227 Ariz. 196
254 P.3d 1142
609 Ariz. Adv. Rep. 4
STATE of Arizona, Appellee,
v.
Ronald Bruce BIGGER, Appellant.
No. 2 CA–CR 2007–0244.
Court of Appeals of Arizona, Division 2, Department A.
May 24, 2011.

[254 P.3d 1145]

Thomas C. Horne, Arizona Attorney General By Kent E. Cattani and Joseph L. Parkhurst, Tucson, Attorneys for Appellee.Osborn Maledon, P.A. By Larry A. Hammond, Timothy J. Eckstein, Michael S. Catlett, and Kathleen Brody O'Meara, Phoenix, Attorneys for Appellant.***OPINION*****BRAMMER, Presiding Judge.**

¶ 1 Ronald Bigger appeals from his convictions and sentences for first-degree murder and conspiracy to commit first-degree murder. He contends the trial court committed reversible error by denying his request for a change of venue. He also asserts the court erred by failing to preclude testimony offering probability analyses of deoxyribonucleic acid (DNA) evidence because the analyses relied on theories not generally accepted in the relevant scientific community, and by precluding evidence of third-party culpability. We affirm.

Factual and Procedural Background

¶ 2 On appeal, we view the facts in the light most favorable to sustaining the verdicts. *See State v. Haight–Gyuro*, 218 Ariz. 356, ¶ 2, 186 P.3d 33, 34 (App.2008). This case arises from the murder of D.S. on October 5, 2004. From 2001 to 2002, D.S. and Bradley Schwartz worked as pediatric ophthalmologists in a practice owned by Schwartz. In the fall of 2002, Schwartz stopped practicing medicine because the Arizona Medical Board was in the process of suspending his license to practice due to his substance abuse problems. After Schwartz's license was suspended, D.S. opened his own practice.

¶ 3 When Schwartz returned to practice following his suspension, his business was not doing well and he blamed D.S. He asked numerous people if they knew someone who would harm or kill D.S. for money. At one point he paid a friend to have her husband, D.H., "harm" D.S.

¶ 4 On the day D.S. was murdered, Bigger was seen at D.S.'s office around 4:00 p.m. Around 5:00 or 6:00 p.m., several people saw an unidentified man wearing blue "scrubs" around the parking area outside D.S.'s office. Sometime between 6:00 and 6:45 p.m., the clerk at a convenience store across the street from D.S.'s office complex saw Bigger in the store wearing blue "scrubs."

¶ 5 D.S. activated his office alarm at 7:26 p.m., suggesting he was leaving for the night. At 10:30 p.m., an employee in the office complex discovered D.S.'s body in the parking lot. An autopsy revealed that D.S. had died from multiple stab wounds. His wallet was found in his pants pocket. D.S.'s automobile was missing, but was discovered two days later.

¶ 6 That same evening Bigger arrived at a restaurant where Schwartz was dining with a companion. Bigger arrived in a taxi and Schwartz paid the fare. The companion recognized Bigger as someone she had met in Schwartz's office earlier in the day. During dinner Schwartz asked Bigger "how the scrubs worked out." They left the restaurant together and found hotel accommodations for Bigger, for which Schwartz paid. The next day Schwartz withdrew $10,000 from his bank account. Soon thereafter Bigger was seen carrying large amounts of cash.

¶ 7 Bigger and Schwartz were charged by indictment with first-degree murder and conspiracy

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to commit first-degree murder. They were tried separately—Schwartz was tried first.[1] After a twenty-eight-day trial, the jury found Bigger guilty of both charges. He was sentenced to concurrent prison terms of natural life on both counts. This appeal followed.

DiscussionVenue

¶ 8 Bigger argues the trial court erred in denying his motion for a change of venue, which he renewed and supplemented before and during his trial. He alleges "extensive and prejudicial press coverage permeated the trial proceedings." When seeking a change of venue on the basis of pretrial publicity, "the moving party shall be required to prove that the dissemination of the prejudicial material will probably result in the party being deprived of a fair trial." Ariz. R.Crim. P. 10.3(b). We therefore must determine " 'whether, under the totality of the circumstances, the publicity attendant to [Bigger's] trial was so pervasive that it caused the proceedings to be fundamentally unfair.' " *State v. Cruz,* 218 Ariz. 149, ¶ 13, 181 P.3d 196, 203 (2008), *quoting State v. Blakley,* 204 Ariz. 429, ¶ 13, 65 P.3d 77, 82 (2003). This analysis involves two inquiries: "(1) did the publicity pervade the court proceedings to the extent that prejudice can be presumed?; if not, then (2) did defendant show actual prejudice among members of the jury?" *Cruz,* 218 Ariz. 149, ¶ 14, 181 P.3d at 203, *quoting State v. Murray,* 184 Ariz. 9, 26, 906 P.2d 542, 559 (1995).

¶ 9 In denying the request for a change of venue, the court found much of the publicity had been duplicative; it was impossible to determine from the record how many people had been exposed to publicity in the case; most of the publicity was factual and non-inflammatory; most of the inaccurate publicity had related to insignificant matters; most of the outrageous commentary had been publicized in a newspaper of relatively modest circulation; the volume of publicity had decreased significantly since D.S. had been killed; and, some of the publicity had been generated by Bigger's and Schwartz's attorneys. Bigger contends, however, that the media coverage was so "extensive and outrageous" that the court should have presumed prejudice. We review a court's ruling on a motion for change of venue for an abuse of discretion. *Cruz,* 218 Ariz. 149, ¶ 12, 181 P.3d at 203.

Presumed Prejudice

¶ 10 The burden of establishing a presumption of prejudice is "very heavy." *Cruz,* 218 Ariz. 149, ¶ 20, 181 P.3d at 204. For a court to presume prejudice, "the publicity must be 'so unfair, so prejudicial, and so pervasive that [the court] cannot give any credibility to the jurors' answers during voir dire." *Id.* ¶ 15, *quoting State v. Bolton,* 182 Ariz. 290, 300, 896 P.2d 830, 840 (1995). Media coverage must be so "extensive or outrageous that it permeated the proceedings or created a 'carnival-like' atmosphere." *Cruz,* 218 Ariz. 149, ¶ 15, 181 P.3d at 204, *quoting State v. Atwood,* 171 Ariz. 576, 631, 832 P.2d 593, 648 (1992), *overruled on other grounds by State v. Nordstrom,* 200 Ariz. 229, 25 P.3d 717 (2001). Or, the publicity must be so outrageous that it turned the trial into a "mockery of justice or a mere formality." *State v. George,* 206 Ariz. 436, ¶ 23, 79 P.3d 1050, 1059 (App.2003), *quoting State v. Jones,* 197 Ariz. 290, ¶ 44, 4 P.3d 345, 362 (2000). The mere exposure of jurors to publicity resulting in knowledge of the case will not create a presumption of prejudice when jurors can set aside acquired information and render a verdict based on the evidence. *Cruz,* 218 Ariz. 149, ¶ 14, 181 P.3d at 203–04.

¶ 11 A court will consider the effect of pretrial publicity and not merely its quantity. *Id.* at 156, 181 P.3d at 203. "[Courts] have been reluctant to presume prejudice if publicity was primarily factual and non-inflammatory or if the publicity did not occur close in time to the trial." *Nordstrom,* 200 Ariz. 229, ¶ 15, 25 P.3d at 727; *see also Cruz,* 218 Ariz. 149, ¶ 18, 181 P.3d at 204 (prejudice

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not presumed where most coverage accurate and occurred more than year before trial); *Blakley*, 204 Ariz. 429, ¶ 15, 65 P.3d at 82 (prejudice not presumed where no evidence inflammatory language in articles affected proceedings and most coverage occurred near time of crime or pretrial stages); *Bolton*, 182 Ariz. at 300, 896 P.2d at 840 (prejudice not presumed where most reports factually based and repetitive).

¶ 12 Bigger directs us to several aspects of the pretrial publicity in his case, none of which, individually or collectively, justifies a presumption of prejudice. He refers to extensive press coverage that continued through his trial and included over 1,400 television news segments, 300 newspaper articles, and other electronic media coverage, including a "blog" and website. Although the volume of publicity here exceeds that which was at issue in various other Arizona cases, our supreme court repeatedly has stated the quantity of publicity alone will not justify a presumption of prejudice. *See, e.g., Cruz*, 218 Ariz. 149, ¶ 13, 181 P.3d at 203 ("We consider the effect of pretrial publicity, not merely its quantity."); *Nordstrom*, 200 Ariz. 229, ¶ 14, 25 P.3d at 727 ("In considering a motion for change of venue, the court is concerned with the effect of pretrial publicity, rather than its quantity."). Moreover, many of the media reports simply duplicated earlier material and did not mention Bigger. *See State v. Bible*, 175 Ariz. 549, 564, 858 P.2d 1152, 1167 (1993).

¶ 13 Bigger also alleges the pretrial publicity was inflammatory because of the nature of the crime and the inaccuracy of some reports. But Arizona cases have upheld the denial of a motion for a change of venue even when the alleged crime was heinous and the media had reported inaccurate information. *See, e.g., Bible*, 175 Ariz. at 560, 564, 858 P.2d at 1163, 1167 (no presumption of prejudice in case where defendant convicted of first-degree murder, kidnapping, and molestation of a child even though some reports included inadmissible evidence and inaccurate information). The trial court here determined most of the publicity was factual in nature and not inflammatory, and the record supports that determination. The inaccurate or inadmissible information reported by the media was an "exception[ ] to the largely factual information in the great bulk of the news reports," and most occurred well in advance of Bigger's trial. *Id.; see also Nordstrom*, 200 Ariz. 229, ¶ 17, 25 P.3d at 727–28 (no presumption of prejudice where most inflammatory, inaccurate, and inadmissible reports occurred many months before trial).

¶ 14 Bigger further argues the pretrial publicity was inflammatory because of the "salacious details" included in reports about Schwartz's personal life, controversy tangentially related to the case within the Pima County Attorneys Office, and reports containing repeated references to a "hit man." Again, the record supports the trial courts conclusion that most of the reports were factual, and many did not mention Bigger by name. *See Jones*, 197 Ariz. 290, ¶ 45, 4 P.3d at 362 (no presumption of prejudice where most articles factual and did not mention defendant directly). Although Bigger alleges "[m]uch of the reporting was sensationalized," on the record before us it does not appear the publicity gave rise to the "outrageous" or "carnival-like" atmosphere necessary for a finding of presumed prejudice, and therefore we conclude the court did not abuse its discretion in finding Bigger had failed to meet his burden of establishing that prejudice should be presumed. *See Cruz*, 218 Ariz. 149, ¶ 17, 181 P.3d at 204.

¶ 15 Bigger also argues his and D.S.'s relative status in the community supports a presumption of prejudice. Although a victim's status in the community may explain the extensive publicity surrounding a case, it is not, in and of itself, evidence that the publicity is prejudicial. In *Cruz*, the victim was an officer in the Tucson Police Department and he had been killed in the line of duty; much of the publicity focused on him. 218 Ariz. 149, ¶¶ 11, 16, 181 P.3d at 203, 204. Nevertheless, our supreme court in that case determined the extensive publicity had not been "outrageous" or "carnival-like" for the same reasons we already have noted in this case-because the publicity

mostly was accurate and occurred well in advance of the trial. *Id.* ¶¶ 17–18.

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¶ 16 Bigger also contends he "could [not] have received a fai[r] trial in Pima County" because his trial was held after Schwartz was tried and convicted. We disagree with Bigger's suggestion that if there is significant publicity about a case, it is impossible for a defendant to receive a fair trial when the defendant is tried in the same venue as a codefendant, particularly when, as in this case, the publicity surrounding the case is mostly factual and non-inflammatory. Moreover, most of the publicity surrounding the case occurred prior to Schwartz's May 2, 2006, conviction. Additionally, much of the publicity after Schwartz's conviction did not mention Bigger or was not about Schwartz's conviction.

¶ 17 Bigger further argues the number of jurors who had been exposed to publicity in the case is evidence the pretrial publicity was unfair, prejudicial, and pervasive. Eighty-four percent of the prospective jurors stated they recalled some publicity related to the case. Of those, thirty-five percent had formed an opinion about the guilt of Schwartz or Bigger. After strikes for cause, seventy percent of the remaining 150 potential jurors remembered some publicity about the case and fifteen percent of those had formed an opinion about the guilt of Schwartz or Bigger. Of the twenty-nine jurors from which the final jury and alternates were selected, eighty-three percent had been exposed to some publicity about the case.

¶ 18 In *Bible*, "nearly all" of the potential jurors had some knowledge of the case and half had formed an opinion about the defendants guilt. 175 Ariz. at 563, 858 P.2d at 1166. Nevertheless, the court determined it was not a case "where the voir dire record itself shows that pervasive pretrial publicity so tainted the venire that jurors' statements under oath regarding their ability to set aside preconceptions and render a verdict on the evidence must be rejected." *Id.* at 565 n. 6, 858 P.2d at 1168 n. 6. Here, in comparison to *Bible*, fewer jurors had heard about the case and a lower percentage had formed an opinion about the defendants guilt. The percentage of prospective jurors who had been exposed to publicity in this case and had formed an opinion about guilt is not so great as to have required the trial court to conclude the publicity was so pervasive it could not "give any credibility to the jurors' answers during voir dire." *Cruz*, 218 Ariz. 149, ¶ 15, 181 P.3d at 204, *quoting Bolton*, 182 Ariz. at 300, 896 P.2d at 840.

¶ 19 Based on the totality of the circumstances, the publicity surrounding Bigger's trial was not so pervasive as to render the trial fundamentally unfair. *See Cruz*, 218 Ariz. 149, ¶ 13, 181 P.3d at 203. Although voluminous, the publicity largely was factual and non-inflammatory, and most occurred well in advance of Bigger's trial. *See Nordstrom*, 200 Ariz. 229, ¶ 15, 25 P.3d at 727. We also note the trial court made substantial efforts to ensure a fair and unbiased jury was seated. *See Jones*, 197 Ariz. 290, ¶ 45, 4 P.3d at 362 (no presumption of prejudice where trial court "also took the precautionary steps necessary to choose an impartial jury"). The court repeatedly asked prospective jurors if they would have any difficulty setting aside anything they might have learned about Schwartz's trial and deciding Bigger's case only on the evidence presented. No juror expressed he or she would have any difficulty doing so. Therefore, the court did not abuse its discretion in determining prejudice could not be presumed.

Actual Prejudice

¶ 20 If prejudice cannot be presumed, a defendant instead must show "the pretrial publicity was actually prejudicial and likely deprived him of a fair trial." *Cruz*, 218 Ariz. 149, ¶ 21, 181 P.3d at 204, *quoting State v. Davolt*, 207 Ariz. 191, ¶ 49, 84 P.3d 456, 471 (2004). Courts look at "the effect of the publicity on the objectivity of the jurors' actually seated." *Cruz*, 218 Ariz. 149, ¶ 21, 181 P.3d at 204, *quoting Murray*, 184 Ariz. at 26, 906 P.2d at 559. For a court to find actual prejudice, jurors must have formed preconceived notions of guilt

they were unable to set aside. *Blakley*, 204 Ariz. 429, ¶ 16, 65 P.3d at 82.

¶ 21 In this case, during voir dire no seated juror admitted having formed any opinion on Bigger's guilt or innocence and, although many were familiar with publicity about the case, most had only vague recollections

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and did not recall specifically Bigger's involvement. Therefore, Bigger has not established actual prejudice. *See Davolt*, 207 Ariz. 191, ¶ 50, 84 P.3d at 471 (prior knowledge of case insufficient to disqualify if juror has not formed preconceived notions about case and believes can be fair and impartial); *see also Bolton*, 182 Ariz. at 301, 896 P.2d at 841 (no actual prejudice where any prior knowledge consisted "only of vague recollections"); *Bible*, 175 Ariz. at 566, 858 P.2d at 1169 (no actual prejudice where almost all potential jurors had heard about case but all said could set aside opinions and decide case based on evidence).

¶ 22 Bigger has not established prejudice should be presumed from the pretrial publicity, nor has he established that publicity created actual prejudice. Therefore, the trial court did not abuse its discretion in denying his motion for a change of venue.

DNA Evidence

¶ 23 Bigger argues the trial court abused its discretion by denying his pretrial motion to preclude testimony of two state's witnesses offering probability analyses of DNA evidence because the analyses relied on theories he asserts are not accepted generally in the relevant scientific community. Arizona uses the *Frye*[2] test to determine whether to admit expert testimony based on novel scientific evidence. [3] *Logerquist v. McVey*, 196 Ariz. 470, ¶ 62, 1 P.3d 113, 133 (2000). *Frye* applies "when an expert witness reaches a conclusion by deduction from the application of novel scientific principles, formulae, or procedures developed by others." *Id.* Under *Frye*, a court must determine whether the scientific principle underlying the expert testimony is "generally accepted in the relevant scientific community." *Bible*, 175 Ariz. at 578, 858 P.2d at 1181. *Frye* does not require the proponent of the evidence to show universal acceptance of the reliability of a scientific principle or unanimity of scientific opinion on the subject. *State v. Superior Court*, 149 Ariz. 269, 279, 718 P.2d 171, 181 (1986); *State v. Garcia*, 197 Ariz. 79, ¶ 19, 3 P.3d 999, 1002 (App.1999). Although we review a trial courts decision whether to admit expert testimony for an abuse of discretion, *State v. Villalobos*, 225 Ariz. 74, ¶ 25, 235 P.3d 227, 234 (Ariz.2010), under *Frye* we review de novo whether expert opinion evidence rests on scientific principles that are accepted generally in the relevant scientific community, *Bible*, 175 Ariz. at 578, 858 P.2d at 1181.

¶ 24 Arizona Department of Public Safety (DPS) and a private laboratory, Reliagene Technologies, Inc. (Reliagene), analyzed numerous DNA samples from the crime scene and from D.S.'s car, including a swab containing a mixture of multiple persons' DNA from the car's radio knob, labeled in evidence as LX39. Bigger filed a pretrial motion to preclude any statistical probability evidence based on LX39,[4] arguing the sample was a "low level" mixture and there was no generally accepted approach to interpret such mixtures.

¶ 25 The trial court conducted a three-day *Frye* hearing prior to trial, where Bigger presented testimony from experts including Dan Krane, Norah Rudin, and Laurence Mueller. Ranajit Chakraborty testified as an expert witness for the state. Krane testified there was "no generally accepted means of generat[ing] statistics for a low-level mixture" or in "low-copy number situations," which he defined as DNA samples of such little material that random effects complicate interpretation of the sample. Mueller testified there was no generally accepted method for interpreting mixed samples. Chakraborty disagreed, testifying that DNA mixtures such as LX39 often are analyzed in many United States laboratories and that it generally is acceptable to use established methods to interpret mixtures containing

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partial results for one of the contributors. He testified that most laboratories interpret low-level mixtures by excluding any inconclusive portions of the DNA and basing statistical results on the remainder of the sample. The court found there was a generally accepted method for interpreting low copy number mixtures and denied Bigger's motion to preclude.

¶ 26 At trial, Curtis Reinbold, a criminalist for DPS, testified about DNA analyses he had performed on LX39 using short tandem repeats (STR) testing. He determined LX39 included a mixture of DNA from more than one person, that D.S. was the major contributor of DNA, and that Bigger could not be excluded as the minor contributor. Reinbold produced three reports on his analyses. He first used the random man not excluded method (RMNE),[5] and then the likelihood ratio method (LR),[6] to develop statistical results on the probability that a random person would fit the partial profile of the minor contributor. Reinbold used LR to reach statistical results based on his most recent test. Based on information from seven DNA locations, or loci,[7] he found it was:

> three million times more likely to observe [the] mixed profile if [D.S.] and [Bigger were] the contributors than if [D.S.] and a random unrelated Caucasian [were] the contributors; 1.9 million times more likely [than] if [D.S.] and a random unrelated African–American [were] the contributors; and 900,000 times more likely than if [D.S.] and a random Hispanic [were] the contributors.

¶ 27 Reliagene also analyzed two swabs from LX39. Gina Pineda, assistant director and technical leader at Reliagene, testified that D.S. was the major contributor of DNA in the LX39 sample. Bigger's profile matched the three loci [8] containing information about the minor contributor. Pineda testified that particular profile "occurs with a frequency of approximately 1 in 97 persons of the Caucasian population, 1 in 277 persons of the African–American population, and 1 in 48 persons of the Hispanic population." Pineda used the "modified product rule" [9] to reach the probabilities based on her results.

¶ 28 On appeal, Bigger argues the trial court erred by failing to preclude testimony offering probability analyses of DNA evidence because the analyses relied on scientific principles not accepted generally in the relevant scientific community. Bigger argues "neither the LR approach nor the RMNE (modified product rule) approach is generally accepted" for calculating the probability of a match involving low copy number (LCN) DNA. He argues, for example, that LR fails to account for the stochastic (or random) effects that occur when analyzing small amounts of DNA.[10] Krane testified that when disproportionate amounts of DNA appear in a mixture so that one contributor's

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amount is very small, or when the original sample itself is very small, stochastic effects may become more prominent and make it less certain whether the sample or the stochastic effects are governing the results.

¶ 29 LR, RMNE, and the modified product rule are DNA interpretation methods generally accepted in the relevant scientific community. LR has been acknowledged by Division One of this court as a *Frye*-compliant method for interpreting mixed DNA samples. *See Garcia,* 197 Ariz. 79, ¶¶ 1, 26, 3 P.3d at 1000, 1004 (also noting National Research Council (NRC) found "LRs should be admissible unless they are so unintelligible that they provide no assistance to a jury or so misleading that they are unduly prejudicial").

¶ 30 Further, Krane, Bigger's expert, conceded that neither the use of LR nor RMNE is scientifically controversial.[11] The modified product rule, used in RMNE, also has been accepted by Arizona courts. *See Davolt,* 207 Ariz. 191, ¶ 68, 84 P.3d at 474–75 ("DNA evidence based on the product rule method of calculating the probability of a match is acceptable when the database satisfies *Frye* requirements.") [12]; *State v. Marshall,* 193 Ariz.

547, ¶¶ 10–11, 975 P.2d 137, 141–42 (App.1998). Krane, Mueller, and Chakraborty all agreed the modified product rule has been endorsed by the NRC and has been used generally since 1996. *See Marshall*, 193 Ariz. 547, ¶ 10, 975 P.2d at 141 (endorsement by NRC strong evidence of general acceptance).

¶ 31 Bigger, however, argues these techniques are not accepted generally when applied to "DNA typing using samples containing minute amounts of DNA, also known as low copy number (LCN) samples." He contends such an application "is so nascent in its development that there is not ... a consensus regarding the proper approach for calculating the probability of a match involving low copy number DNA." In addition to relying on his expert testimony, Bigger cites a number of scientific articles about LCN analysis. [13] However, those articles do not establish that the methods used in this case were not accepted generally to analyze a mixture such as LX39. First, the authors use multiple definitions of LCN when discussing current developments and disputes in the field, many of which focus on much smaller samples and do not apply directly to LX39.[14] Although Krane testified LCN testing and testing low levels of DNA in a mixture were "very related concepts," he acknowledged they are not synonymous, and Chakraborty testified the issues with LCN samples may not apply to mixtures like LX39. We need not determine the proper definition for low copy number, or whether the DNA testing used in this case is labeled properly as LCN; however, we do identify the definitions used by the articles to the extent their relevance depends on whether they discuss methods

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used in this case.[15] For example, Bigger contends in his opening brief that one article concludes "we should avoid altogether the statistical interpretation of mixed LCN samples." That article, however, discusses small samples that require manipulation not attempted by the analysts in this case, such as with mixed "touch samples." Bruce Budowle et al., *Validity of Low Copy Number Typing and Applications to Forensic Science*, 50 Croatian Med. J. 207, 212 (2009).

¶ 32 Second, many of the articles Bigger cites present enhancements to existing methods for analyzing very small samples—such as using computer models to calculate probabilities for inconclusive loci—none of which was attempted in this case. *E.g.*, Peter Gill et al., *LoComatioN: A software tool for the analysis of low copy number DNA profiles*, 166 Forensic Sci. Int'l 128, 132 (2006) (model "more powerful" than traditional methods and takes interpretation "a stage further").[16] As Chakraborty explained, these articles do not reflect that there is no generally accepted tool for statistical interpretation in this case; rather, they represent that "DNA forensics has become so powerful and so very generally applicable we are extending the horizon of this application by entertaining more challenging situations."

¶ 33 Proposed enhancements to established methods, and the debates surrounding them, do not demonstrate that those established methods are no longer generally accepted under *Frye*. *See State v. Superior Court*, 149 Ariz. at 279, 718 P.2d at 181 (need not show universal acceptance or unanimity of scientific opinion). As Budowle acknowledged, "STR typing strategies are sufficiently sensitive to detect alleles[17] in the LCN range, without further modification.... Thus, LCN typing can be performed with routine methods. Nonetheless, enhancing the sensitivity of detection for LCN typing has been sought." Bruce Budowle et al., *Low Copy Number—Consideration and Caution*, Publication 01–26 Federal Bureau of Investigation Laboratory Division 1 (2001), available at http:// www. promega. com/ products/ pm/ genetic- identity/ ishi- conference-proceedings/ 12 th- ishi- oral- presentations. Bigger tacitly acknowledges this in his opening brief when he states that the articles urge "a new approach to LCN reporting is needed" to "elaborate" upon current approaches.[18]

¶ 34 Although Krane testified there is no generally accepted means of generating statistical probabilities from a low-level mixture, Chakraborty testified that DNA mixtures are

analyzed in "many laboratories" in the United States. Reinbold confirmed it is not uncommon to analyze DNA mixtures with differing concentrations and partial profiles, especially as the sensitivity of the analytical equipment has improved. Even the professional papers Bigger relied upon at the *Frye* hearing admit that although mixture interpretation is often challenging, it is "a routine ... aspect of forensic DNA analysis," and common approaches include LR and exclusion probabilities like RMNE. Carll Ladd et al., *Interpretation of Complex Forensic DNA Mixtures*, 42 Croatian Med. J. 244, 244 (2001). Because it was possible to analyze LX39 using established methods satisfying *Frye*, the evidence was admissible subject to a foundational showing. *See Bible*, 175 Ariz. at 580, 858 P.2d at 1183 (If *Frye* is satisfied, scientific evidence is admissible "subject to a

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foundational showing."), *quoting State ex rel. Collins v. Superior Court*, 132 Ariz. 180, 196, 644 P.2d 1266, 1282 (1982).

¶ 35 Bigger also argues Reinbolds and Pineda's LR and RMNE formulas were flawed because they were based on partial information and the missing data could have excluded Bigger as a match.[19] To the extent he is arguing formulas that exclude inconclusive portions of a profile are not accepted generally, the state's evidence proved otherwise. Because "this case [did] not involve the most challenging aspects of LCN interpretation," Chakraborty testified, he "would use the method that most forensic laboratories in the U.S. use, namely, when you have [a] large amount of imbalance of contribution from the mixture components, you declare some loci as inconclusive, ... exclude those loci and then use a much ... simpler theory" based on the remaining loci, which is a more conservative approach.[20] The analyst removes the inconclusive loci and then calculates results based on the definitive loci without accounting for stochastic effects. Chakraborty testified it is generally acceptable to interpret a mixture with only a partial profile for the minor contributor using established methods, and whether or not stochastic effects are occurring should be considered on a case-by-case basis.[21] He disagreed with Bigger's suggestion that stochastic effects must be included in every statistical calculation involving low-level mixtures.

¶ 36 Similarly, Bigger contends the calculation Reinbold based his probability statistics on was flawed because it "did not account for ... the fact that Bigger could have been excluded" by a small peak he found at one locus. We already have determined that generally accepted methods permitted admission of this statistical evidence based only on the conclusive portions of a partial sample, and there was no evidence the excluded result at this locus was reliable enough to be included. Reinbold observed the small peak while running a test at forty-six RFU (relative fluorescence units), well below the laboratory's established threshold standard for determining which peaks are true DNA alleles, and "couldn't get it to repeat" despite several attempts. Therefore, Reinbold concluded it was not a "real DNA peak." As Pineda testified, any single allele above the threshold could have and would have excluded Bigger if it was different than Bigger's, but no such allele was found.

¶ 37 Moreover, whether Reinbold correctly implemented an otherwise generally accepted technique goes to the weight of the evidence, rather than its admissibility. *See State v. Tankersley*, 191 Ariz. 359, ¶ 21, 956 P.2d 486, 493 (1998) (reliability of particular result based on implementation, rather than reliability of technique itself, is "foundational consideration [ ] governed by ordinary evidentiary standards"), *abrogated on other grounds by State v. Machado*, 226 Ariz. 281, 246 P.3d 632 (2011). Once the trial court has determined a particular approach is accepted generally in the relevant scientific community, *Bible*, 175 Ariz. at 578, 858 P.2d at 1181, it is the jury's task to weigh the significance of any errors in implementing the approach to the facts of a case. *State v. Van Adams*, 194 Ariz. 408, ¶ 34, 984 P.2d 16, 27 (1999).

¶ 38 The state provided sufficient evidence to establish that the analytical techniques

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used by DPS and Reliagene, and presented by Reinbold and Pineda at trial, are not novel, but rather are methods generally accepted for providing probability statistics. The disputes Bigger highlights about new methods to enhance LCN analysis do not indicate that established methods no longer are accepted generally to deal with DNA mixtures and stochastic effects.

¶ 39 Because LR, RMNE, and the modified product rule procedures are generally accepted techniques that satisfy *Frye* when utilized in this type of case to analyze DNA mixtures with major and minor components, the trial court did not abuse its discretion by admitting Reinbold's and Pineda's testimony regarding DNA probability calculations. Although the proper implementation of each method may depend on the facts of each case, those decisions go to the weight of such evidence and become the proper subject of cross-examination. *See Tankersley,* 191 Ariz. 359, ¶ 21, 956 P.2d at 493. We leave for another case the determination of whether there is a generally accepted method for achieving probability statistics from DNA templates significantly smaller than those observed here, or where analysts seek to interpret results below a laboratory's established minimum RFU threshold.

Third–Party Culpability Evidence

¶ 40 Bigger argues the trial court abused its discretion in precluding him from presenting the jury with evidence of a third party's culpability. Bigger sought to introduce evidence D.S.'s wife, Daphne, had murdered D.S., including evidence that D.S. recently had increased the benefit amount of his life insurance policy, of which his wife was the sole beneficiary, that she was not excluded as a contributor to DNA found in his vehicle, and that she had acted suspiciously when officers came to her home on the night he was murdered. Bigger also sought to introduce evidence D.H. was responsible for the murder, including testimony that coworkers, including K.E., saw D.H. around the time of the murder cleaning and discarding, as Bigger asserts, a "bloody" knife[22] and that his whereabouts were unknown the night of the murder. Bigger also sought to introduce testimony that D.H. had asked K.E. whether she would ever kill for money. The court precluded all of this evidence.

¶ 41 The admissibility of evidence offered to prove third-party culpability is governed by Rules 401 through 403 of the Arizona Rules of Evidence.[23] *State v. Machado,* 226 Ariz. 281, ¶ 16, 246 P.3d 632, 635 (2011). Such evidence is relevant under Rule 401 only when it "tend[s] to create a reasonable doubt as to the defendants guilt." *Id.* n. 2, *quoting State v. Gibson,* 202 Ariz. 321, ¶ 16, 44 P.3d 1001, 1004 (2002). The trial court has discretion to exclude relevant evidence of third-party culpability "if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence." *Id., quoting* Ariz. R. Evid. 403.

¶ 42 "[E]vidence of a third party's culpability ... is neither relevant nor subject to analysis under Rule 403, unless it tends to create a reasonable doubt that the defendant committed the offense." *State v. Machado,* 224 Ariz. 343, ¶ 17, 230 P.3d 1158, 1167–68 (App.2010), *aff'd,* 226 Ariz. 281, 246 P.3d 632 (2011). A defendant is not entitled to raise unfounded suspicions or to simply "throw strands of speculation on the wall and see if any of them will stick." *Id.* n. 11, *quoting* David McCord, " *But Perry Mason Made It Look So Easy!": The Admissibility of Evidence Offered by a Criminal Defendant to Suggest that Someone Else is Guilty,* 63 Tenn. L.Rev. 917, 984 (1996). "The trial court has considerable discretion in determining the relevance and admissibility of evidence, and we will not disturb its ruling absent a clear abuse of that discretion."

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State v. Amaya–Ruiz, 166 Ariz. 152, 167, 800 P.2d 1260, 1275 (1990). However, when evaluating evidence of third-party culpability

under Rule 403, Ariz. R. Evid., we, as does the trial court, view that evidence in the light most favorable to the proponent, maximizing probative value and minimizing prejudicial effect. *Machado,* 224 Ariz. 343, n. 1, 230 P.3d at 1164 n. 1.

¶ 43 The trial court determined the evidence of Daphne's purported guilt was irrelevant by the above standard and we agree. The proffered evidence constitutes no more than "[v]ague grounds of suspicion." *State v. Fulminante,* 161 Ariz. 237, 252, 778 P.2d 602, 617 (1988). Moreover, the evidence had "trivial probative value once placed in context," *see Machado,* 224 Ariz. 343, ¶ 45, 230 P.3d at 1175, as the information Bigger sought to present easily could be explained.[24] Consequently, it did not tend to create a reasonable doubt as to Bigger's guilt, *see Machado,* 226 Ariz. 281, n. 2, 246 P.3d at 635 n. 2, and the court did not abuse its discretion in excluding the evidence.

¶ 44 The trial court also determined evidence Bigger had proffered of D.H.'s guilt was irrelevant because it raised only a possible ground of suspicion, and under Rule 403, Ariz. R. Evid., any relevance was outweighed substantially by confusion of the issues. The court did not abuse its discretion in excluding the evidence because the timing of the "knife incident" could not be connected sufficiently to the time of the murder and thus "it offer[ed] only a possible ground of suspicion against another." *See State v. Prion,* 203 Ariz. 157, ¶ 21, 52 P.3d 189, 193 (2002). After initial uncertainty, K.E. told detectives in a follow-up interview that she had seen D.H. cleaning and disposing of a knife before July 2004, months before the murder—timing of which she was certain based on when D.H. had left his position as manager at her workplace and her conversation with the new manager about her July birthday. The court determined there was "no credible evidence" that K.E.'s recollection of when the knife incident had occurred was incorrect, and the record does not establish this determination was erroneous.[25] Because the court did not abuse its discretion in excluding the evidence based on relevance, we need not address whether it otherwise was inadmissible under Rule 403, Ariz. R. Evid. *See Machado,* 224 Ariz. 343, ¶ 17, 230 P.3d at 1167–68.

¶ 45 The trial court also did not err in excluding testimony about D.H. having asked K.E. whether she would kill for money because it was hearsay and did not fall within any exception to the rule precluding the admission of hearsay evidence. Bigger urged the court to admit the statement under the state-of-mind exception in Rule 803(3), Ariz. R. Evid., as a statement against interest under Rule 804(b)(3), Ariz. R. Evid., or under the "catch-all" hearsay exception.[26] The statement merely posed a hypothetical question and, therefore, was not admissible under the state-of-mind exception in Rule 803(3) because it neither described a "present feeling or future intent[ ]," nor did it "tend to prove relevant conduct of the declarant." *See State v. Fulminante,* 193 Ariz. 485, ¶¶ 32–33, 975 P.2d 75, 85 (1999).

¶ 46 The statement similarly is inadmissible under the "catch-all" exception in

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Rule 803(24). It was not "offered as evidence of a material fact," as we already have determined evidence of D.H.'s purported guilt was irrelevant and inadmissible, and the statement was no more than a hypothetical question. Therefore, the court did not abuse its discretion in determining the statement was inadmissible. *See Amaya–Ruiz,* 166 Ariz. at 167, 800 P.2d at 1275 ("The trial court has considerable discretion in determining the relevance and admissibility of evidence....").[27]

Disposition

¶ 47 For the foregoing reasons, we affirm.

CONCURRING: PHILIP G. ESPINOSA, Judge, and JOSEPH W. HOWARD, Chief Judge.Appendix

¶ 1 Arizona Department of Public Safety (DPS) recovered about 14 nanograms of DNA material in swab LX39. To analyze the swab, DPS amplified just over one nanogram of DNA.[1]

It found LX39 was a mixture, and the minor component of the sample was about 1/30th of the total amount. The various definitions of LCN appearing in the articles offered by Bigger focus on the size of the starting sample (template), and do not necessarily contemplate mixtures where the starting sample is not LCN. For example:

• LCN is "usually associated with a low amount of DNA (less than 200 [picograms [2]])," or "a technique sensitive enough to analyze just a few cells." P. Gill et al., *DNA commission of the International Society of Forensic Genetics: Recommendations on the interpretation of mixtures,* 160 Forensic Sci. Int'l 90, 96 (2006) (herein *ISFG Recommendations*); Peter Gill, *Application of Low Copy Number DNA Profiling,* 42 Croatian Med. J. 229, 229 (2001) (herein *Application of LCN*).

• LCN typing may be contrasted with STR (short tandem repeat) testing at its "optimum efficiency" where one nanogram of DNA is analyzed and not more than 28–30 cycles of amplification are carried out.[3] *Application of LCN, supra,* at 229. The article discusses ways to "seek to increase the sensitivity of [scientific] methods" to analyze samples below 250 picograms and using more than 28–30 cycles of amplification, noting that analysis of those samples suffered disadvantages due to stochastic effects. *Id.*

• Due to the success of STR typing, "the envelope of the technology is being pushed to type ever smaller amounts of DNA, even down to the equivalent of DNA contained in a single cell[,] ... known as low copy number (LCN) typing," which raises reliability concerns. Bruce Budowle, *Low Copy Number Typing Still Lacks Robustness and Reliability, in* Proceedings from the 20th International Symposium on Human Identification at 1 (2010), *available at* http:// www. promega. com/ profiles/ 1302/ 1302_ 02. html.

• LCN involves the "analysis of any sample that contains less than 200 [picograms] of template DNA" including touch samples that are too small for conventional analysis. Bruce Budowle et al., *Validity of Low Copy Number Typing and Applications to Forensic Science,* 50 Croatian Med. J. 207, 207, 208, 212 (2009). Generally, LCN is the "analysis of any DNA sample where the results are below the stochastic

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threshold for reliable interpretation," meaning that the height of the allele peaks "by definition would fall below the established stochastic threshold for conventional STR typing" [4] and require manipulations of the amplification process. *Id.* at 207, 211.

• There are concerns about LCN typing, "particularly for touch samples" and for "complex mixture touch samples," as revealed in experiments where laboratories divided 100 pg samples into thirds or less. Bruce Budowle et al., *Low copy number typing has yet to achieve " general acceptance,"* 2 Forensic Sci. Int'l: Genetics Supplement Series 551, 551, 552 (2009).

• Low template DNA profiling techniques include "processes which seek to obtain profiles from DNA samples below 200 picogram[s] (pg) and the application of supra–28 cycle amplification." Brian Caddy et al., *A Review of the Science of Low Template DNA Analysis* 3 (2008), *available at* http:// www. homeoffice. gov. uk/ publications/ police/ operational-policing/ Review_ of_ Low_ Template_ DNA_ 1. pdf? view= Binary.

¶ 2 In some contexts, scientists use broader definitions for LCN that may include mixtures. For example:

• "LCN typing is better defined as the analysis of any results below the stochastic threshold for normal interpretation." Bruce Budowle et al., *Low Copy Number—Consideration and Caution,* Publication 01–26 Federal Bureau of Investigation Laboratory Division 1 (2001), *available at* http:// www. promega. com/% 25/media/files/resources/conference% 20proceedings/ishi% 2012/oral% 20presentations/budowle.ashx?la=en.

• The operational definition of LCN is "the manifestation of stochastic effects." It "is usually associated with a low amount of DNA (less than 200 pg)" but stochastic effects may occur in some mixtures where the minor component is more susceptible to such random effects.[5] *ISFG Recommendations, supra,* at 96.

¶ 3 Testimony about whether LX39 was an LCN sample, and whether disputes about LCN presented in scholarly articles applied to this case, varied based on the definition applied. For example:

• Reinbold testified he did not consider this an LCN case because the term usually "refers to doing samples that are just several cells," for example a fingerprint, and involves different procedures.

• Pineda did not describe this as an LCN case because she defined LCN as "analysis of DNA below the minimum threshold that each lab has set," or where the total amount of DNA in the sample is less than 100 pg.

• State expert Chakraborty testified that "[t]his was not a strict LCN case," and that the issues that arise when starting with a very small amount of DNA may not apply in this case.

• However, Chakraborty did acknowledge that LX39 could fit Budowle's definition of LCN because the two contributors of DNA to the mixture were of vastly different concentrations.

• Krane testified that although LCN and testing a low-level amount of DNA in a mixture are not synonymous, "they are very related concepts."

• Chakraborty testified that "the issues that relate to very small amount[s] of DNA" in starting templates may not be applicable to minor components of a mixture.

Notes:

[1.] The jury found Schwartz guilty of conspiracy to commit first-degree murder, but was unable to reach a verdict on the charge of first-degree murder. He was sentenced to a life term of imprisonment without the possibility of parole for twenty-five years.

FN2. *Frye v. United States,* 293 F. 1013 (D.C.Cir.1923).

[3.] In 2010, the legislature enacted A.R.S. § 12–2203, which purported to change the *Frye* standard for admitting expert testimony. However, the law was enacted after Bigger's trial and we held it unconstitutional as applied to the defendant in *Lear v. Fields,* 226 Ariz. 226, 245 P.3d 911 (App.2011).

[4.] For all but LX39, the DNA results were either inconclusive as to Bigger or he was excluded as a contributor.

[5.] RMNE calculates the probability that an observed profile is from a person unrelated to the known contributor.

[6.] LR measures the probability that the source of the DNA is from the suspect divided by the probability that the source is a randomly selected person unrelated to the suspect.

[7.] Although human DNA is identical at most regions, there are a small number of locations, or loci, where differences occur. Typically, analysts test at thirteen or fifteen loci. Although Reinbold tested LX39 at thirteen loci, data were available for only seven.

[8.] Reliagene only considered three loci because "at the majority of the loci [it] didn't detect a minor component ... [or] a secondary donor at all."

[9.] The modified product rule is a method, used in RMNE, where the analyst multiplies together the frequency of the occurrence of each allele (base pair component of DNA) to calculate the chance of a match at those alleles. The result is then modified for particular subpopulations.

[10.] Bigger quotes P. Gill et al., *DNA commission of the International Society of Forensic Genetics: Recommendations on the*

interpretation of mixtures, 160 Forensic Sci. Int'l 90, 92 (2006) (herein *ISFG Recommendations*), to argue that experts observe "courts are unwilling to accept the LR method" because it fails to account for stochastic effects. Bigger's use of this quote, taken out of its context, appears misleading at best. The article first recommends the use of the LR method and, although acknowledging some courts have not accepted it (without specifying a particular reason related to stochastic effects), encourages scientists nonetheless to use LR routinely as the preferred method before reporting evidence in line with any court requirements.

[11.] Bigger contends using the RMNE method with samples "involving stochastic effects [ ]or LCN mixtures" is prejudicial to defendants. The article he cites in support of his critique does not assert, as he suggests, that neither LR nor RMNE is appropriate for interpreting mixtures. Nor does it establish scientific dispute has removed the method from general acceptance. To the contrary, the article begins by stating "[t]here are two different methods in common use to report DNA profiles: these are the classic profile probability approach [RMNE] and the likelihood ratio approach." *ISFG Recommendations*, *supra*, at 90. It merely goes on to propose that LR is preferred to RMNE when interpreting mixtures. *Id.* at 91.

[12.] Although the issue was discussed in the trial court, Bigger does not dispute on appeal the acceptability of the databases used by the state's analysts. Moreover, the state presented evidence the databases used to generate the probability statistics admitted in evidence were reliable.

[13.] Included in the articles offered by Bigger are those published after trial and attached in an appendix to his reply brief. Although this court as a general rule does not consider material outside the record on appeal, *see State v. Saiers*, 196 Ariz. 20, ¶ 7, 992 P.2d 612, 614 (App.1999), when determining general acceptance under *Frye*, an appellate court may "consider scientific literature published, as well as cases decided, after trial." *Bible*, 175 Ariz. at 586 n. 33, 858 P.2d at 1189 n. 33.

[14.] For example, LCN is commonly defined as the analysis of less than 200 picograms of DNA, and sometimes as a technique sensitive enough to analyze only a few cells (less than one picogram). *See, infra,* Appendix. LX39 consisted of about 14 nanograms (1 nanogram = 1,000 picograms), and DPS analyzed the sample by amplifying just over one nanogram of DNA.

[15.] A partial list of LCN definitions as posed in the articles presented by Bigger, and how they relate to LX39, is contained in the Appendix to this opinion.

[16.] To determine which peaks are true DNA alleles, laboratories establish a minimum threshold expressed in units of measurement known as relative fluorescence units (RFU). In this case, the analysts developed statistical probabilities using only conclusive results from the LX39 mixture, taking into account the alleles that appeared above their established thresholds—seventy-five RFU for Pineda, and 100 RFU in Reinbold's final report. They did not attempt to assign values to inconclusive loci, and Bigger does not dispute that their threshold levels were appropriate.

[17.] DNA's component parts include base pairs that determine genetic traits, called alleles. *Bible*, 175 Ariz. at 576, 858 P.2d at 1179.

[18.] The article Bigger cites merely states in a brief section labeled "Future" that: "A future approach would elaborate the combinatorial approaches...." *ISFG Recommendations*, *supra*, at 96.

[19.] Even if this argument relies on the contention LR and RMNE are not accepted generally for use in this case, we already have rejected that argument.

[20.] Bigger argues DPS and Reliagene did not perform their statistical analyses using the method explained by Chakraborty because he stated analysts should provide statistics based on the "unincluded loci," whereas the analysts in this case calculated probabilities based only on included loci. It is clear from the context of Chakraborty's statement, combined with his later

testimony—"look at the loci where you can definitely include and give statistics based on that"—that he agrees statistical results should be based only on the loci that were not excluded as inconclusive. Reinbold testified he did not use "inconclusive" loci to calculate statistics, and Pineda based her calculations only on the three loci where the minor component was present. Moreover, Chakraborty testified at trial that he found Reinbold's LR statistics to be both correct and conservative.

[21.] Chakraborty reviewed Reinbold's calculations and found that he had included the possibility of stutter (one type of stochastic effect), "making his conclusions (as well as statistics) conservative."

[22.] K.E. described the knife as "dirty" and could not say whether there was blood on the knife.

[23.] Rule 401, Ariz. R. Evid., states that relevant evidence is "evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable." Rule 402, Ariz. R. Evid., states that all relevant evidence is admissible except as provided by other applicable law.

[24.] Daphne explained to officers that she had asked whether her husband had been harmed when they came to her home because she knew he had not come home and because she knew someone "really despised him." In addition, it was D.S. who had increased the life insurance policy on the advice of a financial planner. Moreover, the possible presence of Daphne's DNA in her husband's vehicle is neither surprising nor probative of potential guilt.

[25.] Bigger suggests another employee's account of the knife incident contradicts K.E.'s recollection of the timing. However, in that employee's interview with detectives, he was uncertain about when the incident occurred. Although he stated it may have happened in the last four months of when he was working there, and that he had started a new job immediately in January 2005, he also said he believed the incident occurred in the summertime but could not "really narrow down too much of what was going on."

[26.] On appeal, Bigger does not contend the statement was admissible as a statement against interest and we do not address its admissibility on that ground. Moreover, we do not address his argument on appeal that the statement was admissible because it had a "non-hearsay purpose" because that argument was not raised below and he has not argued any error was fundamental. *See State v. Henderson*, 210 Ariz. 561, ¶¶ 18–19, 115 P.3d 601, 607 (2005).

[27.] Because we find no error, we do not address Bigger's claim that the alleged errors cumulatively constituted a violation of his due process rights.

[1.] Reinbold testified his laboratory's target amount of DNA to use for analysis was one nanogram, and Pineda confirmed that manufacturers typically recommend a template or starting amount between one and two nanograms of DNA.

[2.] There are 1,000 picograms (pg) in one nanogram; i.e., 0.1 nanograms equals one hundred picograms. One picogram is the equivalent of DNA from approximately thirty cells.

[3.] Reliagene used 28 cycles to amplify the DNA samples. Testimony by a former DPS analyst suggested that Reinbold also used 28 cycles of amplification.

[4.] Reinbold and Pineda, by contrast, generated their probability statistics from alleles that were above the thresholds established by their laboratories (100 RFU and 75 RFU respectively).

[5.] The occurrence of these effects depends on each case and, in some cases, the probability of particular stochastic effects decreases to zero. *ISFG Recommendations, supra*, at 95.