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SUPERIOR COURT OF NEW JERSEY
MERCER COUNTY
LAW DIVISION, CRIMINAL PART
IND. 22-03-0196-I
PROS. FILE 21-3860

STATE OF NEW JERSEY,

Plaintiff,

v.

RONAL ORDONEZ-LIMA,

Defendant.

Decided: March 21, 2024

JAMES SCOTT, ESQ., assistant prosecutor, attorney for State of New Jersey (Office of the Mercer County Prosecutor).

JOSEPH KRAKORA, ESQ., New Jersey Public Defender, attorney for Ronal Ordonez-Lima.

OSTRER, J.A.D. (retired and temporarily assigned on recall):

In the pre-dawn hours of Christmas Day 2021, a fire engulfed a row-house in Trenton, taking the lives of two residents trapped inside and driving four others from their home. Two of the residents who escaped were defendant's sister and brother-in-law. The State alleges defendant set the fire and presents evidence of motive and

opportunity to support its allegations. The State contends that the prior evening, defendant argued with his brother-in-law who hit defendant multiple times. In addition, the State maintains defendant was present alone on the front porch of the house shortly before flames erupted. Defendant was indicted and charged with two counts of murder of the two persons caught inside; attempted murder of his sister and brother-in-law; aggravated arson; and felony murder.

To support its case, the State seeks to call Mercer County Prosecutor's Office Detective Anthony Sturchio as an expert witness to opine about the origin and cause of the fire, specifically, that the fire's "area of origin" was the exterior of the front porch; the fire's "point of origin" was the front door "sill area"; and the cause was "incendiary" – in other words, someone ignited the fire intentionally.

Defendant moved to preclude the detective's causation opinion on the ground that the detective's methodology violated reliable standards for scientific analysis of fire causation set forth in NFPA 921 – Guide for Fire and Explosion (2021) ("NFPA 921"), a publication of the National Fire Protection Association. Defendant specifically contended that Det. Sturchio applied a methodology known as "negative corpus," which NFPA 921 rejects. See NFPA 921, § 19.6.5. "Negative corpus" is a form of the process of elimination. It involves "[i]dentifying the ignition source for a fire by believing to have eliminated all ignition sources found, known, or suspected to have been present in the area of origin, and for which no supporting

evidence exists." Ibid. Defendant relied on the opinion of Vytenis Babrauskas, Ph.D., a widely published expert in fire science and a member of the NFPA body that developed NFPA 921.

At oral argument, the State conceded that NFPA 921 sets forth a scientifically valid and reliable methodology for determining the cause of a fire. But the State contended that Det. Sturchio adhered to that methodology. The court granted defendant's motion for an evidentiary hearing under N.J.R.E. 104 to determine the admissibility of Det. Sturchio's opinion regarding the cause of the row-house fire.

Having heard the testimony of Det. Sturchio and Dr. Babrauskas, and having considered the relevant provisions of NFPA 921, the court concludes that Det. Sturchio did not adhere to NFPA 921. The court does so mainly for two reasons: (1) Det. Sturchio inappropriately relied on another investigator's net opinion excluding an electrical cause of the fire; and (2) Det. Sturchio applied "negative corpus" because he relied on speculation instead of supporting evidence for his conclusion the fire was "incendiary," which NFPA 921 defines as a fire "intentionally ignited in an area or under circumstances where and when there should not be a fire." NFPA, § 3.3.121. Therefore, the court precludes the State from offering at trial Det. Sturchio's opinions eliminating an accidental electrical cause and concluding the cause of the fire was incendiary.

The court does not preclude Det. Sturchio from opining about the fire's "area of origin" and "point of origin."

I.

In excluding Det. Sturchio's causation opinion, the court relies on settled legal principles governing the admissibility of expert testimony, as well as persuasive authority pertaining to the admissibility of fire causation opinions.

N.J.R.E. 702 sets the standard for admissibility of expert testimony: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise." The State, as the proponent of Det. Sturchio's expert testimony, bears the burden to establish its admissibility. See Hisenaj v. Kuehner, 194 N.J. 6, 15 (2008) (stating that "[t]he burden of proving that the testimony satisfies those threshold requirements [of N.J.R.E. 702] rests with the party proffering the testimony").

To meet its burden, the State must demonstrate "three things: (1) the subject matter . . . [is] 'beyond the ken of the average juror'" – thus, it is helpful; "(2) the field of inquiry [is] . . . 'at a state of the art such that an expert's testimony could be sufficiently reliable'; and (3) 'the witness must have sufficient expertise to offer the 'testimony.'" State v. J.L.G., 234 N.J. 265, 280 (2018) (quoting State v. Kelly, 97

N.J. 178, 208 (1984)); see also State v. Olenowski, 253 N.J. 133, 143 (2023); Hisenaj, 195 N.J. at 15. Defendant's motion focuses on the second element.[1]

The court is obliged, in its role as a gatekeeper, to assure that expert testimony "rests on a reliable foundation." Olenowski, 253 N.J. at 147 (quoting Daubert v. Merrell Dow Pharms. Inc., 509 U.S. 579, 597 (1993)). "Reliability is critical to the admissibility of expert testimony. Indeed, '[a]n expert opinion that is not reliable is of no assistance to anyone.'" Olenowski, 253 N.J. at 150 (quoting Kelly, 97 N.J. at 209). "Methodology, in all its parts, is the focus of the reliability assessment, not outcome." In re Accutane Litigation, 234 N.J. 340, 397 (2018). Reliability must be clearly established. See State v. Cassidy, 235 N.J. 482, 492 (2018) (stating "[t]he proponent of the technique has the burden to 'clearly establish' general acceptance" under the Frye standard)[2]; Olenowski, 253 N.J. at 618 (Pierre-Louis, J., dissenting) (noting that under new Daubert-type standard, proponent still "must carry the burden

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[1] One might argue that a fire causation opinion based on "negative corpus" also does not satisfy the helpfulness prong because a jury is as capable as an expert to infer that a fire was intentionally set once all accidental causes have been eliminated. In Somnis v. Country Mut. Ins. Co., 840 F.Supp. 2d 1166, 1172-73 (D. Minn. 2012), the court avoided deciding if a "negative corpus" opinion was inadmissible as scientifically unreliable, and instead excluded an expert opinion that a fire was incendiary because "once [the expert] testifies that he could not identify an accidental cause for the fire, the jury will be capable of concluding on its own whether the fire was intentional." As defendant does not challenge Det. Sturchio's opinion on this ground, the court does not decide the issue.

[2] Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

to 'clearly establish' that the testimony is sufficiently reliable under N.J.R.E. 702"); State v. Shabazz, 400 N.J. Super. 203, 210 (App. Div. 2005) (stating the proponent bears "the burden to 'clearly establish' reliability of the evidence").

Some courts have held that a negative corpus opinion lacks sufficient scientific reliability to be admissible under N.J.R.E. 702. See, e.g., Mich. Millers Mut. Ins. Corp. v. Benfield, 140 F.3d 915, 920-21 (11th Cir. 1998) (affirming trial court exclusion of negative corpus-type opinion under Daubert). Other courts have declined to hold that NFPA 921, including its approach to negative corpus, embodies the exclusive scientifically reliable methodology for evaluating fire causation. See, e.g., Schlesinger v. United States, 898 F. Supp. 2d 489, 504-05 (E.D.N.Y. 2012) (finding expert's methodology reliable "[r]egardless of whether it is an NFPA approved method"); State v. Sharp, 395 N.J. Super. 175, 181-82 (Law Div. 2006) (holding that an expert's causation opinion "based on the process of elimination" satisfied the general acceptance standard under Frye v. United States, 293 F. 1013 (D.C. Cir. 1923)).[3]

[3] Two subsequent events evidently weaken Sharp's persuasiveness: (1) after the court's decision in Sharp in 2006, the NFPA adopted its current position rejecting negative corpus and (2) the New Jersey Supreme Court jettisoned the Frye standard in criminal prosecutions and adopted a Daubert-type standard instead in 2023. See Olenowski, 253 N.J. at 150-54.

Even NFPA 921 contemplates alternative methodologies: "Deviations from [NFPA] procedures . . . are not necessarily wrong or inferior but need to be justified." NFPA 921, § 1.3. As one court stated, "The mere fact that [the expert] did not cite or use NFPA 921 as his guide does not necessarily mean he failed to use a reliable method." Pekarek v. Sunbeam Prods., 672 F.Supp. 2d 1161, 1175 (D. Kan. 2008).[4] Other courts agree. See Russell v. Whirlpool Corp., 702 F.3d 450, 455 (8th Cir. 2012) (stating "we have not held NFPA 921 is the only reliable way to investigate a fire") (emphasis in original); People v. Perkins, 533 P.3d 971, 978 (Colo. Ct. App. 2023) (holding, "consistent with the majority of other jurisdictions to have considered this issue that while the methods that NFPA 921 identifies constitute a reliable way to investigate a fire . . . following NFPA 921 is not the only way to do so").

But this court need not choose sides in the debate because Det. Sturchio accepted NFPA 921 as the exclusive, scientifically reliable methodology for determining a fire's cause. He testified that "NFPA 921 is the standard guide for conducting fire and explosive investigations," T41; and he agreed that NFPA 921 is "the guide that . . . has to be followed," T66, and "if the methodology used does

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[4] Although the court in Pekarek permitted an expert to opine that certain items – including a breaker panel and candle -- did not cause a fire, the court barred the expert from opining that an electric blanket was the cause, as he failed to follow a reliable methodology. 672 F. Supp. 2d at 1175-76.

not comport with 921, then the opinion of the investigator is of no use in a courtroom." T67.

According to the weight of authority, "an expert who purports to follow NFPA 921 must apply its contents reliably." Russell, 702 F.3d at 455. See also Presley v. Lakewood Eng'g, 53 F.3d 638, 645 (8th Cir. 2009) (affirming exclusion of opinion of expert who "failed to follow these aspects of the [NFPA] standards he purported to follow"); Fireman's Fund Ins. Co. v. Canon U.S.A., Inc., 394 F.3d 1054, 1057-58 (8th Cir. 2005) (affirming trial court holding that experts who "purportedly followed" NFPA 921 standard "did not apply this standard reliably to the facts of the case"); State Farm Fire & Cas. Co. v. Steffen, 948 F.Supp. 2d 434, 443-44 (E.D.Pa. 2013) (rejecting expert's opinion that "impermissibly relies on . . . untestable 'negative corpus' even though the NFPA 921 protocol that he purports to have followed specifically identifies his approach as inconsistent with the scientific method"); Perkins, 533 P.3d at 978 (stating "an opinion by an expert who purported to follow NFPA 921 may only be excluded 'on NFPA 921 grounds' if such expert did not reliably apply the methodology to the fire investigation at issue").

To decide whether Det. Sturchio adhered to NFPA 921, the court must "assess both the methodology [actually] used by the expert to arrive at an opinion and the underlying data used in the formation of the opinion." In re Accutane Litigation,

234 N.J. at 396-97. Doing so "ensure[s] that the expert is adhering to norms accepted by fellow members of the pertinent scientific community." Id. at 397.

Notably, N.J.R.E. 703 permits an expert to rely on the opinions of others only "[i]f of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject." And a court must "make an inquiry into and a finding on whether experts in the field rely on certain information." Ryan v. KDI Sylvan Pools, Inc., 121 N.J. 276, 289 (1990) (applying predecessor rule).

In sum, the court must determine whether the State has demonstrated that Det. Sturchio has "applied his . . . scientifically recognized methodology in the way that others in the field practice the methodology." In re Accutane Litigation, 234 N.J. at 399-400. And if the State has not demonstrated "the soundness of [his] methodology, both in terms of its approach to reasoning and to its use of data, from the perspective of others within the relevant scientific community," the court must bar the detective's testimony as unreliable. Id. at 400.

The court turns next to Det. Sturchio's methodology and use of underlying data to determine if he adhered to the accepted norms found in NFPA 921.

II.

A.

The court qualified Det. Sturchio as an expert in "[f]ire investigation and origin and cause determinations," T37-38, and qualified Dr. Babrauskas as an expert

in "fire safety[,] fire investigation and fire science." T108. Both witnesses testified credibly and candidly. But their qualifications differ significantly, and so did the authoritativeness with which they addressed the scientific methodologies embodied in NFPA 921.

Det. Sturchio has been a law enforcement officer since 2013. T5-8. He started work for the Mercer County Prosecutor's Office three years later. Id. Det. Sturchio had also served as a volunteer firefighter in Pennington and Hopewell for about eight years. T8-9. Although he was assigned to the prosecutor's office's arson unit in 2017, he conceded that arson-related work constituted a "relatively small part" of his day-to-day responsibilities, compared to his assignments in the Special Investigations Unit, which focuses on narcotics cases, and the Electronic Surveillance Unit. T31-34.

Det. Sturchio earned an associate's degree in fire science in 2018 and a bachelor's degree in fire administration in 2019, both from Columbia Southern University. T9. He began enrolling in various training courses in arson investigation shortly before joining the arson unit. T12-14. He earned a certification as a "fire investigative technician" from the International Association of Arson Investigators but has yet to earn the group's certification as a "fire investigator." T17-20 During his academic work and training, he became familiar with NFPA 921. T13-15, 41-42.

Det. Sturchio testified that he was not part of the initial investigative team on scene. T42. Rather, he was tasked with reviewing the data others collected and independently analyzing the fire's origin and cause. T42-43.

Dr. Babrauskas holds a bachelor's degree in physics from Swarthmore College, and a master's degree in structural engineering and a Ph.D. in fire protection engineering from the University of California at Berkeley. T101. He has held numerous research science and academic positions in the fire science field and operates a consulting firm that focuses on fire safety science issues. T101-04. He has published over 400 works, including lengthy treatises on fire ignition, The Ignition Handbook, and electrical fires, Electrical Fires and Explosions. T104-05. He has held positions in numerous societies and associations involving fire science and arson investigation and has been honored by the Society of Fire Protection Engineers. T105-106. Significantly for this case, since 2006, he has served as a principal voting member on the NFPA's Technical Committee on Fire Investigations, which writes NFPA 921. T108-09. The defense retained Dr. Babrauskas to review Det. Sturchio's report for consistency with NFPA 921. T111.

Based on Dr. Babrauskas's advanced education and training, and his extensive experience and scholarship, as well as the depth of reasoning in his testimony, the court found Dr. Babrauskas to be the more persuasive and authoritative witness on NFPA 921's meaning, and what constitutes adherence to its methodologies.

B.

Both experts reviewed surveillance videos from various locations near the house that caught fire. They reviewed multiple reports prepared by police and fire officials who evidently responded to the fire or investigated it. They also reviewed statements from the survivors.[5]

For purposes of the hearing, it was undisputed that shortly before the fire, video surveillance captured defendant as he walked down the block where his sister and brother-in-law lived. He then lingered in front of their home and entered the front porch. He stood there alone, smoked a cigarette – presumably lit with a match or a lighter -- and then tossed it toward the street. Seconds after he allegedly left the front porch, a small light flickered. Flames then erupted at the base of the front door and rapidly spread through the house and a neighboring one.

None of the videos captured defendant "doing anything in conjunction with the doorsill," according to Dr. Babrauskas. T125. Nor was any individual depicted "carrying a gasoline container or a container of liquid of some sort." Ibid. There also is no evidence that the porch contained other combustibles, such as junk or rubbish, that may have ignited first before setting the house aflame. T142. Notably, Det. Sturchio testified that he reviewed a photograph of the front porch taken a few

[5] Neither party introduced into evidence at the hearing the surveillance videos or the reports of fire and police personnel.

months before the fire, but he did not identify any combustible materials on the porch. T61-62. He also testified that there was no "pre-existing" source of ignition near the doorsill, T69, an assertion Dr. Babrauskas disputed, as discussed below.

After the fire was put out, a fire official found an item of debris or "charred material" – no more specific description was provided -- that tested positive for gasoline, a fire accelerant. T63, 73. The record does not clearly identify the item's location when found. Det. Sturchio first testified it was "identified on the front porch," T63, but later admitted he did not know where it came from, T73, agreeing that after the fire was put out, debris from around the house was removed and the gasoline-tainted item was placed on the sidewalk. T74. Det. Sturchio admitted he had "no idea if [the gasoline-tainted debris] had anything to do with the starting of the fire." Ibid.

C.

Det. Sturchio's opinion on the fire's "point of origin" and "area of origin" – although uncontested – is critical to understanding his opinion on causation. NFPA 921, § 3.3.149 defines a "point of origin" as "[t]he physical location within the area of origin where a heat source, a fuel, and an oxidizing agent first interact, resulting in a fire or explosion." By contrast, an "area of origin" is "[a] structure, part of a structure, or general geographic location within a fire scene, in which the 'point of

origin' of a fire or explosion is reasonably believed to be located."[6] NFPA 921, § 3.3.13 (emphasis in original).

Det. Sturchio explained that identifying a fire's point of origin is important to be able to test hypotheses for a cause analysis. T44. Dr. Babrauskas essentially agreed, stating that determining a point of origin is "normally" a precondition to determining cause. T112. He explained that NFPA 921 requires that an investigator "seek the cause of the fire solely within the area of origin of the fire." T114. He explained there would be an inherent conflict in identifying a cause in an area separate from where the fire originated. Ibid. Also, seeking causes in areas separate from the area of origin would present an unmanageable task susceptible to error, because there usually exist many potential ignition sources. T114-15.

Det. Sturchio purported to follow the scientific method prescribed by NFPA 921, which calls for recognizing the need for the investigation, defining the problem, collecting data, analyzing data, developing a hypothesis, testing the hypothesis, and then selecting the final hypothesis. T40. Det. Sturchio opined that the fire's "point of origin" was "in the area of the doorsill" and the "area of origin" was the front porch. T52, 68. Det. Sturchio stated it was uncommon for a house fire to originate

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6 A "scene" is "[t]he general physical location of a fire or explosion incident (geographic area, structure or portion of a structure, vehicle, boat, piece of equipment, etc.) designated as important to the investigation because it may contain physical damage or debris, evidence, victims, or incident-related hazards." NFPA 921, § 3.3.166.

at a doorsill because not many "sources of ignition that could generate a fire" are found there. T52-53.

To formulate his opinion on the fire's point of origin and area of origin, Det. Sturchio relied on sources of information that NFPA 921 identifies for such determinations, including witness information; electronic data, such as the surveillance data; and fire patterns. T45; see NFPA 921, § 18.1.2. Det. Sturchio also utilized bodycam footage, photographs, weather reports, and the numerous reports of police and fire officials. T45-48. He tested his hypothesis that the fire originated at the front porch by examining the damage to the structure, "working from the least to most burned area." T50. In identifying the point of origin as the doorsill, he relied on video surveillance; the nature of the fire damage, including charring; and a pre-fire photograph indicating the sill was decayed. T51-53. He stated the doorsill had "the heaviest level of damage." T53.

Dr. Babrauskas said that since he did not attend the fresh fire scene, he had no basis to contest Det. Sturchio's opinion on point of origin and area of origin. T113, 119. Nor did Dr. Babrauskas specifically criticize Det. Sturchio's methodology in reaching his conclusions about area of origin and point of origin. But Dr. Babrauskas rejected the suggestion that the point of origin was limited to part of the doorsill, excluding the point at which the doorsill contacted the door jamb. T143. He found no basis in Det. Sturchio's opinion for so restricting the point of origin. Ibid. That

was a critical point, because electrical wiring abutted the door jamb and – for reasons discussed below – Dr. Babrauskas opined that Det. Sturchio lacked a scientifically reliable basis for excluding an electrical cause of the fire. T123.

D.

Having identified the point and area of origin, Det. Sturchio turned to determining the fire's cause, which entailed identifying "an ignition source, the first fuel ignited, and the circumstances which brought those together." T54. He concluded that the fire was caused by the application of a direct flame to "available combustibles," T65, although he did not identify them, T94.

Before so concluding, he tested and rejected several hypotheses that the fire arose from an accidental cause. For example, he rejected the hypothesis that the accidental discarding of a match or cigarette caused the fire; he explained a discarded match or cigarette would generate a fire slowly, and the fire depicted in video surveillance developed quickly. T64-65. He also ruled out a mechanical cause because investigators found no mechanical items or appliances on the front porch, T63-64. Finally, he eliminated any chemical cause because investigators found no evidence of chemicals near the point of origin, T85-86, 92-93. Det. Sturchio identified a "chemical-involved incident" as "an accidental spill of chemicals that reaches an ignition source." T92.

Significantly, Det. Sturchio also rejected the hypothesis that the fire erupted from an electrical cause. Det. Sturchio relied on the on-scene examination by others. The court concludes that Det. Sturchio, in so doing, deviated from the scientific method that NFPA 921 prescribes.

Det. Sturchio testified, "Electrical fire cause was ruled out by investigators based on their on-scene examination of electrical components in the general area of the fire origin." T64. He quoted in his report another detective's conclusion that there was "no indication of electrical outlets, extension cords or faulty wiring in the area of origin." T82-83. Yet, Det. Sturchio acknowledged that multiple wires ran up and down both sides of the front door where the fire started. T83. He was also unaware of any metallurgical analysis of the wires. T83-84. He admitted that on-scene inspection of wiring is at best an incomplete method of testing for an electrical cause:

> Q: [B]y the way, you've had some training in electrical wires? You have to actually test wires with some kind of scientific methodology to determine if they're faulty, right?
>
> A: I mean, there are physical fire signs that would be present typically in electrical wiring.
>
> Q: Right, but you can't necessarily look at the wires to determine whether they're faulty?
>
> A: To some degree. You could observe beading.
>
> Q: But that's not scientific?

A: Correct.

Q: Right.

A: It would lead for further assessment or examination.

Q: Right, which was not done here?

A: Not to my knowledge.

[T85.]

Dr. Babrauskas was more definitive. He said that to reliably test the hypothesis that an electrical failure accidentally caused a fire, one must subject the wires to "detailed examination in a metallurgical laboratory." T123. He stated:

> [C]ertainly photographs show that electrical wiring was present right adjacent to that front door. . . . [Y]ou cannot determine whether electrical wiring was faulty or not without taking the wiring into evidence and bringing it into a competent metallurgical laboratory for expert examination. . . It is not something that can be reliably and appropriately done by visual examination in the field or on photographs.
>
> [Ibid.]

Dr. Babrauskas asserted that Det. Sturchio eliminated an electrical cause by relying on a conclusory opinion that lacked a scientific basis. T122. He also contended that the presence of wiring around the door belied Det. Sturchio's assertion there were no pre-existing ignition sources at the point of origin, since the door jamb, along which the wires ran, abutted the doorsill. T136-37, 142-43.

The court concludes that the State has failed to demonstrate that Det. Sturchio properly applied a scientifically reliable methodology in eliminating the possibility of an electrical cause. The court does so because the State failed to demonstrate that a fire science expert applying NFPA 921 would rely on another investigator's conclusion, reached without metallurgical analysis, that a fire had no electrical cause. See N.J.R.E. 703 (stating an expert may rely on another's opinion "[i]f of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject"). Furthermore, because Det. Sturchio's ultimate opinion that the fire was incendiary rests on the ill-founded opinion regarding accidental causes, his methodology for concluding that the fire was incendiary must also be rejected. T87.

E.

Even assuming Det. Sturchio applied reliable scientific methodology in ruling out accidental causes, his conclusion that the fire was incendiary violated NFPA 921's guidance on negative corpus. The court will first review the pertinent NFPA 921 provisions and then discuss their application in this case.

(1)

NFPA 921 acknowledges that the process of elimination plays an important part in the scientific method, but it can be misused. NFPA 921 states:

> The process of elimination is an integral part of the scientific method. All potential ignition sources present or

> believed to be present in the area of origin should be identified, and alternative hypotheses should be considered and challenged against the facts. Elimination of a testable hypothesis by disproving the hypothesis with reliable data is a fundamental part of the scientific method. However, the process of elimination can be used inappropriately.
>
> [NFPA 921, § 19.6.5.]

Misuse occurs when the investigator infers a cause without supporting evidence, based only on the elimination of other causes. NFPA 921 characterizes that methodology as "negative corpus."

> Identifying the ignition source for a fire by believing to have eliminated all ignition sources found, known, or suspected to have been present in the area of origin, and for which no supporting evidence exists, is referred to by some investigators as *negative corpus*. . . . Negative corpus has been used in classifying fires as incendiary, although the process has also been used to characterize fires as accidental.
>
> [Ibid.]

NFPA 921 considers negative corpus to be scientifically unreliable: "The negative corpus process is not consistent with the scientific method, is inappropriate, and should not be used because it generates untestable hypotheses and may result in incorrect determinations of the ignition source and first fuel ignited." Ibid.

NFPA 921 requires investigators to base their hypotheses on facts, not speculation:

> Determination of the ignition source must be based on data

> or logical inferences drawn from that data. . . . Any hypotheses formulated for the causal factors (e.g. first fuel, ignition source, and ignition sequence) must be based on the analysis of facts and logical inferences that flow from those facts. Those facts and logical inferences are derived from data, observations, calculations, experiments, and the laws of science. Speculative information cannot be included in the analysis.
>
> [Ibid.]

When an investigator cannot identify a fire's cause by applying NFPA 921's methodologies, the investigator must conclude the fire's cause is "undetermined."

> In circumstances where all hypotheses have been rejected, or if two or more hypotheses cannot be rejected, the only choice for the investigator is to conclude that the fire cause, or specific causal factors, is undetermined. It is improper to base hypotheses on the absence of any supportive evidence.
>
> [NFPA 921, § 19.6.5.1.]

However, NFPA 921 recognizes there are situations when an investigator may properly determine a cause even if physical evidence of the ignition source is missing and cannot be identified:

> There are times when there is no physical evidence of the ignition source found at the origin, but where an ignition sequence can logically be inferred using other data. Any determination of fire cause should be based on evidence rather than on the absence of evidence; however, there are limited circumstances when the ignition source cannot be identified, but the ignition sequence can logically be inferred. This inference may be arrived at through the testing of alternate hypotheses involving potential ignition sequences, provided that the conclusion regarding the

> remaining ignition sequence is consistent with all known facts *(see Chapter 4)*.
>
> [NFPA 921, § 19.4.4.3.]

NFPA 921 identifies a non-exclusive list of situations "that lend themselves to formulating an ignition scenario when the ignition source is not found during the examination of the fire scene." Ibid. In its post-hearing brief, the State contends that two such situations apply here: "[w]hen an ignitible [sic] liquid residue (confirmed by laboratory analysis) is found at one or more locations within the fire scene and its presence at that location(s) does not have an innocent explanation *(see Chapter 23)*," NFPA 921, § 19.4.4.3(2), and when "[t]he fire was observed or recorded at or near the time of inception or before it spread to a secondary fuel," NFPA 921, § 19.4.4.3(5). Pbf8-9. For reasons that follow in section (3) below, the court rejects that contention.

But first, the court will address Det. Sturchio's use of negative corpus.

(2)

Det. Sturchio concluded that the fire was incendiary; he opined that someone applied "a direct flame to available combustibles." T56, 60-61, 65. He said the "direct flame" could have been provided by a "portable ignition source," T60, which could be a match or lighter. And "available combustibles" would include "any item located on the front porch in the area of origin, specifically more focused to the point of origin, that a sufficient ignition source could ignite." T93.

There is no doubt that Det. Sturchio used the process of elimination in reaching this conclusion. As already discussed, he eliminated hypotheses that the fire was caused accidentally – by careless discarding of smoking materials, or by mechanical, chemical or electrical means. The question is whether he applied negative corpus, by reaching his conclusion based on speculation, rather than supporting evidence. Persuaded by Dr. Babrauskas's analysis, the court concludes he did.

Dr. Babrauskas explained that a match or a cigarette lighter is not a "competent ignition source" for a wooden doorsill, even a decayed or rotted one. T115, 140. He likened it to trying to ignite a log with a match; it will not succeed because the match lacks sufficient energy; a fuel is needed. T115-16, 144. As he explained, "The issue to be addressed is was there an ignition source that met a fuel which it was a competent source of ignition towards and that combination having been located within the area of origin." T124-25.

Although Det. Sturchio insisted he followed the scientific method, T93, he admitted that he had to speculate, at least in part, that something on the porch provided the fuel for the fire to start in the doorsill area. T76.

> Q: Okay. So, in other words, you need to have some specific evidence as to the source of ignition and the fuel and the circumstances that brought the two together in order to determine the cause of the fire?
>
> A: Correct.

> Q: And here you've conceded that there's a degree of speculation involved in your conclusion as to how this fire started?
>
> A: That's correct.
>
> Q: Okay. And, in fact, the last line of Section 19.6.5, says, quote, speculation information cannot be included in the analysis?
>
> . . .
>
> Q Speculative information cannot be included in the analysis?
>
> A: Correct.
>
> Q: And that's what you did?
>
> A: Not entirely.
>
> [T78-79.]

As noted previously, Det. Sturchio possessed data that depicted the doorsill before the fire, yet he provided no information about the presence of "available combustibles" on the porch.

Dr. Babrauskas opined that Det. Sturchio relied "solely on negative corpus because no affirmative source of ignition was found and on that basis and on that basis alone Mr. Sturchio ends up making the claim that the defendant was the perpetrator of an incendiary fire." T139; see also T118-19 (stating Det. Sturchio used negative corpus). Dr. Babrauskas stated it would be "gross speculation" to

conclude the fire could have started with "other available combustibles" on the porch. T140-41. Even if other persons typically stored various items on their porches in the neighborhood where the fire occurred, "there is no evidence . . . that there was some pile[] of rubbish on that porch . . . that the defendant would now be accused of having ignited." T142.

Dr. Babrauskas also opined that it was inappropriate to deduce the fire was incendiary based on the fact an individual was present shortly before it started. T134. He noted there was no evidence that the individual did anything to the doorsill. T132.

Based on Dr. Babrauskas's analysis, the court is persuaded that Det. Sturchio utilized a negative corpus methodology, which NFPA 921, § 19.6.5 rejects.

(3)

The court turns to the State's argument that Det. Sturchio properly inferred an incendiary cause because (1) "an ignitable liquid residue (confirmed by laboratory analysis)" – the gasoline-tainted debris – was found at the fire scene and did not have an innocent explanation, see NFPA 921, § 19.4.4.3(2); and (2) "[t]he fire was observed or recorded at or near the time of inception or before it spread to a secondary fuel." NFPA 921, § 19.4.4.3(5).

Dr. Babrauskas explained that scenarios set forth in section 19.4.4.3 pertain to situations where the fire cannot be traced to a particular origin.

> Now what the section lists is things that are primarily in diffuse, in flash fires and explosions and those, of course, are an exception because they are a situation that leaves a fire scene which does not include documentation – which does not include evidence that can be traced to a particular origin. But that is a very specific exclusion and it is certainly not meant to allow people to be accused of incendiarism when their actions cannot be tied to an ignition source that ignites a specific piece of fuel.
>
> [T146.]

Furthermore, Dr. Babrauskas specifically rejected the notion that the gasoline-tainted debris was a cause of the fire. Dr. Babrauskas noted that none of the surveillance videos depicted a person carrying "anything . . . that could be connected to the start of a fire" including a container of gasoline or any other liquid. T125. He said it would be "speculation" to tie the gasoline-tainted debris found in the fire scene with the fire. T126. He further explained that "doorsills . . . will not ignite from a spill of gasoline on there because the gasoline burns off basically in a flash and it would require a sizable amount just to stay there long enough to be lit as the gasoline volatility is quite huge." T149.

Det. Sturchio himself declined to assert that the gasoline-tainted debris was a cause of the fire.

> Q: So, you have no idea if it [the gasoline-tainted debris] had anything to do with the starting of the fire?
>
> A: That's correct.

> Q: Okay. So, it's not a fuel that's identified as being a contributing cause to the fire? It can't be?
>
> A: No.
>
> [T74-75.]

Dr. Babrauskas also rejected the suggestion that one could reliably deduce the fire was incendiary because the "fire was observed or recorded at or near the time of inception or before it spread to a secondary fuel." NFPA 921, § 19.4.4.3(5). He explained that the videos did not record "what exactly was ignited or how it spread to a next fuel." T147. He noted the videos were "of very limited resolution," and, though they showed a fire at the front door, they did "not show how the fire spread through a secondary fuel" and they did "not in any way demonstrate that the accused actually lit anything in the door sill area." Ibid.

Thus, the court concludes, based on Dr. Babrauskas's testimony, as well as admissions by Det. Sturchio, that NFPA 921, § 19.4.4.3 does not apply here to justify the inference that the fire in the case was incendiary.

III.

Defendant contends, in his post-hearing brief, that the indictment must be dismissed absent the State's proposed expert testimony on the fire's cause. As defendant has not sought dismissal by formal motion, the court shall not address the issue, other than to make two observations.

First, the scientific method demands a level of certainty sometimes greater than the needs of our judicial system. Cf. Rubanick v. Witco Chem. Corp., 125 N.J. 421, 436-37 (1991) (noting that "[t]he scientific method . . . fails to address or accommodate the needs and goals of the tort system"). In particular, the prosecution is obliged to prove a defendant's guilt "beyond a reasonable doubt," not to a "scientific certainty." See, e.g., Smith v. United States, 709 A.2d 78, 82 (D.C. 1998) (en banc) (approving beyond-a-reasonable-doubt jury instruction that included statement that "[t]he government is not required to prove guilt . . . to a mathematical or scientific certainty").

Second, other courts have held that an arson prosecution may rest solely on circumstantial evidence. See Schlesinger, 898 F. Supp. 2d at 511 (citing cases); Narrod v. Napoli, 763 F. Supp. 2d 359, 385 (W.D.N.Y. 2011) (holding that admission of arson investigator's testimony "even if erroneous" did not deny defendant a fair trial because of "overwhelming" circumstantial evidence); cf. Michigan Millers Mut. Ins. Co., 140 F.3d at 921-22 (reversing trial court's entry of directed verdict for insured after it excluded insurer's arson expert, because the insurer presented sufficient circumstantial evidence of motive, opportunity, and incendiary cause). Thus, this court is not prepared to conclude, absent full briefing, that expert testimony on the fire's cause is essential to prosecution.

IV.

In conclusion, Det. Sturchio may testify that the fire's area of origin was the porch and its point of origin was "in the area of the doorsill." But he may not offer his opinion that the cause of the fire was incendiary. Nor may he offer his opinion that all accidental causes have been eliminated, as that conclusion rests on another person's non-scientifically reliable opinion excluding a possible electrical cause of the fire.