the buccal swab analysis. Rather, the known processing group conducted this analysis and provided the resulting DNA profile to [the expert witness] for her to use in her comparison. [The expert witness] neither participated in nor observed this analysis.” *Id.* In addition, “[there was] no

evidence contained within the record indicating that the known processing group provided [the expert witness] with the raw machine data generated from the preliminary stages of the analysis such that [she] could independently verify that the DNA profile had accurately been constructed.” Id., 696–97.

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