

I. Introduction

7. Based on Nelson's extensive DNA testing litigation, the Court is familiar with facts surrounding this case. As a result, the facts will focus primarily on the serology evidence presented at trial by the State's serologist – Jo Ann Mamelli.

8. Nelson's conviction is premised entirely on Morgan's identification, as well as Angela Young's identification of Nelson. Young is Morgan's daughter.

9. Nelson's and Morgan's identifications became the linchpin to the State's case after Mamelli performed her serology tests and concluded that her results were "inconclusive."

a. Mamelli determined that Morgan was an ABO type A, *non-secretor*. As a non-secretor, Morgan does not secrete ABO antigens in her vaginal fluids.

b. Mamelli determined that Nelson was an ABO type O, *secretor*. As an O secretor, Nelson secretes H antigens in the watery portion of his seminal plasma.

c. Mamelli tested a liquid extract of a vaginal swab collected by Margaret Aiken at the Rape Crisis Center.

i. The liquid extract was a *mixture* of Morgan's vaginal fluid and the assailant's semen.

ii. Thus, if Nelson's semen mixed with Morgan's vaginal fluids, ABO typing of the mixture would only reveal Nelson's H antigens.

iii. Similarly, if a *non-secretor's* semen mixed with Morgan's vaginal fluids, ABO typing of the mixture would identify *no* ABO antigens because neither the semen donor nor Morgan secretes ABO antigens in the watery portion of his seminal plasma or her vaginal fluid.

d. Mamelli's ABO typing identified *no* ABO antigens – not even an H antigen, proving that Morgan's assailant was a *non-secretor* and that Nelson could not be the assailant because he is a *secretor*.

e. Despite the exculpatory nature of her results, Mamelli erroneously characterized her results as "inconclusive" rather than "exculpatory."

10. At trial, Mamelli identified three reasons why she characterized her results as "inconclusive."

a. First, she said Morgan's vaginal fluids "masked" Nelson's H antigens.

b. Second, she said Morgan's vaginal fluids "diluted" Nelson's H antigens. She also surmised that Morgan may have bled or urinated after her assault and that her blood or urine "diluted" Nelson's H antigens.

c. Third, she characterized Nelson as a "very weak" secretor.

11. Here is Mamelli's testimony:

Now, in... the suspect's case, he was a very weak secretor... .

[E]verybody secretes, if they are secretors, at different concentrations. And in his case he was a very weak secretor by my tests. And so I did the typing, I could not pick up any markers foreign to the victim.

Now, what happens in a case like this, frequently if the victim is traumatized, they drain copiously. They lose a lot of fluid. Sometimes they dilute out the semen sample.

In... this particular situation there were some sperm there but not many, which indicates to me that there was some loss perhaps through urinating or perhaps from trauma and bleeding. I don't know the particulars on this victim. But I'm saying that the markers were either masked by her vaginal fluid or they were diluted out.

By this—but since she's a non-secretor, I picked up nothing that said those were her markers because she cannot secrete her markers. In other words, I picked up nothing that would either include or exclude the suspect. No markers were detected.¹

II. Post-Conviction Proceedings

12. Nelson has unsuccessfully challenged his conviction and sought post-conviction DNA testing for the last two decades.

13. In March 2010, Nelson sought DNA testing again, this time under Tenn. Code Ann. § 40-30-301 *et seq.* (DNA Analysis Act).

a. Nelson sought DNA testing on the knife used by the assailant during the assault.

b. In August 2010, Judge Colton denied DNA testing, but the Tennessee Court of Criminal Appeals, in December 2011, remanded the case back to the Court in light of *Powers v. State*, 343 S.W.3d 36 (Tenn. 2011).

c. On February 2, 2012, the Court held the remand hearing, but denied DNA testing once again on March 8, 2012.

¹ NT, Trial, at 92-93. A copy of Mamelli's trial testimony is attached hereto as Exhibit 1.

14. Shortly after the February 2, 2012 remand hearing, Nelson retained Gary Harmor of the Serological Research Institute (SERI) to review the case material and opine whether the knife handle was in a condition for DNA testing. Harmor is a DNA and serology expert.

a. Once retained, undersigned counsel (Cooley) sent Harmor several documents to review, including Morgan's statement, Margaret Aiken's sexual assault reports, and Jo Ann Mamelli's serology report and bench notes. Cooley asked Harmor to review the material and opine whether the knife handle was in such a condition that DNA testing may be performed.

b. Harmor reviewed the reports and submitted an affidavit on February 6, 2012, opining that the knife handle was in such a condition that DNA testing may be performed.

A. Gary Harmor's Unexpected Email and Second Affidavit

15. More than two weeks later, on February 24, 2012, Harmor unexpectedly emailed Cooley and told him he re-evaluated Aiken's and Mamelli's reports because when he initially reviewed them, to prepare his affidavit regarding the knife, something seemed amiss to him. Here is the content of Harmor's email:

Mr. Cooley;

I have reviewed the sexual assault kit documents and the serology notes of the forensic examiner in Ricky Lee Nelson's case (Agency Case 89-0149). The alleged post coital time for this case is about three hours. The assault as reported by the victim was at 9:30 AM on 2/19/1989 and the victim arrived at the hospital at 12:20 PM the same day. She reported a vaginal penetration with an ejaculation. She had no menstrual flow, there were no cleansing measures taken by her and the assailant did not use a condom.

The forensic serology examination was conducted on 8/6/1990. The examiner reported that the victim was classified as an ABO type A and a non-secretor of ABO substances. This means that the victim expresses no ABO substances in her body fluids and would give a negative result for the ABO secretor test. This would be true of all non-secretors.

The examiner had a positive acid phosphatase (a presumptive test for semen) result on the vaginal swab sample, a positive result for the P30 test (a protein found in seminal fluid) and found spermatozoa (male reproductive cells) with a significant number of tails still attached. So, there are intact sperm on the vaginal swab. The acid phosphatase and P30 results strongly indicate a post coital interval of less than 24 hours. The intact sperm cells indicate a

post coital interval of less than 12 hours. All of these results support the three hour post coital time reported. The examiner conducted an ABO secretor test on a liquid extract made from the vaginal swab. The results were negative for ABO substances. In my opinion, the serology test results and post coital time interval indicates that the amount of semen found on the vaginal swabs was easily sufficient to detect the semen donor's ABO type and secretor status if the assailant was a secretor.

Had I been consulted by the defense, to review the same documents in 1990, I would conclude from this data that the semen donor is an ABO non-secretor. This would eliminate all semen donors that are ABO secretors.

Ricky Lee Nelson was determined to be an ABO type O and a secretor. Therefore based on the serology test results, in my opinion, Ricky Lee Nelson is excluded as the semen donor in this case.

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16. Based on his reevaluation of the material, Harmor believed the facts contained in Aiken's and Mamelli's report and bench notes, as well as Morgan's statement, established that the assailant was a *non-secretor* and that Nelson *cannot* be the assailant because he is a *secretor*.

17. Moreover, having read only portions of Mamelli's trial testimony quoted and paraphrased in Nelson's DNA motion, Harmor also believed her testimony was likely false and invalid. To be sure, Harmor requested Aiken's and Mamelli's entire trial testimony, which Cooley sent him.

18. Harmor also advised Cooley to obtain Nelson's biological sample so SERI could test it and determine whether he was, in fact, a "very weak" secretor.

a. On April 12, 2012, Cooley collected Nelson's buccal sample at Northeast Correctional Facility and sent it to SERI for testing.

b. On April 24, 2012, SERI issued a report concluding that Nelson is not a "weak" secretor, but rather a run-of-the-mill secretor who secretes normal levels of antigens in his bodily fluids. The report is attached hereto as Exhibit 3.

² A copy of the email is attached hereto as Exhibit 2.

19. On April 24, 2012, based on SERI's results, Aiken's and Mamelli's testimony and reports, and Morgan's statement, Harmor submitted an affidavit explaining why *the assailant is a non-secretor* and why Mamelli's trial testimony was false and invalid.

- a. Harmor's affidavit is attached hereto as Exhibit 4.
- b. The content of his affidavit will be discussed below.

B. Arthur Young's Affidavit

20. On April 18, 2012, Cooley retained Arthur Young – an experienced serology and DNA expert – for the purpose of reviewing Mamelli's serology reports and trial testimony.

21. Cooley sent Young the same material he sent Harmor, but to minimize expectation and confirmation bias, Cooley did not inform Young of Harmor's findings and conclusions or, that he had even communicated with Harmor.

22. Young reviewed the material, and on April 25, 2012, he submitted an affidavit explaining why *the assailant is a non-secretor* and why Mamelli's trial testimony was false and invalid.

- a. Young's affidavit is attached hereto as Exhibit 5.
- b. The content of his affidavit will be discussed below.

C. Robert Shaler's Affidavit

23. On May 4, 2012, Cooley retained Robert Shaler – an experienced and well-credential serology and DNA expert – for the purpose of reviewing Mamelli's serology reports and trial testimony.

24. Cooley sent Shaler the same material he sent Harmor and Young, but to minimize expectation and confirmation bias, Cooley did not inform Shaler of Harmor's or Young's findings and conclusions, or that he had even communicated with Harmor and Young.

25. Shaler reviewed the material, and on May 14, 2012, he submitted an affidavit explaining why *the assailant is a non-secretor* and why Mamelli's trial testimony was false and invalid.

- a. Shaler's affidavit is attached hereto as Exhibit 6.
- b. The content of his affidavit will be discussed below.

III. How and Why The Serology Evidence Proves Nelson's Innocence

A. A Primer On Conventional Serology

26. Conventional serology involves analyzing fluids for certain markers that are lifelong individual characteristics, based principally on water soluble ABO blood group substances and the phosphoglucomutase ("PGM") enzyme genetic marker system.

27. The ABO blood group antigens are found on the surface of red blood cells. Within this genetic marker system there are four possible types: A, B, AB, and O.

28. Based on the analysis of more than 70,000 samples, scientists determined that approximately 40% of the Caucasian population is type A, 11% type B, 45% type O, and 4% type AB.³

29. For African-Americans, 23% are type A, 22% type B, 51% type O, and 4% type AB. *Id.* The following chart summarizes these statistics:

<u>ABO Blood Group Frequencies</u>		
<u>Caucasians</u>	<u>Type</u>	<u>African-Americans</u>
40%	A	23%
11%	B	22%
45%	O	51%
4%	AB	4%

30. Every member of the population falls into one of these four types and every member of the population has the appropriate A, B, AB, or O blood group antigens on the surface of his or her red blood cells.

31. Those population members who are deemed secretors, which is approximately 80% of the population, will also have the corresponding blood group antigen dissolved in the watery portion of several body fluids, including saliva, semen, and vaginal fluid.

32. Individuals deemed non-secretors, which are roughly 20% of the population, will not have the corresponding blood group antigen in the watery portion of their body fluids even though they have blood group antigens on the surface of their red blood cells. Thus, a female who is a non-secretor will not secrete her blood antigen in her vaginal secretions.

33. Moreover, individuals who are A, B, or AB secretors, in addition to possessing the appropriate A, B, or AB blood group antigen, also possess the H[O] blood group antigen.

34. This is so because the H[O] blood group antigen is a precursor substance upon which the A and B blood group antigens are built.⁴

35. The following chart summarizes the critical differences between secretors and non-secretors:

³ See Dale Dykes, *Probability of Inclusion in Paternity Testimony – A Technical Workshop*, AMERICAN ASSOCIATION OF BLOODBANKS (1982).

⁴ See George F. Sensabaugh, Jan Bashinski & Edward T. Blake, *The Laboratory's Role in Investigating Rape*, *Diagnostic Medicine* 4 (March 1985); PAUL C. GIANNELLI AND EDWARD L. IMWINKELRIED, JR., *SCIENTIFIC EVIDENCE* § 17.09 (2007).

ABO Genetic Marker System Antigens Found in the Cells of Body Fluid Secretions of Secretors and Non-Secretors			
Antigens on Red Blood Cells for Secretors and Non-Secretors		Secretions of Secretors and Non-Secretors	
Secretors	Non-Secretors	Secretors	Non-Secretors
A		A, H	Negative
B		B, H	Negative
AB		A, B, H	Negative
O[H]		H	Negative

B. Harmor's, Young's, and Shaler's Application of Conventional Serology Principles To The Facts of Nelson's Case

36. Here are the facts as presented in the Morgan's statement, Aiken's two sexual assault reports, Mamelli's serology results, and the new serology results (produced by SERI) regarding Nelson's secretor status.

37. The assault, as reported by Morgan, occurred at 9:30 a.m. on February 19, 1989 and Morgan arrived at the Rape Crisis Center at 12:20 p.m. the same day where Aiken examined her.⁵

38. Aiken reported the following facts and observations in her *Physical Examiner's Checklist* report:

- a. Morgan did not report and Aiken did not identify physical trauma to Morgan's genitalia;
- b. Morgan did not report and Aiken did not identify vaginal or anal bleeding;
- c. Aiken identified non-motile sperm;
- d. Morgan was not menstruating;
- e. Morgan did not urinate, shower, bath, or douche after her assault;
- f. Morgan told Aiken her assailant did not wear a condom;
- g. Morgan reported vaginal penetration with ejaculation;
- h. Morgan did not report and Aiken did not identify excessive vaginal flow or drainage during or after the assault.⁶

39. Aiken reported the following facts and observations in her *Medical Examination of Sexually Assaulted Persons* report:

⁵ Exs. 7-8

⁶ Ex. 7.

- a. Aiken wrote “No trauma to vaginal or anal areas. No bleeding or discharge”;
- b. Morgan did not urinate, bath, douche, or shower after her assault;
- c. Aiken identified non-motile sperm.
- d. Morgan did not report and Aiken did not identify excessive vaginal flow or drainage during or after the assault.⁷

40. Mamelli performed her serology examinations on the following dates.

- a. On March 16, 1989, Mamelli tested Morgan’s blood and saliva sample.
 - i. Morgan’s had type A blood.
 - ii. Morgan’s saliva sample presented with no ABO antigens, meaning she is a non-secretor. As a non-secretor, Morgan’s vaginal fluid does not present with any ABO antigens (A, B, or O[H] antigens).⁸

- b. On March 20th and 27th 1989, Mamelli performed visual and chemical examinations on the vaginal swab from Morgan’s rape kits.

- i. Mamelli visually identified “intact” sperm – or sperm with tails – on the vaginal swab.

- ii. Mamelli had a positive acid phosphatase (AP) result on the vaginal swab sample. The AP test is a presumptive test for semen.

- iii. Mamelli also had a positive p30 result on the vaginal swab sample. P30 is a protein found in seminal fluid and its detection is conclusive evidence of the presence of semen.

41. Based on these facts, Harmor, Young, and Shaler all concluded that the post-coital time was three hours – which is consistent with Morgan’s statement and Aiken’s observations.

42. On August 6, 1990, Mamelli conducted ABO-secretor tests on Nelson’s blood and saliva samples.

- a. Nelson had type O blood.
- b. When Mamelli tested his saliva sample, it presented with H antigens, meaning he is a *secretor*. As a secretor, Nelson secretes H antigens in the watery portion of his seminal plasma.

43. On August 6, 1990, Mamelli conducted an ABO-secretor test on a liquid extract made from a rape kit vaginal swab.

⁷ Ex. 8.

⁸ Ex. 9.

a. The liquid extract is a *mixture* of Morgan's vaginal fluid and the assailant's semen.

b. More importantly, according to Harmor, Young, and Shaler, the quantity of intact sperm, the positive AP and p30 results, the three hour post-coital time interval, and the facts presented in Aiken's two reports establish to a reasonable degree of scientific certainty that the amount of semen identified on the vaginal swab was *easily sufficient* to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor. In other words, if Nelson was the assailant, a capable serologist in 1990 would have detected H antigens in the liquid extract.

c. Mamelli's ABO-secretor test *did not identify any* ABO antigens – A, B, or O[H].

44. Based on the following facts, Harmor, Young, and Shaler all concluded that the semen donor is a non-secretor:

- a. The quantity of intact sperm;
- b. The positive AP and p30 results;
- c. Three hour post-coital time interval;
- d. The facts presented in Aiken's two reports;
- e. Mamelli's ABO typing of Morgan and Nelson;
- f. Mamelli's liquid extract ABO-secretor result;
- g. The fact that "masking" could not have occurred; and
- h. The fact that "dilution" did not occur.

45. As a secretor, therefore, Nelson *cannot* be Morgan's assailant.

C. Harmor's, Young's, and Shaler's Review And Criticism of Mamelli's Trial Testimony

46. Harmor, Young, and Shaler reviewed Mamelli's trial testimony and all three concluded that her testimony is incorrect, inappropriate, and antithetical to the scientific method.

47. Mamelli testified that her ABO-secretor test on the liquid extract of the vaginal swab was "inconclusive" for three reasons:

- a. Masking;
- b. Dilution; and
- c. The fact that Nelson was a "very weak" secretor.

48. In terms of masking, Mamelli said Morgan's vaginal fluids "masked" Nelson's H antigens.

49. In terms of dilution, Mamelli said the following:

a. Morgan drained a “copious” amount of vaginal fluid that “diluted” Nelson’s H antigens.

b. Morgan *may have* suffered vaginal trauma and bleeding and the blood “diluted” Nelson’s H antigens.

c. Morgan *may have* urinated after her assault and the urination “diluted” Nelson’s H antigens.

d. Morgan’s vaginal fluid “diluted” Nelson’s H antigens because he’s a “very weak” secretor.

1. “Masking” Could Not Occur

50. “Masking” occurs when a victim’s ABO type is identical to, or inclusive of, the culprit’s ABO type. A prime example of masking occurs when the victim is an AB-secretor and the culprit is an A-secretor. In this situation, ABO typing cannot specifically inform the serologist whether the A antigen detected on the vaginal swab was from the victim or assailant because his A antigens may be “masked” by the victim’s A (and B) antigens.

51. Harmor, Young, and Shaler each concluded “masking” could not have occurred here because a non-secretor *cannot* mask anyone, not even another non-secretor.

a. Morgan is a non-secretor, and, as a result, *she could not have masked Nelson’s H antigens* – assuming Nelson was, in fact, the assailant.

b. A capable serologist should have known this in 1990.

52. Consequently, Mamelli’s testimony that Morgan’s vaginal fluids “masked” Nelson’s H antigens, assuming he was the assailant, was false and invalid.

2. “Dilution” Did Not Occur Here

53. “Dilution” – which is distinct from “masking” – occurs when the ABO antigens become no longer detectable by conventional serology analysis, even though sperm and p30 can still be detected.

54. Harmor, Young, and Shaler all concluded that *dilution did not occur here* for the following reasons.

a. First, the quantity of ABO antigens in semen is extremely high, easily capable of being detected at dilutions of 1:1000.

i. To fully understand the significance of this, consider that the volume of the average ejaculate is 3.5 milliliters:

ii. If it were to be mixed with 3.5 liters of water, the ABO type would still be detectable.

iii. In their experience, Harmor, Young, and Shaler regularly observe detection at the 1:2000 and 1:4000 range, with occasional detection at the 1:8000 range.

iv. Even if the volume of the assailant's ejaculate were only 1 milliliter, an analyst, according to Harmor, Young, and Shaler, would still be able to detect it if the victim had copiously secreted a *liter* of vaginal fluid.

b. Second, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post-coital time interval, and the facts presented in Aiken's two reports establish to a reasonable degree of scientific certainty that the amount of semen identified on the vaginal swab was *sufficient* to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.

c. Third, Aiken's two sexual assault reports specifically noted the following facts:

i. Morgan did not report and Aiken did not observe excessive vaginal drainage after the assault.

ii. Morgan did not report and Aiken did not observe vaginal or anal bleeding and trauma.

iii. Morgan did not bath, douche, and urinate after her assault.

d. Fourth, based on SERI's April 24, 2012 report, Nelson is not a "very weak" secretor, but a so-called "run-of-the-mill" secretor who secretes normal levels of antigens in his bodily fluids, including his semen.

55. Thus, based on these facts, Harmor, Young, and Shaler strongly believe it is *extremely unlikely* dilution occurred here.⁹ These facts, moreover, support their initial conclusion which is: The *most scientifically plausible and sound* answer as to why Mamelli did not identify Nelson's H antigens in the liquid extract from the vaginal swab is that *Nelson is not the assailant* because the assailant in this case is a non-secretor.

⁹ As Harmor, Young, and Shaler each point out in their affidavits, in sexual assault cases, dilution is *always a possibility*, but the likelihood dilution occurred here is extremely unlikely based on the aforementioned reasons.

3. Mamelli Did Not Adhere To The Scientific Method

56. It is evident from Mamelli's trial testimony that she assumed Nelson was, in fact, the assailant and worked backwards from that assumption, trying to explain why her serology tests did not identify his H antigens on Morgan's vaginal swab. Harmor, Young, and Shaler all said Mamelli's approach was antithetical to the scientific method.

a. A capable serologist in 1990 should have known that the proper null hypothesis,¹⁰ in this context, would have been the exact opposite, *i.e.*, Nelson is not the assailant.

b. With this hypothesis in place, a competent serologist would have performed her serology tests with the intent of trying to disprove the null hypothesis. Here, disproving the null hypothesis meant identifying H antigens in the liquid extract from the vaginal swab.

c. The serology results did not disprove the null hypothesis because it did not identify Nelson's H antigens. By not identifying H antigens, Mamelli's results actually supported the null hypothesis, *i.e.*, that Nelson is *not* the assailant.

57. According to Harmor, Young, and Shaler, it is also apparent that her trial testimony is not based on facts in the record, specifically those contained in Aiken's two sexual assault reports or even her own serology tests. This is most noticeable when Mamelli discussed "dilution" and the fact that Nelson was supposedly a "very weak" secretor.

58. In terms of Mamelli's dilution "theory" – there were several critical facts in Aiken's sexual assault reports and her own serology tests that invalidated this "theory":

a. First, Aiken's two sexual assault reports are *void* of observations, facts, evidence, or comments remotely suggesting that:

- i. Morgan drained a "copious" amount of vaginal fluid;
- ii. Morgan suffered vaginal bleeding; and
- iii. Morgan urinated, bathed, or douched after her assault.

b. To the contrary, Aiken specifically noted:

- i. Morgan did not present with vaginal or anal bleeding;
- ii. Morgan did not urinate, bathe, or douche after the assault; and

¹⁰ Science involves formulating and testing hypotheses, assertions that are capable of being proven false using a test of observed data. The null hypothesis typically corresponds to a general or default position. It is typically paired with a second hypothesis, the alternative hypothesis, which asserts a particular relationship between the phenomena.

iii. Morgan did not experience excessive vaginal flow or drainage after the assault. Indeed, in her *Medical Examination of Sexually Assaulted Persons* report, Aiken handwrote the following: “No trauma to vaginal or anal areas. No bleeding or discharge.”¹¹

c. Second, the following facts from Mamelli’s own serology tests invalidated her dilution “theory”:

- i. The post-coital time of three hours;
- ii. The number of intact sperm identified; and
- iii. The strong positive results for both AP and p30.

d. Based on these facts, a capable serologist in 1990 should have concluded that the dilution “theory” was invalid – and that the most *scientifically plausible reason* why Nelson’s H antigens were not detected in the liquid extract is that a non-secretor committed the crime – not Nelson (a secretor).¹²

59. In terms of Mamelli’s “very weak” secretor testimony, Harmor, Young, and Shaler saw no facts or data whatsoever in her report or bench notes that support or corroborate her characterization of Nelson.

a. Harmor, Young, and Shaler, moreover, contend that the lack of corroboration supports their opinion that Mamelli simply assumed Nelson was the assailant and worked backwards from this premise, “theorizing” why Nelson’s H antigens were not present, instead of drawing valid and reliable conclusions from the facts and data presented to her by her own serology tests, Aiken’s two sexual assault reports, and Morgan’s statements.

60. Lastly, it is clear from her testimony Mamelli did not understand the important differences between “dilution” and “masking.” According to Harmor, Young, and Shaler, a capable serologist in 1990 should have known the distinction between these two phenomena.

61. Consequently, Mamelli’s trial testimony was wrong, purely speculative, and inappropriate.

a. The following testimony was incorrect and invalid:

- i. Her “inconclusive” conclusion;
- ii. Her “masking” testimony;
- iii. Her “dilution” testimony; and

¹¹ Ex. 8.

¹² This conclusion is strengthened by SERI’s April 24, 2012 report regarding Nelson’s secretor status.

- iv. Her “very weak” secretor testimony.
- b. Mamelli acted antithetical to the scientific when she:
 - i. Started with the assumption that Nelson was, in fact, the assailant;
 - ii. “Speculated” and “theorized” that Nelson was a “very weak” secretor when she had no facts or data to support her speculation or theory;
 - iii. “Speculated” or “theorized” as to why she did not identify Nelson’s H antigens when masking was not scientifically possible and the facts presented to her invalidated her dilution theory.

IV. Arguments

A. Nelson Is Entitled To Post-Conviction Relief Under *Dellinger v. State* Because The Serology Evidence Proves His Actual Innocence

62. Based on Harmor’s, Young’s, and Shaler’s affidavits, the pre-trial serology results demonstrate Nelson’s actual innocence.

63. The serology results establish that the assailant is a non-secretor, while Nelson is a secretor.

64. Based on these facts Nelson is entitled to relief under *Dellinger v. State*, 279 S.W.3d 282, 290 (Tenn. 2009) (holding that the Post-Conviction Act “expressly provides for freestanding claims of actual innocence” based on “scientific evidence”).

B. Nelson Is Entitled To *Coram Nobis* Relief

65. *Coram nobis* relief is available to convicted defendants in criminal cases. *See* Tenn. Code Ann. § 40-26-105(a). Whether to grant *coram nobis* relief rests within the trial judge’s sound discretion. *See State v. Vasques*, 221 S.W.3d 514, 527-28 (Tenn. 2007). *Coram nobis* relief may be based on newly-discovered evidence:

Upon a showing by the defendant that the defendant was without fault in failing to present certain evidence at the proper time, a writ of error *coram nobis* will lie for subsequently or newly discovered evidence relating to matters which were litigated at the trial if the judge determines that such evidence may have resulted in a different judgment, had it been presented at the trial.

Tenn. Code Ann. § 40-26-105(b).

66. Thus, a prisoner is entitled to relief if the new evidence *may have* resulted in a different judgment had it been presented at the prisoner’s trial. When conducting this analysis, the trial

judge “must... consider both the evidence *at trial* and that offered at the *coram nobis* proceeding in order to determine whether the new evidence may have led to a different result.” *State v. Vasques*, 221 S.W.3d at 527 (emphasis added).

67. A *coram nobis* petition must be filed within one year of the date the judgment becomes final. *See* Tenn. Code Ann. § 27-7-103; *State v. Mixon*, 983 S.W.2d 661, 663 (Tenn. 1999). Despite the one-year limitations period, due process may require equitable tolling if a petitioner seeks relief based upon newly-discovered evidence of actual innocence. *See Harris v. State*, 301 S.W.3d 141, 145 (Tenn. 2010).

68. Likewise, Nelson had to “exercise due diligence in presenting his claim(s).” *Mixon v. State*, 983 S.W.2d at 670.

a. If the Court determines Nelson did not diligently present his current claims, due process and fundamental fairness trump the Court’s diligence ruling because the facts presented in his current petition demonstrate his actual innocence. *See Workman v. State*, 41 S.W.3d 100, 101 (Tenn. 2001).

b. If the Court determines Nelson did not diligently developed and present the facts and claims in his current petition, Nelson’s trial, direct appeal, and initial state post-conviction attorneys are all ineffective and their ineffectiveness prejudiced Nelson. *See* U.S. CONST. AMEND. VI; TENN. CONST. ART. 1, §§ 8-9.

69. Nelson satisfies these requirements because the serology results demonstrate he is actually innocent. Had the facts presented in Harmor’s, Young’s, and Shaler’s affidavit’s been presented to Nelson’s jury, they may have resulted in a different judgment.

a. Nelson’s conviction is based entirely on Morgan’s and Young’s eyewitness identifications. Credibility and reliability, therefore, were the critical issues for the jury, *i.e.*, the reliability of Morgan’s and Young’s identification, as well as Mamelli’s credibility as a serology expert.

b. The “only duty of a jury in cases in which identification evidence has been admitted will often be to assess the reliability of that evidence.” *Watkins v. Sowders*, 449 U.S. 341, 347 (1981) (emphasis in original); *accord Perry v. New Hampshire*, 132 S.Ct. 716, 723 (2012) (noting that “state and federal statutes and rules ordinarily govern the admissibility of evidence, and juries are assigned the task of determining the reliability of the evidence presented

at trial.”); *Kansas v. Ventris*, 556 U. S. 586, 594, n. (2009) (“Our legal system... is built on the premise that it is the province of the jury to weigh the credibility of competing witnesses.”).

c. Likewise, the jury’s “estimate of the truthfulness and reliability of a given witness may well be determinative of guilt or innocence[.]” *Napue v. Illinois*, 360 U.S. 264, 269 (1959). Here, the jury’s reliability assessments of Morgan’s and Young’s identifications were inextricably intertwined with its assessment of Mamelli’s credibility.

d. If the jury deemed Mamelli’s serology testimony credible, the jury would have walked away believing the serology evidence was a non-factor because of its “inconclusive” nature.

i. As a non-factor, therefore, the jury would have had to look outside the serology evidence – at the other evidence – to gauge the reliability of their identifications.

ii. Here, the “other” evidence the jury presumably relied was the fact that *both* Morgan and Young identified the same man as the assailant, *i.e.*, Nelson. In other words, the jury’s reliability assessment of Morgan’s identification was presumably affected by the fact that Young also identified Nelson – and vice versa; the jury’s reliability assessment of Young’s identification was presumably affected by the fact that Morgan also identified Nelson.

e. On the other hand, if the jury deemed Mamelli’s testimony incredible, unreliable, or invalid, it may (and likely would) have affected their reliability assessments of Morgan’s and Young’s identification. This, in turn, may have affected their verdict.

f. For instance, had Nelson presented the facts in Harmor’s, Young’s, and Shaler’s affidavits to the jury, it may (and likely would) have concluded that the following testimony from Mamelli was false and invalid:

- i. Her claim that Morgan drained a “copious” amount of vaginal fluid;
- ii. Her claim that Morgan’s vaginal fluid “masked” Nelson’s H antigens;
- iii. Her claim that Morgan’s vaginal fluid “diluted” Nelson’s H antigens;
- iv. Her claim that Nelson is a “very weak” secretor”;

v. Her claim that Nelson could not be excluded as the assailant because her results were “inconclusive.”

g. If the jury believed Mamelli’s testimony was false and invalid, the jury may (and likely would) have agreed with Harmor’s, Young’s, and Shaler’s conclusion that Nelson cannot be the assailant because the assailant is a non-secretor, while Nelson is a secretor.

h. If the jury believed the serology exonerated Nelson, it would have found Morgan's and Young's identification unreliable (and wrong) and acquitted Nelson.

70. For these reasons Nelson is entitled to *coram nobis* relief.

C. State And Federal Constitutional Claims

1. The Pre-Trial Serology Results Prove That The State of Tennessee Convicted An Innocent Person And Nelson's Continued Incarceration Violate His Constitutional Rights To Due Process And Not To Be Subject To Cruel And Unusual Punishment. U.S. Const. Amends VI, XIV; Tenn. Const. Art. 1, §§ 8, 9.

71. The facts pled in all previous paragraphs are incorporated herein as if fully pled.

72. Based on Harmor's, Young's, and Shaler's affidavits, the pre-trial serology results demonstrate Nelson's actual innocence.

73. The serology results establish that the assailant is a non-secretor, while Nelson is a secretor.

74. Based on these facts Nelson is entitled to relief under state and federal law. *See In re Davis*, 130 S.Ct. 1 (2009); *Herrera v. Collins*, 506 U.S. 390 (1993); *Dellinger v. State*, 279 S.W.3d at 290.

2. The Pre-Trial Serology Results Demonstrate That Nelson's Conviction Is Premised On Unreliable Identification Evidence Rendering His Entire Trial Fundamentally Unfair. U.S. Const. Amends. VI, XIV; Tenn. Const. Art. 1, §§ 8, 9

75. The facts pled in all previous paragraphs are incorporated herein as if fully pled.

76. The pre-trial serology results prove Nelson is innocent and Morgan's and Young's identification are incorrect, and, as a result, inadmissible under state and federal due process principles. *See Neil v. Biggers*, 409 U.S. 188, 198 (1972) ("It is the likelihood of a misidentification which violates a defendant's right to due process..."); *Simmons v. United States*, 390 U. S. 377 (1968).

77. The introduction of their unreliable identifications rendered Nelson's entire trial fundamentally unfair. *See Manson v. Brathwaite*, 432 U.S. 98 (1977); *Dowling v. United States*, 493 U.S. 342, 352 (1990).

78. Nelson is entitled to relief.

3. Harmor's, Young's, And Shaler's Affidavits Demonstrate That Mamelli Presented False And Invalid Serology Testimony And It Is Reasonably Likely Her False Testimony May Have Affected The Jury's Verdict. U.S. Const. Amends. VI, XIV; Tenn. Const. Art. 1, §§ 8, 9

79. The facts pled in all previous paragraphs are incorporated herein as if fully pled.

80. Harmor's, Young's, and Shaler's affidavit demonstrate Mamelli presented invalid serology testimony.

81. Mamelli's invalid serology testimony impacted – to Nelson's detriment – the jury's reliability assessments regarding Morgan's and Young's identifications.

82. Morgan's and Young's identifications were the only evidence linking Nelson to Morgan's assault.

83. Thus, there is a reasonable likelihood Mamelli's invalid serology testimony may have affected the jury decision to convict Nelson. *See Miller v. Pate*, 386 U.S. 1 (1967); *Napue v. Illinois*, 360 U.S. 264, 269 (1959).

D. The Need For Additional Fact Development – If The Court Determines Nelson Is Not Entitled To Relief Based On The Aforementioned State and Federal Claims

84. Nelson believes he is entitled to relief without the need for additional fact development because the pre-trial serology results prove his actual innocence beyond clear and convincing evidence.

85. To protect his state and federal claims, however, Nelson requests additional fact development to determine whether the State disclosed Mamelli's pre-trial serology report and bench notes.

86. At this point, Nelson is unsure whether the State actually disclosed Mamelli's pre-trial serology report and bench notes. The circumstantial evidence, though, strongly suggests the State did not disclose Mamelli's report and bench notes prior to trial.

a. On August 10, 1990, Mamelli completed her ABO-secretor testing of Nelson's blood and saliva samples.¹³

b. Three days later, at an August 13, 1990 pre-trial hearing, Trent Hall, Nelson's public defender, requested pre-trial DNA testing after he "learned of" Mamelli's "inconclusive"

¹³ Ex. 9.

results. How Hall “learned of” Mamelli’s results is not entirely clear, but it appears the prosecutor gave him the results “verbally” – instead of actually disclosing Mamelli’s report and bench notes. This can be gleaned from Hall’s statement to the trial judge: “Your Honor, Mr. Craft [the prosecutor] and I talked a few minutes ago. *I’m not trying to put words in his mouth*, but apparently the report on the test we asked for today is inconclusive.”¹⁴

c. When the trial judge denied Hall’s request for pre-trial DNA testing,¹⁵ the case immediately went to trial and Hall cross-examined Mamelli the *very next day* – on August 14, 1990. His cross-examination, importantly, was not only incredibly short (lasting only two pages in the trial transcripts),¹⁶ he did not base any of his questions on her report or bench notes. Indeed, Hall would have known the answers to many of his questions if the State had, in fact, disclosed Mamelli’s report and bench notes prior to trial.

d. And lastly, on her *Rape Kit Evidence Report*, Mamelli wrote the following notation in the lower right hand corner: “8/14/90 Testified in Div. 6 pertaining to this case –”¹⁷ Obviously, had Mamelli disclosed her report prior to trial, this notation would not be on her report.

87. Despite the strong circumstantial evidence that suggests the State did not disclose Mamelli’s report and bench notes prior to trial, additional fact development is necessary to adequately determine whether the State adhered to its *Brady* obligations and Hall, direct appeal counsel, and post-conviction counsel adhered to their constitutional duty of providing effective representation at trial, on direct appeal, and during post-conviction proceedings. *See Banks v. Dretke*, 540 U.S. 668 (2004); *Martinez v. Ryan*, 132 S.Ct. 1309 (2012); *Strickland v. Washington*, 466 U. S. 668 (1984).

88. Nelson, therefore, requests an evidentiary hearing and the following discovery. *See* TENN. SUP. CT. R. 28, §§ 7-8.

- a. The Shelby County Public Defender’s Office entire case file;
- b. The Shelby County District Attorney’s Office entire case file;
- c. The Memphis Health Department’s entire case file; and

¹⁴ NT, Trial, at 1 (emphasis).

¹⁵ NT, Trial, at 8-9.

¹⁶ *See id.* at 93-95.

¹⁷ Ex. 9.

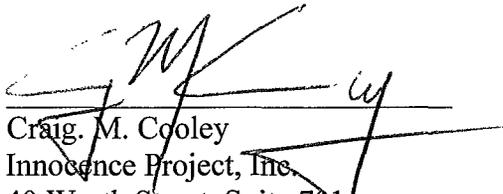
d. The Memphis Health Department's policies and procedures manual that was in effect when Mamelli performed her serology tests and reported her results.

IV. Conclusion And Prayer For Relief

89. WHEREFORE, Nelson requests the following relief:

- a. An Order vacating his conviction;
- b. An Order declaring his innocence;
- c. An Order granting the following discovery:
 - i. The Shelby County Public Defender's Office entire case file;
 - ii. The Shelby County District Attorney's Office entire case file;
 - iii. The Memphis Health Department's entire case file;
 - iv. The Memphis Health Department's policies and procedures manual that was in effect when Mamelli performed her serology tests and reported her results; and
- d. An Order granting an evidentiary hearing.

Respectfully submitted this the 22nd day, May 2012



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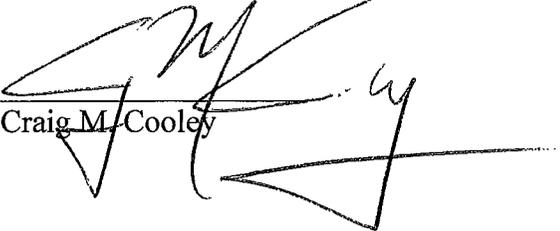
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Attorneys for Petitioner

Date: May 22, 2012

Certificate of Service

Undersigned counsel sent a copy of the instant petition, via email and Fed-Ex, to John Campbell of the Shelby County District Attorney's Office on May 22, 2012.


Craig M. Cooley

Date: May 22, 2012

Exhibits

1. Jo Ann Mamelli's August 14, 1990 Trial Testimony
2. Email from Gary Harmor to Craig Cooley, February 24, 2012
3. Serological Research Institute, Analytical Report, April 24, 2012
4. Gary Harmor's April 24, 2012 Affidavit
5. Arthur W. Young's April 25, 2012 Affidavit
6. Robert Shaler's May 14, 2012 Affidavit
7. Margaret Aiken's Physical Examiner's Checklist, February 19, 1989
8. Margaret Aiken's Medical Examination of Sexually Assaulted Persons Report, February 19, 1989
9. Jo Ann Mamelli's Rake It Evidence Report and Bench Notes

EXHIBIT 1

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MR. CRAFT: Nothing further of this witness.

THE COURT: Thank you, Ms. Aiken.

(WITNESS EXCUSED)

* * *

THE COURT: Next witness.

MR. CRAFT: Ms. Mamelli.

JD ANN MAMELLI was called and being duly sworn,
was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CRAFT:

Q. Would you state your name for the jury, please?

A. My name is Jo Ann Mamelli.

Q. Spell your last name for the court reporter,
please?

A. M - as in Mary - A - another M - E - double L - I.
Mamelli.

Q. Okay. And what do you do for your job?

A. I am forensic serologist hired by the City to work
as -- connected with the Rape Crisis Center, now known as
the Resource Center for Sexual Assault.

Q. All right. Your office is in the Health
Department; is that right?

A. I'm based at the Health Department.

Q. Would you tell the jury what a forensic serologist

1 is, please, ma'am?

2 A. A forensic serologist is a laboratorian who types
3 and classifies and tries to characterize body fluids,
4 looking for markers that are genetically controlled. But we
5 look at body fluids in relation to a medical/legal context.
6 And we work with any affair that is of public interest
7 medically and legally.

8 Q. Okay. And what's your educational background?

9 A. I have a master's degree in microbiology. I'm a
10 licensed medical technologist with the State. I've been a
11 medical technologist for thirty years with supervisor of
12 immunology at Baptist Hospital for fifteen years. But my
13 training in forensics was with the FBI and with the
14 Tennessee Bureau of Investigation.

15 Q. And how long have you been doing that?

16 A. Four years.

17 Q. Okay. And about how many tests, if you know, have
18 you performed over that time?

19 A. We average -- at the Rape Crisis Center last year
20 I did six hundred and nineteen rape kits, which is what's
21 collected on each victim. We average about six hundred and
22 fifty a year. In those four years that's what my average
23 has been.

24 MR. CRAFT: Your Honor, I'd ask that she be
25 declared an expert in forensic serology.

1 MR. HALL: We'll stipulate, Your Honor.

2 THE COURT: Any voir dire?

3 MR. HALL: No, Your Honor, we'll stipulate.

4 THE COURT: She may testify as such.

5 Q. (By Mr. Craft) Ma'am, I'm going to hand you an
6 item and ask you if that's the item that you brought me this
7 morning when you came down here. Is that correct?

8 (Item passed to witness.)

9 A. This is the remains of our rape kit.

10 Q. And I'll ask you where did you get that kit?

11 A. It's our policy to maintain the chain of custody.
12 Each victim who is seen by our Rape Crisis nurse
13 practitioners, they're seen either at the hospital if
14 they're severely traumatized, or they are seen at our center
15 which is located on Poplar.

16 And they collect the evidence using a standard
17 procedure for every box, or kit, as we call it. They collect
18 whatever they need in the way of evidence, plus they collect
19 me standards that consist of, like, blood from the victim
20 and saliva so that I can establish her blood type and
21 secretor status.

22 This is all placed in a kit and sealed with -- by
23 that nurse practitioner and locked in a locked refrigerator.
24 And once a week I access these kits by going to the center
25 and personally accessing -- unlocking the refrigerator and

1 then taking them back to my laboratory where they stay in my
2 possession.

3 Q. Okay. These are originally stored in boxes in
4 kits; is that correct?

5 A. Correct.

6 Q. What's happened to the box in this particular kit?

7 A. The box -- this is a xeroxed label that's an exact
8 reproduction of the box. It's about two inches deep and
9 it's that size.

10 The Attorney General, because of a problem with
11 space and storage, has given me permission to destroy the
12 box and break down the kits into smaller containers that are
13 then frozen, maintained at optimal storage.

14 And so this is the remainder of the contents of
15 the kit, meaning some has been used up in testing.

16 Q. So you perform tests on this kit; is that right?

17 A. That's correct.

18 Q. Would you tell the jury what -- the results of
19 your testing, please?

20 A. Yes. First I typed this victim's blood. And she
21 was an A non-secretor by the typing of her blood and her
22 saliva.

23 Then I looked at the other components of the kit
24 looking for the presence of semen and foreign markers. And
25 on the vaginal swab I found semen and spermatozoa. And on a

1 pad which they used to wipe the perineum in case there's
2 evidence that is spilled around the orifice, I found the
3 presence of acid phosphatase which indicate semen.

4 Q. Okay. Now, perineum, if you would just tell the
5 jury what that area is, please, ma'am?

6 A. The area, the physical area around the vagina as
7 -- the tissue outlining the vulva is considered the
8 perineum, between -- the space between the vulva and the
9 anus in the female.

10 Q. Were there any anal swabs taken?

11 A. There -- excuse me. Yes, there were. There were
12 anal swabs taken and I found sperm on them also.

13 Q. Okay. Now, did you also take the blood from the
14 Defendant, Rickey Nelson?

15 A. I did. Mr. Nelson was brought to the laboratory
16 by the investigator on August the 3rd and I drew blood and
17 saliva from him myself.

18 Q. Okay. Now, did you determine his blood type?

19 A. He was an O secretor.

20 Q. Okay. From your comparison of your tests can you
21 form any opinion as to whether or not Mr. Nelson could be
22 excluded as the person who put those fluids in Ms. Morgan?

23 A. I could not. These tests that I performed were
24 based on the presence of ABO secretors, which are the blood
25 markers. If a person is a secretor, this means that they

1 are able to secrete into their body fluids those markers
2 which correspond to their blood type. Blood type being A,
3 B, AB and O. And this is a genetically ruled situation.
4 Eighty percent of the population can secrete.

5 Now, in Mr. -- in the suspect's case, he was a
6 very weak secretor. When I say secrete, it's a blood group
7 substance which is similar to the blood type.

8 But everybody secretes, if they are secretors, at
9 different concentrations. And in his case he was a very
10 weak secretor by my tests. And so when I did the typing, I
11 could not pick up any markers foreign to the victim.

12 Now, what happens in a case like this, frequently
13 if the victim is traumatized, they drain copiously. They
14 lose a lot of fluid. Sometimes they dilute out the semen
15 sample.

16 In her -- in this particular case there were some
17 sperm there but not many, which indicates to me that there
18 was some loss perhaps through urinating or perhaps from
19 trauma and bleeding. I don't know the particulars on this
20 victim. But I'm saying that the markers were either masked
21 by her vaginal fluid or they were diluted out.

22 By this -- but since she's a non-secretor, I
23 picked up nothing that said those were her markers because
24 she cannot secrete her markers. In other words, I picked up
25 nothing that would either include or exclude the suspect. No

1 markers were detected.

2 Q. All right.

3 MR. CRAFT: Your Honor, that's all I have of this
4 witness.

5 THE COURT: You may cross-examine.

6 MR. HALL: Thank you, Your Honor.

7 CROSS-EXAMINATION

8 BY MR. HALL:

9 Q. Good morning, Ms. Mamelli.

10 A. Good morning.

11 Q. Mamelli?

12 A. Mamelli.

13 Q. Okay. So your office only runs tests on body
14 fluids?

15 A. Blood and body fluids.

16 Q. Okay. No tests run on any pubic hairs that might
17 be collected?

18 A. I do not analyze pubic hairs. However, we hold
19 them in the event that they're requested.

20 Q. All right. Was that requested?

21 A. No, it was not.

22 Q. Okay. Now, of course we stipulated to your
23 qualifications and you're obviously very well-educated in
24 your field. I'm assuming you have to read medical journals
25 periodically, or you do make that your practice?

1 A. I certainly try to.

2 Q. Yes, ma'am. Were any other tests run on these
3 fluids?

4 A. No. All of my tests -- well, what we do first of
5 all is we do chemical tests which we call the acid
6 phosphatase test. And that is a presumptive test looking
7 for the presence of semen.

8 Then if we -- it's a super-sensitive test. If you
9 get a negative, you're pretty sure there's no semen. I
10 mean, you could say ninety-nine percent of the time there's
11 no semen. But you can get false positives from vaginal
12 fluid or from other constituents in body fluids.

13 However, in men the acid phosphatase concentration
14 is about four hundred times greater than in females and
15 other people -- I mean, other fluids. So what I'm saying
16 is, we do a screening test and then we do a confirmatory
17 test for semen.

18 Q. And how do you characterize this test we're
19 talking about, the -- is it secretor/non-secretor? Is that
20 how it's called?

21 A. Correct.

22 Q. Okay. But that's the only identifying test you
23 do?

24 A. That's all I used. On this particular victim
25 there was not a whole lot -- when I look at a slide and want

1 to determine how many sperm are present --

2 MR. HALL: (Interposing) Your Honor -- pardon me.
3 Your Honor, she's not being responsive. I think the answer
4 calls -- the question calls for a yes or no answer.

5 THE WITNESS: Oh. Would you repeat it, please?

6 THE COURT: Yes.

7 Q. (By Mr. Hall) Is this the only identifying test
8 you ran? The secretor/non-secretor?

9 A. Yes, it is.

10 Q. Okay. Nothing else was asked for?

11 A. Nothing else was asked for.

12 Q. And the bottom line, I suppose is, the test was
13 inconclusive, correct?

14 A. Correct.

15 Q. Thank you, ma'am.

16 MR. CRAFT: I don't have anything further of this
17 witness, Your Honor.

18 THE COURT: Thank you very much, Ms. Mamelli.

19 (WITNESS EXCUSED)

20 * * *

21 THE COURT: Next witness.

22 MR. CRAFT: Your Honor, at this time the State
23 rests its case in chief. I'd ask that Exhibits 4 -- excuse
24 me -- the pictures be passed to the jury, Your Honor. I
25 think that's 5 through 8.

EXHIBIT 2



Ricky Lee Nelson SERI Case R'9364'12

Gary Harmor <GHarmor@serological.com>
To: Craig Cooley <CCOOLEY@innocenceproject.org>

Fri, Feb 24, 2012 at 3:14 PM

Mr. Cooley;

I have reviewed the sexual assault kit documents and the serology notes of the forensic examiner in Ricky Lee Nelson's case (Agency Case 89-0149). The alleged post coital time for this case is about three hours. The assault as reported by the victim was at 9:30 AM on 2/19/1989 and the victim arrived at the hospital at 12:20 PM the same day. She reported a vaginal penetration with an ejaculation. She had no menstrual flow, there were no cleansing measures taken by her and the assailant did not use a condom.

The forensic serology examination was conducted on 8/6/1990. The examiner reported that the victim was classified as an ABO type A and a non-secretor of ABO substances. This means that the victim expresses no ABO substances in her body fluids and would give a negative result for the ABO secretor test. This would be true of all non-secretors.

The examiner had a positive acid phosphatase (a presumptive test for semen) result on the vaginal swab sample, a positive result for the P30 test (a protein found in seminal fluid) and found spermatozoa (male reproductive cells) with a significant number of tails still attached. So, there are intact sperm on the vaginal swab. The acid phosphatase and P30 results strongly indicate a post coital interval of less than 24 hours. The intact sperm cells indicate a post coital interval of less than 12 hours. All of these results support the three hour post coital time reported. The examiner conducted an ABO secretor test on a liquid extract made from the vaginal swab. The results were negative for ABO substances. In my opinion, the serology test results and post coital time interval indicates that the amount of semen found on the vaginal swabs was easily sufficient to detect the semen donor's ABO type and secretor status if the assailant was a secretor.

Had I been consulted by the defense, to review the same documents in 1990, I would conclude from this data that the semen donor is an ABO non-secretor. This would eliminate all semen donors that are ABO secretors.

Ricky Lee Nelson was determined to be an ABO type O and a secretor. Therefore based on the serology test results, in my opinion, Ricky Lee Nelson is excluded as the semen donor in this case.

Gary C. Harmor, B.S., F-ABC

Executive Director

Chief Forensic Serologist

Serological Research Institute

3053 Research Drive

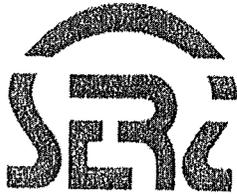
Richmond, CA 94806

Phone: 510-223-7374, ext. 225

Cell: 707-365-2474

FAX: 510-222-8887

EXHIBIT 3



SEROLOGICAL RESEARCH INSTITUTE

April 24, 2012

Craig M. Cooley
Innocence Project
40 Worth Street, Suite 701
New York, NY 10013

SERI Case No. R'9364'12
Memphis P. D. Case No.890219005970
Suspect: Ricky Lee Nelson

ANALYTICAL REPORT

On April 17th 2012, one item was received at the Serological Research Institute (SERI) from Craig Cooley of the Innocence Project via Federal Express (8771 3833 8160). A forensic serology test for ABO and Secretor Status was requested as a rush analysis on this item.

ITEM 1 ORAL SWAB REFERENCE FROM RICKY LEE NELSON

This item consists of three oral swabs. A portion of one swab was sampled and extracted into aqueous solution and centrifuged in order to separate liquid supernatant from solid pellet. A portion of supernatant was tested for the presence of amylase enzyme, a constituent of saliva, with positive results. Another portion of the supernatant was tested by the absorption-inhibition test for secretor status. Secreted ABO type H substance was detected in the neat (undiluted) extract. These results mean the donor is an ABO type O secretor. A titer analysis (strength of secreted substance) was conducted for this sample substance. The titer results were that the H substance was detected to an endpoint of a one in forty dilution from an extract of one-half of an oral swab extracted into 150 microliters of aqueous solution.

EXPLANATIONS

The enzyme amylase is found in many body fluids including saliva, urine, breast milk, blood serum, feces, perspiration, semen and vaginal secretion. The highest concentration of amylase is found in saliva followed by feces, breast milk, perspiration, urine, blood serum, semen and vaginal secretion.

A secretor is a person who has ABO blood group substances and H substance in many body fluids (e.g. semen, saliva, vaginal secretion, etc.). Therefore, an A secretor will secrete A plus H, a B secretor B plus H, an AB secretor A, B plus H, and an O secretor just H. The method for detecting the blood group substances in body fluids is known as absorption-inhibition. Body fluids from ABO non-secretors give test results of no activity by the inhibition test.

Craig M. Cooley
SERI Case No. R'9364'12
April 24, 2012
Page 2 of 2

CONCLUSION

Rickey Lee Nelson (item 1) is an ABO type O secretor. The results from his saliva sample can be used to estimate the expected titer in his seminal fluid. Generally, the strength of the primary secreted ABO type in seminal fluid is about twenty times the titer strength in the saliva. Therefore, H substance in Ricky Lee Nelson's seminal fluid is expected to be at least detectable at a one in 800 dilution of seminal fluid.

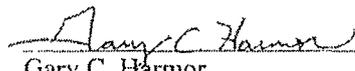
RECOMMENDATIONS

If a direct seminal fluid titer is needed, then a liquid semen sample from Ricky Lee Nelson would have to be submitted for testing the titer of his primary secreted antigen (H).

EVIDENCE DISPOSITION

The remaining unconsumed submitted evidence will be returned to Craig Cooley. Portions of the submitted reference sample along with any unconsumed extracts will be retained at SERI.

SEROLOGICAL RESEARCH INSTITUTE



Gary C. Harmor
Chief Forensic Serologist

EXHIBIT 4

- c. Mr. Cooley initially retained me to offer an opinion regarding the knife used during assault.
 - d. On February 6, 2012, I submitted an affidavit to Mr. Cooley regarding my opinion as to whether the knife handle was in such a condition that DNA testing could be performed.
4. When Mr. Cooley initially retained me, he sent me the following material to review:
 - a. Ricky Nelson's DNA testing motion;
 - b. The State's response to Nelson's DNA motion;
 - c. Judge John Colton's August 30, 2010 order denying DNA testing;
 - d. Margaret Aiken's February 19, 1989, Physical Examiner's Checklist;
 - e. Margaret Aiken's February 19, 1989, Medical Examination of Sexually Assaulted Person's Report;
 - f. Jo Ann Mamelli's August 10, 1990 Rape Kit Evidence Report;
 - g. Memphis Police Department, Incident Report, February 19, 1989;
 - h. Release of Evidence Form, August 3, 1990;
 - i. Memphis Police Department, Supplementary Offense Report;
 - j. Frances Ann Morgan's Statement, February 19, 1989; and
 - k. Angela Jean Young's Statement, February 19, 1989.
5. After I reviewed the material for my first affidavit regarding the knife, I re-examined Nelson's DNA testing motion, Jo Ann Mamelli's reports, and Margaret Aiken's reports, on my own initiative and without Mr. Cooley's prompting, because something seemed amiss to me when I first read Nelson's DNA motion, Mamelli's results, and her trial testimony.
6. Once I re-examined Nelson's DNA testing motion, Mamelli's results, and her limited trial testimony mentioned in Nelson's DNA testing motion, I emailed Mr. Cooley on February 24, 2012, informing him that I suspected Mamelli's testimony may be false and invalid.
7. When I spoke with Mr. Cooley on February 24, 2010, I asked him to send me the transcripts of Mamelli's and Margaret Aiken's trial testimony so I could see the questions

presented to them and how they answered these questions. Mr. Cooley sent me Mamelli's and Aiken's trial testimony shortly thereafter and I reviewed them.

8. I also advised Mr. Cooley to collect Nelson's biological sample and to have it tested at SERI to determine whether Nelson is, in fact, a weak secretor.
 - a. Mr. Cooley collected a sample from Nelson on April 12, 2012 and sent it to SERI for testing.
 - b. I tested Nelson's sample and determined that, contrary to Mamelli's trial testimony, Nelson is *not* a "very weak" secretor. My report is attached hereto as Exhibit 2.

Questions Presented

9. Based on the new serology results as well as the material Mr. Cooley had already sent me, Mr. Cooley asked me the following questions regarding Jo Ann Mamelli's serology testing, results, and trial testimony:
 - a. **Question #1:** Based on Mamelli's serology results – what is my opinion as to the assailant's secretor status? In other words, is the assailant a secretor or non-secretor?
 - b. **Question #2:** Is Mamelli's trial testimony – that Morgan's vaginal fluid masked Nelson's H antigens – scientifically possible? In other words, can a non-secretor "mask" a secretor?
 - c. **Question #3:** Based on Morgan's statement, the post- post coital time, Aiken's sexual assault reports, Mamelli's serology reports, and SERI's serology report, is Mamelli's trial testimony – that Morgan's vaginal fluid diluted Nelson's H antigens – a likely or realistic possibility?
 - d. **Question #4:** Based on Mamelli's serology reports – is there a factual basis supporting Mamelli's trial testimony that Nelson is a "very weak" secretor?
10. I address each question in the proceeding sections.

A Primer on Conventional Serology

11. A brief primer on conventional serology will preface my findings and conclusions.
12. Conventional serology involves analyzing fluids for certain markers that are lifelong individual characteristics, based principally on water soluble ABO blood group substances and the phosphoglucomutase ("PGM") enzyme genetic marker system.

13. The ABO blood group antigens are found on the surface of red blood cells. Within this genetic marker system there are four possible types: A, B, AB, and O.
14. Based on the analysis of more than 70,000 samples, scientists determined that approximately 40% of the Caucasian population is type A, 11% type B, 45% type O, and 4% type AB.¹
15. For African-Americans, 23% are type A, 22% type B, 51% type O, and 4% type AB. *Id.* The following chart summarizes these statistics:

ABO Blood Group Frequencies		
Caucasians	Type	African-Americans
40%	A	23%
11%	B	22%
45%	O	51%
4%	AB	4%

16. Every member of the population falls into one of these four types and every member of the population has the appropriate A, B, AB, or O blood group antigens on the surface of his or her red blood cells.
17. Those population members who are deemed *secretors*, which is approximately 80% of the population, will also have the corresponding blood group antigen dissolved in the watery portion of several body fluids, including *saliva, semen, and vaginal fluid*.
18. Individuals deemed *non-secretors*, which are roughly 20% of the population, **will not** have the corresponding blood group antigen in the watery portion of their body fluids even though they have blood group antigens on the surface of their red blood cells. Thus, a female who's a non-secretor **will not** secrete her blood antigen in her vaginal secretions.
19. Moreover, individuals who are A, B, or AB secretors, in addition to possessing the appropriate A, B, or AB blood group antigen, also possess the H[O] blood group antigen.
20. This is so because the H[O] blood group antigen is a precursor substance upon which the A and B blood group antigens are built.²
21. The following chart summarizes the critical differences between secretors and non-secretors:

¹ See Dale Dykes, *Probability of Inclusion in Paternity Testimony – A Technical Workshop*, AMERICAN ASSOCIATION OF BLOODBANKS (1982).

² See George F. Sensabaugh, Jan Bashinski & Edward T. Blake, *The Laboratory's Role in Investigating Rape*, *Diagnostic Medicine* 4 (March 1985); PAUL C. GIANNELLI AND EDWARD L. IMWINKELRIED, JR., *SCIENTIFIC EVIDENCE* § 17.09 (2007).

ABO Genetic Marker System			
Antigens Found in the Cells of Body Fluid			
Secretions of Secretors and Non-Secretors			
Antigens on Red Blood Cells for Secretors and Non-Secretors		Secretions of Secretors and Non-Secretors	
Secretors	Non-Secretors	Secretors	Non-Secretors
A		A, H	Negative
B		B, H	Negative
AB		A, B, H	Negative
O[H]		H	Negative

Factual Findings

22. Here are the facts as presented in the Morgan's statement, Aiken's two sexual assault reports, Mamelli's serology results, and Mamelli's.
23. The assault, as reported by Morgan, occurred at 9:30 a.m. on February 19, 1989 and Morgan arrived at the rape crisis center at 12:20 p.m. the same day where Margaret Aiken examined her.
24. Aiken reported the following facts and observations in her *Physical Examiner's Checklist* report:
- a. There was no bloody external physical trauma to Morgan's genitalia;
 - b. She identified non-motile sperm;
 - c. Morgan was not menstruating;
 - d. Morgan did not shower, bath, or douche after her assault;
 - e. Morgan told Aiken her assailant did not wear a condom;
 - f. Morgan reported vaginal penetration with ejaculation;
 - g. Morgan did not report or mention excessive or excess drainage of vaginal fluids during or after her assault.
25. Aiken reported the following facts and observations in her *Medical Examination of Sexually Assaulted Persons* report:
- a. Aiken wrote "No trauma to vaginal or anal areas. No bleeding or discharge";
 - b. Aiken again noted that Morgan did not urinate, bath, douche, or shower after her assault;

c. Aiken again noted that she identified non-motile sperm.

26. Mamelli performed her serology examinations on the following dates.

a. On March 16, 1989, Mamelli tested Morgan's blood and saliva sample.

i. Morgan's had type A blood.

ii. Morgan's saliva sample presented with no ABO blood antigens meaning she's a non-secretor. As a non-secretor, Morgan's vaginal fluid would not present with any ABO blood antigens.

b. On March 20th and 27th 1989, Mamelli performed visual and chemical examinations on the vaginal swab from Morgan's rape kits.

i. Mamelli visually identified a moderate number of "intact" sperm – or sperm with tails – on the vaginal swabs.

ii. Mamelli had a positive acid phosphatase (AP) result on the vaginal swab sample. The AP test is a presumptive test for semen.

iii. Mamelli also had a strong positive p30 result on the vaginal swab sample. P30 is a protein found in seminal fluid and its detection is conclusive evidence of the presence of semen. Here, Mamelli reported a "3" in her report indicating there was a significant amount of p30 on the vaginal swab.

c. On August 6, 1990, Mamelli conducted an ABO secretor test on a liquid extract made from the vaginal swab.

i. The liquid extract was a mixture of Morgan's vaginal fluid and the assailant's semen.

ii. The results were negative for ABO antigens A, B, and O.

d. On August 6, 1990, Mamelli chemically tested Nelson's blood and saliva samples.

i. Nelson was determined to be an ABO type O and a secretor. As a type O secretor, the seminal plasma (the watery portion of Nelson's semen) would contain the O[H] or H antigen.

ii. On her report, Mamelli handwrote the word "inconclusive."

27. Mamelli testified to the following at Nelson's trial:

- a. Mamelli testified that her ABO-secretor test on the liquid extract of the vaginal swab was “inconclusive.”
- b. Mamelli said her results were “inconclusive” for three reasons:
 - i. Masking;
 - ii. Dilution; and
 - iii. The fact that Nelson was a “very weak” secretor.
- c. In terms of masking, Mamelli said Morgan’s vaginal fluids “masked” Nelson’s H antigens.
- d. In terms of dilution, Mamelli said the following:
 - i. Morgan drained a “copious” amount of vaginal fluid during and after her assault that “diluted” Nelson’s H antigens.
 - ii. Morgan may have suffered vaginal trauma and bleeding and the blood “diluted” Nelson’s H antigens.
 - iii. Morgan may have urinated after her assault and the urination “diluted” Nelson’s H antigens.
 - iv. Morgan’s vaginal fluid “diluted” Nelson’s H antigens because he’s a “very weak” secretor.

Opinions and Conclusions Drawn From Factual Findings

28. Based on the factual findings, here are my opinions and explanations regarding Mr. Cooley’s four questions.
29. **Question #1**: Based on Mamelli’s serology results – what is my opinion as to the assailant’s secretor status? In other words, is the assailant a secretor or non-secretor?
- a. In my expert opinion, **the assailant in this case is a non-secretor** for the following reasons.
 - i. Morgan is an ABO type A non-secretor, while Nelson is an ABO type O secretor.
 - 1. As a non-secretor, as mentioned, Morgan does not secrete her A antigens in her vaginal fluids.

2. As a secretor, though, Nelson secretes his O[H] antigens in his seminal plasma (the watery portion of his seminal fluid).
 - ii. The liquid extract from the vaginal swab that Mamelli tested represented a mixture of Morgan's vaginal fluids and the assailant's semen.
 - iii. Moreover, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post coital time interval, and the facts presented in Aiken's two reports plainly indicate that the amount of semen identified on the vaginal swabs was sufficient to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.
 - iv. Thus, if Nelson was, in fact, the assailant, Mamelli would have identified Nelson's H antigens. Mamelli, however, did not identify any antigen in the liquid extract.
 - b. Consequently, based on the absence of any antigenic activity, the fact masking definitely could not occur here, and that it's extremely unlikely dilution occurred here as well, it's my expert opinion that Morgan's assailant is a non-secretor.
30. **Question #2:** Is Mamelli's trial testimony – that Morgan's vaginal fluid masked Nelson's H antigens – scientifically possible? In other words, can a non-secretor "mask" a secretor?
- a. Morgan's vaginal fluids could not have "masked" Nelson's H antigens, assuming Nelson is, in fact, the assailant.
 - b. "Masking" occurs when a victim's ABO type is identical to, or inclusive of, the culprit's ABO type.
 - i. For instance, if the victim is an AB-secretor and the culprit is an A-secretor, conventional ABO typing would not detect the culprit's ABO type because it's being "masked" by the victim's ABO type. In other words, if ABO typing only detects an A antigen on the victim's vaginal swab, it's impossible to determine whether the A antigen came from the victim or the culprit because both secrete A antigens.
 - ii. A non-secretor, however, cannot "mask" anyone, not even another non-secretor. A capable serology in 1990 should have known this immediately.
 1. Morgan is a non-secretor.
 2. As a result, Morgan could not have masked Nelson's H antigens.

iii. Consequently, Mamelli's testimony that Morgan's vaginal fluids "masked" Nelson's H antigens is false and invalid.

31. **Question #3:** Based on Morgan's statement, the post- post coital time, Aiken's sexual assault reports, Mamelli's serology reports, and SERI's serology report, is Mamelli's trial testimony – that Morgan's vaginal fluid diluted Nelson's H antigens – a likely or realistic possibility?

a. "Dilution" – which is distinct from "masking" – occurs when the ABO antigens become no longer detectable by conventional serology analysis, even though sperm and p30 can still be detected.

b. In sexual assault cases, dilution is always a possibility, but the **likelihood** dilution occurred here is **extremely unlikely for the following reasons.**

i. First, the quantity of ABO antigens in semen is extremely high, easily capable of being detected at dilutions of 1:1000.

1. To fully understand the significance of this, consider that the volume of the average ejaculate is 3.5 milliliters:

2. If it were to be mixed with 3.5 liters of water, the ABO type would still be detectable.

3. In my own experience, I have frequently observed detection at the 1:2000 and 1:4000 range, with occasional detection at the 1:8000 range.

4. Even if the volume of the culprit's ejaculate were only 1 milliliter, an analyst would still be able to detect it if the victim had copiously secreted a liter of vaginal fluid.

ii. Second, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post coital time interval, and the facts presented in Aiken's two reports plainly indicate that the amount of semen identified on the vaginal swab was **sufficient** to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.

iii. Third, Aiken's two sexual assault reports specifically noted the following facts:

1. Morgan did not report and Aiken did not observe excessive vaginal drainage after the assault.

2. Morgan did not report and Aiken did not observe vaginal or anal bleeding and trauma.

3. Morgan did not bath, douche, and urinate after her assault.
 - iv. Fourth, based on my serology tests of Nelson's buccal samples, Nelson is not a "very weak" secretor. To the contrary, he is a so-called "run-of-the-mill" secretor who secretors normal levels of antigens in his bodily fluids, including his semen.
- c. Thus, based on these facts, **it is extremely unlikely dilution occurred here.**
- d. These facts, moreover, support my initial conclusion to Question #1 which is: the **most scientifically plausible and sound** answer to why Mamelli did not identify Nelson's H antigens in the liquid extract from the vaginal swab is that Nelson is not the assailant because the assailant in this case is a non-secretor.

Conclusions and Observations Regarding Mamelli's Trial Testimony

32. It's evident from Mamelli's trial testimony she started with the assumption that Nelson was, in fact, the assailant and then worked backwards from that assumption trying to explain why her serology tests did not identify his H antigens on Morgan's vaginal and anal swabs.
 - a. Mamelli's approach was antithetical to the scientific method.
 - b. A capable serologist in 1990 should have known that the proper null hypothesis, in this context, would have been the exact opposite – that Nelson is not the assailant.
 - c. With this hypothesis in place, a capable serologist would've performed her serology tests with the intent of trying to disprove the null hypothesis. Here, disproving the null hypothesis meant identifying H antigens in the liquid extract from the vaginal swab.
 - d. The serology results, however, did not disprove this null hypothesis because it did not identify H antigens in the liquid extract.
33. It's also apparent that her trial testimony is not based on facts in the record, specifically those facts contained in Aiken's two sexual assault reports.
 - a. This is most noticeable when Mamelli discussed dilution and the fact that Nelson was supposedly a "very weak" secretor.
 - b. In regards to dilution, Aiken's two sexual assault reports are **void** of observations, facts, evidence, or comments remotely suggesting that:
 - i. Morgan drained a "copious" amount of vaginal fluid;

- ii. Morgan suffered vaginal bleeding; and
 - iii. Morgan urinated, bathed, or douched after her assault.
- c. In regards to Nelson's secretor status, there is absolutely no information, data, or evidence in Mamelli's serology reports that support or corroborate her claim that Nelson is a "very weak" secretor.
34. It's also clear Mamelli did not understand the critically important differences between "dilution" and "masking."
- a. Mamelli's "masking" and "dilution" claims are incorrect for the previously stated reasons.
 - b. A capable serologist in 1990 would have known the critical distinction between these two phenomena.
35. Consequently, Mamelli's trial testimony was wrong, purely speculative, and inappropriate.
- a. It was inappropriate for her to start with the assumption that Nelson was, in fact, the assailant.
 - b. It was even more inappropriate for her to *speculate* as to why she did not identify Nelson's H antigens in the liquid extract from the vaginal swab, especially when masking was not possible and the facts contained in Aiken's sexual assault reports did not support her dilution theory.

Availability in 1990

36. While my opinions are based on my training, education, and experience, they are also based on information, literature, and scientific evidence that was available prior to Nelson's 1990 trial.
37. Moreover, had trial, direct appeal, or initial state post-conviction counsel contacted me, I would have provided the opinions contained in this affidavit.
38. Had trial counsel, Trent Hall, contacted me I would have advised him in the following ways:
- a. I would have prepped him as to what questions to ask Mamelli on cross-examination.
 - b. I would have recommended that he have an independent serologist, like me, test Nelson's sample to determine whether Nelson is, in fact, a "weak" secretor.

39. Had Nelson's initial post-conviction counsel contacted me I could have advised him in the following manner:

- a. I would have recommended that he have an independent serologist test Nelson's sample to determine whether Nelson is, in fact, a "weak" secretor.
- b. I would have reviewed Morgan's statements, Aiken's sexual assault reports, Mamelli's serology results, and Mamelli's trial testimony. Had initial post-conviction counsel provided me with this material, I would have provided the opinions offered in this affidavit.

40. I reviewed Nelson's material and provided this affidavit to Mr. Cooley free of charge. I did not charge the Innocence Project for my services.

/s/ Gary Harmor

Gary Harmor

Serological Research Institute

Dated: April 24, 2012



**RESUME OF
GARY CLAYTON HARMOR**

EDUCATION

1974 - 1976

California State University, Sacramento, CA
Bachelor of Science with Honors, Forensic Science
Chemistry (29 semester units)
Biological Science (27 semester units)

1972 - 1974

Sacramento City College, Sacramento, CA
Associate of Arts in General Education

July, 2010

Executive Online Mini-MBA in Core Business Principles
The Satell Center for Executive Education
376 Technology Drive, Malvern, PA

WORK EXPERIENCE

2012 - Present

Serological Research Institute, Richmond, CA
Executive Director

Responsible for the overall administrative function of the company. Is responsible for accounting, auditing, and the financial stability of the company. Is responsible for administrative policy including personnel policy, hiring of staff, safety, and security. Is responsible for negotiating outside proposals, contracts, and bids.

2012 - Present

Serological Research Institute, Richmond, CA
Chief Forensic Serologist

Is the head of the laboratory and responsible for overall supervision and review of all case analysis. Responsible for case work policy, protocols, and training policy. Responsible for technical problem solving, oversight of quality assurance, safety, and proficiency testing. Responsible for overall evaluation of analysts and technical review of analyses and reports. Evaluate analyst testimony.

WORK EXPERIENCE (Continued)

2008 – 2011

Serological Research Institute, Richmond, CA
Assistant Director

Page 2

Assists the Executive Director with the overall administrative function of the company. Assists Director with administrative policy including personnel policy, hiring of staff, safety, and security. Assists Director with negotiating outside proposals, contracts, and bids.

1978 - 2011

Serological Research Institute, Richmond, CA
Senior Forensic Serologist

Train and supervise casework staff and technical staff. Casework examination, client consultation, and testimony. Technical review of analysis and reports. Research of new laboratory techniques and methodology. Responsible for interpretation of laboratory protocols. Act as instructor for training courses as needed. Substitute for the Laboratory Director as needed.

2003 – 2011

Serological Research Institute, Richmond, CA
Quality Assurance Manager

Responsible for all aspects of the Quality System for the laboratory under the guidance of the Technical Leader. Maintain and update the Quality Manual. Monitor laboratory practices to verify continuing compliance with policies and procedures. Evaluate instrument calibration and maintenance records. Ensure the validation of new technical procedures. Investigate technical problems, propose remedial actions, and verify their implementation. Administer proficiency testing and evaluate results. Select, train, and evaluate internal audits. Propose corrections and improvements in the quality system. Liaison with ASCLD/LAB Accreditation Board.

1977 -1978

Beckman Instruments, Inc. - Anaheim, CA
Forensic Chemist

Aid in the research and development of advanced electrophoresis blood grouping techniques on dried bloodstains and the transfer of this technology to selected crime laboratory personnel. This work was done under a LEAA grant.

1976 - 1977

University of California, Berkeley, CA
Staff Research Associate I, Step 2

Aid in the research and development of electrophoresis techniques for the purposes of a population survey of various polymorphic enzymes and proteins. This work was done under a California OCPJ grant.

CERTIFICATIONS AND AWARDS

Page 3

Certificate of Merit from the Southern Association of Forensic Scientists, April 30, 1982.

Certificate of Professional Competency in Criminalistics from the California Association of Criminalists, Awarded December 26, 1989, Number 060.

Diplomate Certificate of Professional Competency in Criminalistics from the American Board of Criminalistics (ABC), Number 440, expires July 2013.

Fellow of the American Board of Criminalistics in Forensic Biology with subspecialties in Forensic Biochemistry and Forensic Molecular Biology, Number 440, expires July 2013.

Certificate from the Satell Center for Executive Online Mini-MBA® Program in Core Business Principles. The Satell Center, 376 Technology Drive, Malvern, PA 19355, 1-800-817-8510. July 2010.

Currently Holds DOD Secret Clearance, effective August 10, 2010.

COURT PRESENTATIONS

Expert testimony presentations in forensic serology made in excess of four hundred (400) times in Superior Courts of the following states: Alaska, Arizona, California, Colorado, Georgia, Illinois, Iowa, Kentucky, Louisiana, Missouri, Nebraska, Nevada, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Utah, Wisconsin and Washington.

Superior Courts in California: Alameda, Butte, Contra Costa, El Dorado, Fresno, Humboldt, Kern, Los Angeles, Orange, Sacramento, San Bernardino, San Diego, San Francisco, San Joaquin, Santa Clara, Shasta, Solano, Sonoma, Sutter, Tulare, and Ventura Counties.

Qualified as a DNA expert approximately two hundred and forty (240) times in Superior Courts of the following states: Alaska, Arizona, California, Florida, Louisiana, Massachusetts, Missouri, Nevada, New Mexico, Ohio, Oregon, Tennessee, Texas and Utah.

Superior Courts in California: Alameda, Contra Costa, El Dorado, Fresno, Marin, Napa, Orange, Kern, Los Angeles, Sacramento, San Bernardino, San Diego, San Francisco, Santa Clara, Sonoma and Sutter Counties.

TECHNICAL PRESENTATIONS

Page 4

C.A.C. Seminar, Spring 1980: "PGM Subtyping by Conventional Electrophoresis"

C.A.C./N.W.A.F.S Joint Seminar, Fall 1981: "Multisystem Approach to Red Cell Black Population Markers - Group IV"

S.A.F.S. Seminar, Spring 1982: "Multisystem Approach to Red Cell Black Population Markers - Group IV"

C.A.C. Seminar, Spring 1986: "Gm and Km Testing on Bloodstains"

2nd Joint Meeting of the Forensic Science Society and the California Association of Criminalists, July 1997: "Life in a Private Laboratory".

C.A.C. DNA Workshop, May 1998: "Casework Using Capillary Electrophoresis on the 310 Genetic AnalyserTM".

Forensic DNA lectures for California Defense Investigators Assoc. San Diego, CA, October 6 and 7, 1995.

Panel member at Perkin-Elmer Applied Biosystems Division - Forensic PCR Technical Training Roundtable Discussions

Guest lecturer on Forensic DNA to a Molecular and Cell Biology Course at the California State University at Sonoma, California on November 23, 1999

California vs. Scott Dyleski: My Experience with the Admissibility of Y-STRs (ABI Y-filerTM), California Association of Criminalists, Fall 2007 DNA Workshop, Berkeley, CA, October 16, 2007.

OFF SITE TECHNICAL COURSES

Instructor at various Forensic laboratories in semen identification and/or advanced electrophoresis techniques:

Iowa Department of Public Safety, Des Moines, January 1984

Michigan Department of State Police, East Lansing, August 1984

Arizona Department of Public Safety, Phoenix, April 1985

South Carolina Dept of Law Enforcement, Columbia, November 1985

Georgia State Bureau of Investigation, Decatur, Georgia, June 1986

Michigan Department of State Police, East Lansing, March 1987

Arizona Department of Public Safety, Phoenix, November 1987

San Diego Police Department, San Diego, September 1988

New York City Police Department, New York, March 1997

DNA TRAINING AND COURSES

Page 5

Forensic DNA Seminar, California Association of Crime Laboratory Directors, November 19, 1987, Newport Beach, CA.

Forensic DNA Symposium, California Association of Criminalists, 71st Semiannual Seminar May 21, 1988, Berkeley, CA.

Topics in Molecular Biology Related to Forensic DNA Analysis, July 24-28, 1989
UC Berkeley Extension

Principles of Molecular Biology, Fall 1989, UC Berkeley Extension (X107A)

Principles of Molecular Biology, Spring 1990, UC Berkeley Extension (X107B)

Certificate of Completion for HLA DQ α Forensic DNA Amplification and Typing Workshop, Cetus Corporation, Forensics PCR Division, August 17, 1990.

Introduction to Genes and Genetics, Fall 1990, UC Berkeley Extension (X143)

The Population Genetics and Statistics Seminar for Forensic Biology, California Association of Criminalists, June 17-19, 1992.

Forensic DNA User Workshop, California Association of Criminalists, May 9 and 10, 1995.

Forensic DNA User Workshop, California Association of Criminalists, May 15, 1996.

Forensic DNA Workshop, 2nd Joint Meeting of the Forensic Science Society and the California Association of Criminalists, Harrogate, North Yorkshire, U.K., July 9-12 1997.

Forensic DNA Workshop, 3rd Joint Meeting of the Forensic Science Society and the California Association of Criminalists, Napa, California, May 9, 2000.

Forensic DNA Workshop, "Short Tandem Repeat Analysis Data: Processing Interpretation and Storage", American Academy of Forensic Science, 53rd Annual Meeting, Seattle, WA on February 20, 2001.

Forensic Applications of Y-Chromosome DNA Typing, Symposium, Tennessee Bureau of Investigation, Nashville, TN on May 12, 2003.

FBI DNA Auditor Training, NWAFS Fall Meeting Workshop, Portland, OR, October 15-16, 2003

Applied Biosystems, Inc., HID Genemapper ID v.3.1- Web Ex Training # 751747357, June 14, 2004.

Applied Biosystems, Inc., Future Trends in Forensic DNA Technology 2006 Seminar HIDTM

University Seminar Series, Berkeley, CA, September 22, 2004.

San Diego District Attorney's Office, "DNA Court Room Training for Criminalists," San Diego, CA, December 2, 2004

DNA TRAINING AND COURSES (Continued)

Page 6

Applied Biosystems, Inc., Future Trends in Forensic DNA Technology 2006 Seminar HID™
University Seminar Series, Berkeley, CA, June 13, 2006.

Forensic DNA Workshop, California Association of Criminalists, Berkeley, CA, October 16th 2007

Forensic Training Network, "Forensic STR Data Analysis Using Genemapper," SERI, June 4th 2008,
Instructor: Jaime Handlesman

Forensic DNA User Workshop, Fall 2009 Seminar, California Association of Criminalists
San Jose, California, October 26th 2009.

Applied Biosystems, Inc., Future Trends in Forensic DNA Technology 2006 Seminar HID™
University Seminar Series, Berkeley, CA, July 20, 2010

21st International Symposium on Human Identification, San Antonio, TX, October 12 and 13, 2010

22nd International Symposium on Human Identification, National Harbor, MD, October 3 thru 6, 2011

PROFESSIONAL RECOMMENDATIONS

Edward T. Blake, D. Crim.
Forensic Analytical Specialties, Inc.
3777 Depot Rd., Suite 403
Hayward, CA 94545-2761
(510) 266-8194

Gary Sims
California Department of Justice
Bureau of Forensic Services
Jan Bashinski DNA Laboratory
101 West Cutting, Suite 110
Richmond, CA 94804-3300
(510) 620-3300

PROFESSIONAL ORGANIZATIONS

California Association of Criminalists
Northwest Association of Forensic Scientists
Association of Forensic Quality Assurance Managers (AFQAM)

PUBLICATIONS

"Electrophoresis of Esterase D in Fresh Blood and in Bloodstains on Cellulose Acetate", Grunbaum,
Harmor, Del Re, Zajac, Journal of Forensic Sciences, Vol. 23, No. 1, January 1978

"Final Report: Bloodstain Analysis System", Wraxall, Bordeaux, Harmor, Walsh, FR2700-101, The
Aerospace Corporation, 955 L'Enfant Plaza, S.W., Washington, D.C., 20531, September 1978

"Final Report: Forensic Serology Workshops", Wraxall, Harmor, Provost, Jordon, 78NI-AX-0079,
NILE and CJ, U.S. Department of Justice, Washington, D.C., 20531, September 1979^{7/11}

EXHIBIT 5

IN THE CRIMINAL COURT FOR SHELBY COUNTY, TENNESSEE

RICKY LEE NELSON,)	
Petitioner,)	
)	
)	SHELBY COUNTY
v.)	Case No. 89-04384
)	89-04385
)	89-04386
STATE OF TENNESSEE,)	
Respondent)	
)	

AFFIDAVIT OF ARTHUR W. YOUNG

1. I'm a DNA and serology expert with more than twenty years of experience collecting, processing, analyzing, and interpreting DNA and serology results.
 - a. I currently work for Guardian Forensic Sciences (Guardian) in Abington, Pennsylvania. I started Guardian in 2010 after I left National Medical Services (NMS) Labs in 2010. My case work duties focus primarily on DNA and serology testing.
 - b. I worked as a DNA analyst and serologist with NMS Labs in Willow Grove, Pennsylvania from 2002 to 2010.
 - c. Prior to NMS Labs, I worked as a serologist and DNA analyst for Acadiana Criminalistics Laboratory in New Iberia, Louisiana from 1991 to 2001.
 - d. My education, training, research and publications are listed in my resume which is attached hereto as Exhibit 1.

2. On April 18, 2012, Craig Cooley, an Innocence Project Staff Attorney, retained me in regards to Ricky Lee Nelson's case. *See State v. Ricky Nelson*, Case No. P-11480 (Shelby County, TN). Nelson stands convicted of Francis Morgan's February 1989 sexual assault.

Material Reviewed

3. When Mr. Cooley retained me, he sent me the following material to review:
 - a. Ricky Nelson's DNA testing motion;
 - b. The State's response to Nelson's DNA motion;

- c. Judge John Colton's August 30, 2010 order denying DNA testing;
- d. Margaret Aiken's February 19, 1989, Physical Examiner's Checklist;
- e. Margaret Aiken's February 19, 1989, Medical Examination of Sexually Assaulted Person's Report;
- f. Jo Ann Mamelli's August 10, 1990 Rape Kit Evidence Report;
- g. Memphis Police Department, Incident Report, February 19, 1989;
- h. Release of Evidence Form, August 3, 1990;
- i. Memphis Police Department, Supplementary Offense Report;
- j. Frances Ann Morgan's Statement, February 19, 1989;
- k. Angela Jean Young's Statement, February 19, 1989;
- l. Jo Ann Mamelli's Trial Testimony;
- m. Margret Aiken's Trial Testimony; and
- n. SERI's April 24, 2012 Serology Report.

Questions Presented

- 4. Mr. Cooley asked me to review the material and answer the following questions regarding Jo Ann Mamelli's serology testing, results, and trial testimony:
 - a. **Question #1:** Based on Mamelli's serology results – what is my opinion as to the assailant's secretor status? In other words, is the assailant a secretor or non-secretor?
 - b. **Question #2:** Is Mamelli's trial testimony – that Morgan's vaginal fluid masked Nelson's H antigens – scientifically possible? In other words, can a non-secretor "mask" a secretor?
 - c. **Question #3:** Based on Morgan's statement, the post- post coital time, Aiken's sexual assault reports, Mamelli's serology reports, and SERI's serology report, is Mamelli's trial testimony – that Morgan's vaginal fluid diluted Nelson's H antigens – a likely or realistic possibility?
 - d. **Question #4:** Based on Mamelli's serology reports – is there a factual basis supporting Mamelli's trial testimony that Nelson is a "very weak" secretor?

5. Based on my review of Morgan's statements, Aiken's sexual assault reports, Mamelli's serology results, and her trial testimony, here are my short answers to Mr. Cooley's questions.
 - a. Answer #1: Based on the material I reviewed, I believe the assailant in this case is a non-secretor. I will explain the basis of my opinion in the proceeding sections.
 - b. Answer #2: Mamelli's trial testimony – that Morgan's vaginal fluids "masked" Nelson's H antigens – is not scientifically possible. Morgan is a non-secretor and non-secretors cannot mask anyone, especially a secretor like Nelson. Morgan's testimony, in this respect, was false and invalid.
 - c. Answer #3: Mamelli's trial testimony – that Nelson is a "very weak" secretor – has no factual support in her serology reports and notes. Moreover, based on SERI's April 24, 2012 serology results, we know Nelson is not a "very weak" secretor.
 - d. Answer #4: There's always a possibility of dilution in sexual assault cases, but the likelihood that Morgan's vaginal fluids diluted Nelson's H antigens, assuming he's in fact the assailant, is extremely unlikely in this case. I will explain the basis of my opinion in the proceeding sections.

A Primer on Conventional Serology

6. A brief primer on conventional serology will preface my findings and conclusions.
7. Conventional serology involves analyzing fluids for certain markers that are lifelong individual characteristics, based principally on water soluble ABO blood group substances and specific isoenzymes, such as the phosphoglucomutase ("PGM") enzyme genetic marker system.
8. The ABO blood group antigens are found on the surface of red blood cells. Within this genetic marker system there are four possible general types: A, B, AB, and O.
9. Based on the analysis of more than 70,000 samples, scientists determined that approximately 40% of the Caucasian population is type A, 11% type B, 45% type O, and 4% type AB.¹
10. For African-Americans, 23% are type A, 22% type B, 51% type O, and 4% type AB. *Id.* The following chart summarizes these statistics:

¹ See Dale Dykes, *Probability of Inclusion in Paternity Testimony – A Technical Workshop*, AMERICAN ASSOCIATION OF BLOODBANKS (1982).

ABO Blood Group Frequencies		
Caucasians	Type	African-Americans
40%	A	23%
11%	B	22%
45%	O	51%
4%	AB	4%

11. Every member of the population falls into one of these four types and every member of the population has the appropriate A, B, AB, or O blood group antigens on the surface of his or her red blood cells.
12. Those population members who are deemed *secretors*, which is approximately 80% of the population, will also have the corresponding blood group antigen dissolved in the watery portion of several body fluids, including *saliva, semen, and vaginal fluid*.
13. Individuals deemed *non-secretors*, which are roughly 20% of the population, **will not** have the corresponding blood group antigen in the watery portion of their body fluids even though they have blood group antigens on the surface of their red blood cells. Thus, a female who's a non-secretor **will not** secrete her blood antigen in her vaginal secretions.
14. Moreover, individuals who are A, B, or AB secretors, in addition to possessing the appropriate A, B, or AB blood group antigen, also possess the H[O] blood group antigen.
15. This is so because the H[O] blood group antigen is a precursor substance upon which the A and B blood group antigens are built.²
16. The following chart summarizes the critical differences between secretors and non-secretors:

ABO Genetic Marker System			
Antigens Found in the Cells of Body Fluid			
Secretions of Secretors and Non-Secretors			
Antigens on Red Blood Cells for Secretors and Non-Secretors		Secretions of Secretors and Non-Secretors	
Secretors	Non-Secretors	Secretors	Non-Secretors
A		A, H	Negative
B		B, H	Negative
AB		A, B, H	Negative
O[H]		H	Negative

² See George F. Sensabaugh, Jan Bashinski & Edward T. Blake, *The Laboratory's Role in Investigating Rape*, *Diagnostic Medicine* 4 (March 1985); PAUL C. GIANNELLI AND EDWARD L. IMWINKELRIED, JR., *SCIENTIFIC EVIDENCE* § 17.09 (2007).

Factual Findings

17. Here are the facts as presented in the Morgan's statement, Aiken's two sexual assault reports, Mamelli's serology results, and Mamelli's.
18. The assault, as reported by Morgan, occurred at 9:30 a.m. on February 19, 1989 and Morgan arrived at the rape crisis center at 12:20 p.m. the same day where Margaret Aiken examined her.
19. Aiken reported the following facts and observations in her *Physical Examiner's Checklist* report:
 - a. There was no bloody external physical trauma to Morgan's genitalia;
 - b. She identified non-motile sperm;
 - c. Morgan was not menstruating;
 - d. Morgan did not shower, bath, or douche after her assault;
 - e. Morgan told Aiken her assailant did not wear a condom;
 - f. Morgan reported vaginal penetration with ejaculation;
 - g. Morgan did not report or mention excessive or excess drainage of vaginal fluids during or after her assault.
20. Aiken reported the following facts and observations in her *Medical Examination of Sexually Assaulted Persons* report:
 - a. Aiken wrote "No trauma to vaginal or anal areas. No bleeding or discharge";
 - b. Aiken again noted that Morgan did not urinate, bath, douche, or shower after her assault;
 - c. Aiken again noted that she identified non-motile sperm.
21. Mamelli performed her serology examinations on the following dates.
 - a. On March 16, 1989, Mamelli tested Morgan's blood and saliva sample.
 - i. Morgan's had type A blood.
 - ii. Morgan's saliva sample presented with no ABO blood antigens meaning she's a non-secretor. As a non-secretor, Morgan's vaginal fluid would not present with any ABO blood antigens.

- b. On March 20th and 27th 1989, Mamelli performed visual and chemical examinations on the vaginal swab from Morgan's rape kits.
 - i. Mamelli visually identified a moderate number of "intact" sperm – or sperm with tails – on the vaginal swabs.
 - ii. Mamelli had a positive acid phosphatase (AP) result on the vaginal swab sample. The AP test is a presumptive test for semen.
 - iii. Mamelli also had a strong positive p30 result on the vaginal swab sample. P30 is a protein found in seminal fluid and its detection is conclusive evidence of the presence of semen. Here, Mamelli reported a "3" in her report indicating there was a significant amount of p30 on the vaginal swab.
- c. On August 6, 1990, Mamelli conducted an ABO secretor test on a liquid extract made from the vaginal swab.
 - i. The liquid extract was a mixture of Morgan's vaginal fluid and the assailant's semen.
 - ii. The results were negative for ABO antigens A, B, and O.
- d. On August 6, 1990, Mamelli chemically tested Nelson's blood and saliva samples.
 - i. Nelson was determined to be an ABO type O and a secretor. As a type O secretor, the seminal plasma (the watery portion of Nelson's semen) would contain the O[H] or H antigen.
 - ii. On her report, Mamelli handwrote the word "inconclusive."

22. Mamelli testified to the following at Nelson's trial:

- a. Mamelli testified that her ABO-secretor test on the liquid extract of the vaginal swab was "inconclusive."
- b. Mamelli said her results were "inconclusive" for three reasons:
 - i. Masking;
 - ii. Dilution; and
 - iii. The fact that Nelson was a "very weak" secretor.

- c. In terms of masking, Mamelli said Morgan's vaginal fluids "masked" Nelson's H antigens.
- d. In terms of dilution, Mamelli said the following:
 - i. Morgan drained a "copious" amount of vaginal fluid during and after her assault that "diluted" Nelson's H antigens.
 - ii. Morgan may have suffered vaginal trauma and bleeding and the blood "diluted" Nelson's H antigens.
 - iii. Morgan may have urinated after her assault and the urination "diluted" Nelson's H antigens.
 - iv. Morgan's vaginal fluid "diluted" Nelson's H antigens because he's a "very weak" secretor.

Opinions and Conclusions Drawn From Factual Findings

23. Based on the factual findings, here are my opinions and explanations regarding Mr. Cooley's four questions.

24. **Question #1:** Based on Mamelli's serology results – what is my opinion as to the assailant's secretor status? In other words, is the assailant a secretor or non-secretor?

- a. In my expert opinion, **the assailant in this case is a non-secretor** for the following reasons.
 - i. Morgan is an ABO type A non-secretor, while Nelson is an ABO type O secretor.
 - 1. As a non-secretor, as mentioned, Morgan does not secrete her A antigens in her vaginal fluids.
 - 2. As a secretor, though, Nelson secretes his O[H] antigens in his seminal plasma (the watery portion of his seminal fluid).
 - ii. The liquid extract from the vaginal swab that Mamelli tested represented a **mixture** of Morgan's vaginal fluids and the assailant's semen.
 - iii. Moreover, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post coital time interval, and the facts presented in Aiken's two reports plainly indicate that the amount of semen identified on the vaginal swabs was **sufficient** to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.

- iv. Thus, if Nelson was, in fact, the assailant, Mamelli would have identified Nelson's H antigens. Mamelli, however, **did not identify any antigen** in the liquid extract.
 - b. Consequently, based on the absence of any antigenic activity, the fact masking definitely could not occur here, and that it's extremely unlikely dilution occurred here as well, it's my expert opinion that **Morgan's assailant is a non-secretor**.
25. **Question #2:** Is Mamelli's trial testimony – that Morgan's vaginal fluid masked Nelson's H antigens – scientifically possible? In other words, can a non-secretor "mask" a secretor?
- a. Morgan's vaginal fluids **could not have "masked" Nelson's H antigens**, assuming Nelson is, in fact, the assailant.
 - b. "Masking" occurs when a victim's ABO type is identical to, or inclusive of, the culprit's ABO type.
 - i. For instance, if the victim is an AB-secretor and the culprit is an A-secretor, conventional ABO typing would not detect the culprit's ABO type because it's being "masked" by the victim's ABO type. In other words, if ABO typing only detects an A antigen on the victim's vaginal swab, it's impossible to determine whether the A antigen came from the victim or the culprit because both secrete A antigens.
 - ii. A non-secretor, however, cannot "mask" anyone, not even another non-secretor. A capable serology in 1990 should have known this immediately.
 - 1. Morgan is a non-secretor.
 - 2. As a result, **Morgan could not have masked Nelson's H antigens**.
 - iii. Consequently, Mamelli's testimony that Morgan's vaginal fluids "masked" Nelson's H antigens is false and invalid.
26. **Question #3:** Based on Morgan's statement, the post- post coital time, Aiken's sexual assault reports, Mamelli's serology reports, and SERI's serology report, is Mamelli's trial testimony – that Morgan's vaginal fluid diluted Nelson's H antigens – a likely or realistic possibility?
- a. "Dilution" – which is distinct from "masking" – occurs when the ABO antigens become no longer detectable by conventional serology analysis, even though sperm and p30 can still be detected.

- b. In sexual assault cases, dilution is always a possibility, but the **likelihood** dilution occurred here is **extremely unlikely for the following reasons.**
- i. First, the quantity of ABO antigens in semen is extremely high, easily capable of being detected at dilutions of 1:1000.
 1. To fully understand the significance of this, consider that the volume of the average ejaculate is 3.5 milliliters:
 2. If it were to be mixed with 3.5 liters of water, the ABO type would still be detectable.
 3. In my own experience, I have frequently observed detection at the 1:2000 and 1:4000 range, with occasional detection at the 1:8000 range.
 4. Even if the volume of the culprit's ejaculate were only 1 milliliter, an analyst would still be able to detect it if the victim had copiously secreted a liter of vaginal fluid.
 - ii. Second, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post coital time interval, and the facts presented in Aiken's two reports plainly indicate that the amount of semen identified on the vaginal swab was **sufficient** to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.
 - iii. Third, Aiken's two sexual assault reports specifically noted the following facts:
 1. Morgan did not report and Aiken did not observe excessive vaginal drainage after the assault.
 2. Morgan did not report and Aiken did not observe vaginal or anal bleeding and trauma.
 3. Morgan did not bath, douche, and urinate after her assault.
 - iv. Fourth, based on Gary Harmor's April 24, 2012 report, Nelson is not a "very weak" secretor. To the contrary, he is a so-called "run-of-the-mill" secretor who secretors normal levels of antigens in his bodily fluids, including his semen.
- c. Thus, based on these facts, **it is extremely unlikely dilution occurred here.**
- d. These facts, moreover, support my initial conclusion to Question #1 which is: the **most scientifically plausible and sound** answer to why Mamelli did not identify



Nelson's H antigens in the liquid extract from the vaginal swab is that Nelson is not the assailant because the assailant in this case is a non-secretor.

Conclusions and Observations Regarding Mamelli's Trial Testimony

27. It's evident from Mamelli's trial testimony she started with the assumption that Nelson was, in fact, the assailant and then worked backwards from that assumption trying to explain why her serology tests did not identify his H antigens on Morgan's vaginal and anal swabs.
- a. Mamelli's approach was antithetical to the scientific method.
 - b. A capable serologist in 1990 should have known that the proper null hypothesis, in this context, would have been the exact opposite – that Nelson is not the assailant.
 - c. With this hypothesis in place, a capable serologist would've performed her serology tests with the intent of trying to disprove the null hypothesis. Here, disproving the null hypothesis meant identifying H antigens in the liquid extract from the vaginal swab.
 - d. The serology results, however, did not disprove this null hypothesis because it did not identify H antigens in the liquid extract.
28. It's also apparent that her trial testimony is not based on facts in the record, specifically those facts contained in Aiken's two sexual assault reports.
- a. This is most noticeable when Mamelli discussed dilution and the fact that Nelson was supposedly a "very weak" secretor.
 - b. In regards to dilution, Aiken's two sexual assault reports are **void** of observations, facts, evidence, or comments remotely suggesting that:
 - i. Morgan drained a "copious" amount of vaginal fluid;
 - ii. Morgan suffered vaginal bleeding; and
 - iii. Morgan urinated, bathed, or douched after her assault.
 - c. In regards to Nelson's secretor status, there is absolutely no information, data, or evidence in Mamelli's serology reports that support or corroborate her claim that Nelson is a "very weak" secretor.
29. It's also clear Mamelli did not understand the critically important differences between "dilution" and "masking."

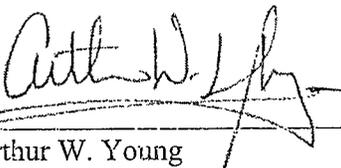
- a. Mamelli's "masking" and "dilution" claims are incorrect for the previously stated reasons.
 - b. A capable serologist in 1990 would have known the critical distinction between these two phenomena.
30. Consequently, Mamelli's trial testimony was wrong, purely speculative, and inappropriate.
- a. It was inappropriate for her to start with the assumption that Nelson was, in fact, the assailant.
 - b. It was even more inappropriate for her to *speculate* as to why she did not identify Nelson's H antigens in the liquid extract from the vaginal swab, especially when masking was not possible and the facts contained in Aiken's sexual assault reports did not support her dilution theory.

Availability in 1990

31. While my opinions are based on my training, education, and experience, they're also based on information, literature, and scientific evidence that was available prior to Nelson's 1990 trial.
32. Moreover, although I wasn't a practicing forensic scientist in 1990, had trial, direct appeal, or initial state post-conviction counsel retained a qualified serologist, he or she would have provided the opinions contained in this affidavit.
33. Had trial counsel, Trent Hall, retained a qualified serologist, the serologist could have advised him in the following ways:
- a. He or she could have prepped him as to what questions to ask Mamelli on cross-examination.
 - b. He or she could have recommended that he have an independent serologist test Nelson's sample to determine whether Nelson is, in fact, a "weak" secretor.
34. Had Nelson's initial post-conviction counsel retained a qualified serology, he or she could have advised him in the following manner:
- a. He or she would have recommended that he have an independent serologist test Nelson's sample to determine whether Nelson is, in fact, a "weak" secretor.
 - b. A qualified serologist would have asked to review Morgan's statements, Aiken's sexual assault reports, Mamelli's serology results, and Mamelli's trial testimony. Had post-conviction counsel provided these materials to a qualified serologist, he or she would have provided the opinions offered in this affidavit.

Disclosure

35. When Mr. Cooley contacted me on April 18, 2012, he did not mention that Gary Harmor had already reviewed the same material and concluded that Mamelli's testimony was false and invalid and that the assailant was a non-secretor. Mr. Cooley purposely did this to prevent Harmor's conclusions and opinions from tainting, impacting, or affecting my conclusions and opinions.
36. Thus, I did not know of Harmor's conclusions and opinions when I reviewed the material Mr. Cooley sent to me. As a result, Harmor's conclusions and opinions did not impact my conclusions and opinions.
37. Only after I conveyed my opinions and conclusions to Mr. Cooley on April 24, 2012, did he inform me of Harmor's conclusions and opinions.
38. I reviewed Nelson's material and provided this affidavit to Mr. Cooley free of charge. I did not charge the Innocence Project for my services.



Arthur W. Young
Guardian Forensic Sciences

Dated: April 25, 2012

ARTHUR W. YOUNG

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EDUCATION

College	University of Southwestern Louisiana, Lafayette, LA (1986 - 1991) Degree: Bachelor of Science Major: Pre-Medical Sciences/Biology Concentrations: Chemistry and Microbiology
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TRAINING

Forensic Serology	Southwestern Association of Forensic Scientists, Colorado Springs, CO (1995) Southern Association of Forensic Scientists, Houston, TX (1994) Southwestern Association of Forensic Scientists, South Padre Island, TX (1993) Forensic Science Research and Training Center, Quantico, VA (1992) North Louisiana Crime Lab, Shreveport, LA (1992) Southern Association of Forensic Scientists / Southwestern Association of Forensic Scientists / Southwestern Association of Toxicologists, Shreveport, LA (1992) Tarrant County Medical Examiner's Office and Forensic Labs, Ft. Worth, TX (1992)
Forensic DNA Analysis	Serological Research Institute, Richmond, CA (1991, 1992) Association of Forensic DNA Analysts and Administrators, Austin, TX (2008) Mid-Atlantic Association of Forensic Scientists, Washington, DC (2007) Tennessee Bureau of Investigation, Nashville, TN (2003) Mid-Atlantic Association of Forensic Scientists, Frederick, MD (2002) Southwestern Working Group on DNA Analysis Methods, Austin, TX (1998, 2000) Applied BioSystems, Foster City, CA (1998) North Louisiana Crime Lab, Shreveport, LA (1997, 1999) Forensic Science Research and Training Center, Quantico, VA (1996) Tulane University/GenTest Laboratories (1996) Southwestern Association of Forensic Scientists, Colorado Springs, CO (1995)
DNA Mixtures	Promega, Pikesville, MD (2011) American Academy of Forensic Sciences, Washington, DC (2008) 310 CE Users' Group, ATF Lab, Beltsville, MD (2008)
Low-Template DNA Analysis Y-STR DNA Analysis	Promega, San Antonio, TX (2010) Tennessee Bureau of Investigation, Nashville, TN (2003) Association of Forensic DNA Analysts and Administrators, Austin, TX (2003)
GeneMapper Software Forensic Biological Microscopy Polarized Light Microscopy Statistics	Applied BioSystems, Foster City, CA (2007) North Louisiana Crime Lab, Shreveport, LA (2001) McCrone Research Institute (1991, 1997) Promega, Pikesville, MD (2011) Promega, Las Vegas, NV (2009) Mid-Atlantic Association of Forensic Scientists, Rockville, MD (2007) Association of Forensic DNA Analysts and Administrators, Austin, TX (2006) Association of Forensic DNA Analysts and Administrators, Austin, TX (2001) Southwestern Working Group on DNA Analysis Methods, Austin, TX (1999) National Forensic Science Training Center, St. Petersburg, FL (1996) SAIC, Clarksville, WV (2001)
CODIS Crime Scene Processing	Southern Association of Forensic Scientists / Southwestern Association of Forensic Scientists / Southwestern Association of Toxicologists, Shreveport, LA (1992)
Blood Spatter	Spalding Forensics, Centreville, VA (2002) University of Tennessee, Memphis, TN (1996)
Photography Courtroom Testimony	Louisiana Association of Scientific Crime Investigators, New Iberia, LA (1993) Mid-Atlantic Association of Forensic Scientists, Wilmington, DE (2004) Quantum Communications, San Carlos, CA (2001) American Academy of Forensic Sciences, Colorado Springs, CO (1992)
Hair Examination	California Criminalistics Institute, Sacramento, CA (1996)

TRAINING (CONTINUED)

Law	Mid-Atlantic Association of Forensic Scientists, Annapolis, MD (2003) Southwestern Working Group on DNA Analysis Methods, Austin, TX (2000, 2002)
Laboratory Auditing	Federal Bureau of Investigation, Quantico, VA (2004) California Criminalistics Institute, Sacramento, CA (1997)
Serial and Signature Homicides	American Academy of Forensic Sciences, Colorado Springs, CO (2004)
Improvised Explosive Devices	Mid-Atlantic Association of Forensic Scientists, Annapolis, MD (2003)
Drug-related Crimes	Markle Symposium, Henry C. Lee Institute of Forensic Science, New Haven, CT (2006)
Ethics	Promega, Las Vegas, NV (2009)

EXPERIENCE

Forensic Science	Guardian Forensic Sciences, Willow Grove, PA (2010 - present) NMS Labs, Willow Grove, PA (2002 - 2010) Arcadia University, Glenside, PA (2004 - 2008) Acadiana Criminalistics Laboratory, New Iberia, LA (1991 - 2001)
Photography	Maison de Portrait/Jay Fugot Photography, Lafayette, LA (1986 - 2001) Jeff Nemetz Photography, Abbeville, LA (1996 - 2001)
Medicine/Pathology/Clinical Lab	University Medical Center, Lafayette, LA (1989 - 1991)

PUBLICATIONS

- Young, Arthur W. "Cracking the Code: Understanding DNA Evidence." How to Try a Rape Case (PBI publication #4416). Mechanicsburg, PA: Pennsylvania Bar Institute, May 2006. Library of Congress Card Catalog Number 2006923621
- Young, Arthur W. "Crime Scene Processing and Forensic DNA." CSI at PBI (PBI publication #2011-6590). Mechanicsburg, PA: Pennsylvania Bar Institute, 2011. Library of Congress Card Catalog Number 2010935230

COURTROOM TESTIMONY

- Forensic serology
- Forensic DNA analysis
- Blood stain pattern interpretation

PROFESSIONAL ASSOCIATIONS

- American Academy of Forensic Sciences - Member
- American Board of Criminalistics - Fellow
- Association of Forensic DNA Analysts and Administrators - Member; past Chairperson
- International Association of Bloodstain Pattern Analysts - Member
- Mid-Atlantic Association of Forensic Scientists - Member
- Southern Association of Forensic Scientists - Member

LECTURES / WORKSHOPS GIVEN

Louisiana Association of Scientific Crime Investigators	"Collection and Preservation of Biological Samples" "Forensic Photography"
Sexual Abuse Response Center Volunteer Training Group	"The Collection, Preservation, and Analysis of Sexual Assault Evidence"
Acadiana Law Enforcement Training Academy	"Collection and Preservation of Biological Samples"
Louisiana Sheriffs' Association	"Forensic DNA Analysis in the 21st Century"
Association of Forensic DNA Analysts and Administrators	"An Introduction to Macintosh Computers" "The MicroTakayama Crystal Test" "A Survey of Report Writing Methods" "Non-Basic Body Fluid Analysis: Urine, Feces, Vaginal Fluid, and Saliva"
American Chemical Society	"Forensic DNA Analysis"
Louisiana Association of Forensic Scientists	"Lugol's Stain and Glycogenated Epithelial Cells" "Understanding the Louisiana Criminal Code"
St. Thomas More High School	"Forensic Science as a Career"
American Association of Critical Care Nurses	"Evidence Lost: The Role of the Nurse in the Forensic Investigation"
Temple University	"Forensic DNA Analysis in the 21st Century"

LECTURES / WORKSHOPS GIVEN (CONTINUED)

Tri-County Area Detectives	"Forensic DNA Analysis in the 21st Century"
Mid-Atlantic Association of Forensic Scientists	"Maxxing Your Macs" "The MicroTakayama Crystal Test" "The Identification of Human Saliva"
Montgomery County Technical Career Center	"Forensic Science as a Career"
American Academy of Forensic Science	"The Identification of Human Saliva"
Pennsylvania Society for the Prevention of Cruelty to Animals	"CSI Meets <i>Animal Cops</i> , With A Dash Of <i>MacGyver</i> : Novel Forensic Solutions To The Humane Officer's Cases"
Pennsylvania District Attorneys Association	"Updates in Forensic Science"
Cheltenham Township Police Department	"Collecting and Preserving Biological Evidence"
Abington Township Police Department, Montgomery County D.A.'s Office, and surrounding agencies	"Collecting and Preserving Biological Evidence"
Markle Symposium (Henry C. Lee Institute)	"Drug-Facilitated Rape: From Collection and Preservation to Analysis and Beyond"
Pennsylvania Bar Institute	"DNA Evidence in Rape Cases"
Association of Forensic DNA Analysts and Administrators	"Strategies for Success: Vacuum Swabs, Vacuum Filters, and Concentrating DNA Extracts"
Philadelphia Police Department Crime Scene Unit	"Basic, Advanced, and Forensic Photography"
Abington Township Police Department, Montgomery County D.A.'s Office, and surrounding agencies	"Basic, Advanced, Forensic, and Advanced Forensic Photography"
International Homicide Investigators Association	"The Case of Deanna Wright-McIntosh"
Southeast Pennsylvania Police Chiefs' Association	"Forensic DNA Analysis in the 21 st Century: 2007 Update"
Philadelphia Defender Association	"Creative Uses of Forensic DNA Analysis to Exculpate"
Delaware County police agencies	"The Forensic Biologist: Your New Partner in Crime"
Montgomery County Technical Career Center	"Forensic Science as a Career"
Montgomery County Public Defender's Office, Montgomery County District Attorney's Office, Philadelphia Defender Association, and area attorneys	"Unravelling DNA's Mysteries: From Molecules to Statistics"
Philadelphia High School for Girls	"Forensic Science as a Career"
Montgomery County District Attorney's Office and Montgomery County police agencies	"Sexual Assault Evidence: From Collection and Preservation to Analysis and Beyond"
Philadelphia Defender Association	"Attacking DNA Evidence: Who, What, When, Where, and Why"
LeadAmerica	"Forensic DNA Analysis in the 21 st Century" "Blood Stain Pattern Interpretation"
United States Attorney General's Office - Philadelphia	"Unravelling DNA's Mysteries: From Molecules to Statistics"
Virginia Homicide Investigators Association	"Forensic DNA Analysis in the 21 st Century" "The Case of Deanna Wright-McIntosh"
Delaware County police agencies	"The Forensic Biologist: Your New Partner in Crime"
Monmouth County Public Defenders Office	"Unravelling DNA's Mysteries: From Molecules to Statistics"
The Innocence Project	"Forensic Serology"

LECTURES / WORKSHOPS GIVEN (CONTINUED)

Hawaii Police Department	"Forensic DNA Analysis in the 21 st Century"
The Innocence Project	"Forensic DNA Analysis in the 21 st Century"
LeadAmerica	"Forensic DNA Analysis in the 21 st Century"
	"Blood Stain Pattern Interpretation"
LeadAmerica	"Forensic DNA Analysis in the 21 st Century" (07/19/10)
	"Blood Stain Pattern Interpretation" (07/19/10)
Montgomery Bar Association	"Cracking the Code"
Promega's 21st International Symposium on Human Identification	"Remembering Deanna"
York City Police Department	"Collecting and Preserving Biological Evidence"
	"Forensic DNA Analysis in the 21st Century"
Pennsylvania Bar Institute	"Behind the Curtain: A Peek at How Scientists Think, the Principles of Crime Scene Processing, and the Basics of Forensic DNA Analysis"
B.J. Burnham Death Scene Awareness Symposium	"Genetic Material: From Death Scene to Lab"
Delaware County Fraternal Order of Police Lodge #27	"Cracking the Code: Understanding Forensic DNA Analysis"
Defence Headquarters (Abuja, Nigeria, Africa)	"DNA Profiling in Forensics: Benefits, Privacy Concerns, and Application in the Identification of Human Remains"
Pennsylvania State Coroners Association	"Forensic DNA Analysis"

EXHIBIT 6

IN THE CRIMINAL COURT FOR SHELBY COUNTY, TENNESSEE

RICKY LEE NELSON,)	
Petitioner,)	
)	
)	SHELBY COUNTY
v.)	Case No. 89-04384
)	89-04385
)	89-04386
STATE OF TENNESSEE,)	
Respondent)	

AFFIDAVIT OF ROBERT SHALER

1. I'm a DNA and serology expert with more than thirty years of experience collecting, processing, analyzing, and interpreting DNA and serology results.
 - a. From 2005 to 2010 I served as a professor of biochemistry and molecular biology at Pennsylvania State University, having founded and directed Penn State's Forensic Science Program.
 - b. Prior to joining Penn State, I served as an adjunct associate professor of pathology and forensic medicine at the New York University School of Medicine from 1978 to 2005 and an adjunct professor and adjunct associate professor at the City University of New York from 1993 to 1995.
 - c. From 1990 to 2005, I was the Director of the Department of Forensic Biology at the Office of the Chief Medical Examiner in New York City, where I performed and directed forensic biological analyses for all homicide investigations until 2005.
 - d. From 1987 to 1989, I was the Director of Forensic-Science Technical Support, Training, and Business Development at Lifecodes Corporation in New York – the nation's first forensic-DNA laboratory.
 - e. In addition, I served as director of serology at the Office of the Chief Medical Examiner in New York City from 1978 to 1986, and director of forensic science at the Aerospace Corporation in Washington, DC, in 1977 and 1978.
 - f. I worked as a criminalist at the Pittsburgh and Allegheny County Crime Lab from 1970 to 1975, and was a research director there in 1974 and 1975.
2. I have also served as a forensic-science consultant for government agencies and professional organizations.

- a. I was a member of the American Bar Association Task Force on Biological Evidence and was an author of the 2009 National Research Council (NRC) report, *Strengthening the Forensic Sciences – A Path Forward*, published by the National Academy of Sciences.
 - b. My other professional activities have included serving on the editorial review board of the *American Journal of Forensic Pathology and Medicine* and as an invited reviewer for the *New England Journal of Medicine*.
 - c. I am also member and the chair of the New York State Crime Laboratory Advisory Committee.
3. I am the author of the textbook: *Crime Scene Forensics – A Scientific Method Approach*. Published by Taylor and Francis, 2012.
4. My resume is attached hereto as Exhibit 1. .
5. On May 4, 2012, Craig Cooley, an Innocence Project Staff Attorney, retained me in regards to Ricky Lee Nelson's case. *See State v. Ricky Nelson*, Case No. P-11480 (Shelby County, TN). Nelson stands convicted of Francis Morgan's February 1989 sexual assault.

Material Reviewed

6. When Mr. Cooley retained me, he sent me the following material to review:
 - a. Ricky Nelson's DNA testing motion;
 - b. The State's response to Nelson's DNA motion;
 - c. Judge John Colton's August 30, 2010 order denying DNA testing;
 - d. Margaret Aiken's February 19, 1989, Physical Examiner's Checklist;
 - e. Margaret Aiken's February 19, 1989, Medical Examination of Sexually Assaulted Person's Report;
 - f. Jo Ann Mamelli's August 10, 1990 Rape Kit Evidence Report;
 - g. Memphis Police Department, Incident Report, February 19, 1989;
 - h. Release of Evidence Form, August 3, 1990;
 - i. Memphis Police Department, Supplementary Offense Report;

- j. Frances Ann Morgan's Statement, February 19, 1989;
- k. Angela Jean Young's Statement, February 19, 1989;
- l. Jo Ann Mamelli's Trial Testimony; and
- m. Margret Aiken's Trial Testimony;
- n. SERI's April 24, 2012 Serology Report.

Questions Presented

7. Mr. Cooley asked me to review the material and answer the following questions regarding Jo Ann Mamelli's serology testing, results, and trial testimony:
- a. **Question #1:** Based on Mamelli's serology results – what is my opinion as to the assailant's secretor status? In other words, is the assailant a secretor or non-secretor?
 - b. **Question #2:** Is Mamelli's trial testimony – that Morgan's vaginal fluid masked Nelson's H antigens – scientifically possible? In other words, can a non-secretor "mask" a secretor?
 - c. **Question #3:** Based on Morgan's statement, the post- post coital time, Aiken's sexual assault reports, Mamelli's serology reports, and SERI's serology report, is Mamelli's trial testimony – that Morgan's vaginal fluid diluted Nelson's H antigens – a likely or realistic possibility?
 - d. **Question #4:** Based on Mamelli's serology reports – is there a factual basis supporting Mamelli's trial testimony that Nelson is a "very weak" secretor?
8. Based on my review of Morgan's statements, Aiken's sexual assault reports, Mamelli's serology results, and her trial testimony, here are my short answers to Mr. Cooley's questions.
- a. **Answer: #1:** Based on the material I reviewed, I believe the assailant in this case is a **non-secretor**. I will explain the basis of my opinion in the proceeding sections.
 - b. **Answer #2:** Mamelli's trial testimony – that Morgan's vaginal fluids "masked" Nelson's H antigens – is **not scientifically possible**. Morgan is a non-secretor and non-secretors cannot mask anyone, especially a secretor like Nelson. Morgan's testimony, in this respect, was false and invalid.
 - c. **Answer #3:** Mamelli's trial testimony – that Nelson is a "very weak" secretor – has **no factual support** in her serology reports and notes. Moreover, based on

SERI's April 24, 2012 serology results, we know Nelson is not a "very weak" secretor.

- d. **Answer #4:** There's always a possibility of dilution in sexual assault cases, but the likelihood that Morgan's vaginal fluids diluted Nelson's H antigens, assuming he's in fact the assailant, is extremely unlikely in this case. I will explain the basis of my opinion in the proceeding sections.

A Primer on Conventional Serology

9. A brief primer on conventional serology will preface my findings and conclusions.
10. Conventional serology involves analyzing fluids for certain markers that are lifelong individual characteristics, based principally on water soluble ABO blood group substances and specific isoenzymes, such as the phosphoglucomutase ("PGM") enzyme genetic marker system.
11. The ABO blood group antigens are found on the surface of red blood cells. Within this genetic marker system there are four possible general types: A, B, AB, and O.
12. Based on the analysis of more than 70,000 samples, scientists determined that approximately 40% of the Caucasian population is type A, 11% type B, 45% type O, and 4% type AB.¹
13. For African-Americans, 23% are type A, 22% type B, 51% type O, and 4% type AB. *Id.* The following chart summarizes these statistics:

ABO Blood Group Frequencies		
Caucasians	Type	African-Americans
40%	A	23%
11%	B	22%
45%	O	51%
4%	AB	4%

14. Every member of the population falls into one of these four types and every member of the population has the appropriate A, B, AB, or O blood group antigens on the surface of his or her red blood cells.
15. Those population members who are deemed *secretors*, which is approximately 80% of the population, will also have the corresponding blood group antigen dissolved in the watery portion of several body fluids, including *saliva, semen, and vaginal fluid*.
16. Individuals deemed *non-secretors*, which are roughly 20% of the population, will not have the corresponding blood group antigen in the watery portion of their body fluids

¹ See Dale Dykes, *Probability of Inclusion in Paternity Testimony – A Technical Workshop*, AMERICAN ASSOCIATION OF BLOODBANKS (1982).

even though they have blood group antigens on the surface of their red blood cells. Thus, a female who's a non-secretor **will not** secrete her blood antigen in her vaginal secretions.

17. Moreover, individuals who are A, B, or AB secretors, in addition to possessing the appropriate A, B, or AB blood group antigen, also possess the H[O] blood group antigen.
18. This is so because the H[O] blood group antigen is a precursor substance upon which the A and B blood group antigens are built.²
19. The following chart summarizes the critical differences between secretors and non-secretors:

ABO Genetic Marker System			
Antigens Found in the Cells of Body Fluid			
Secretions of Secretors and Non-Secretors			
Antigens on Red Blood Cells for Secretors and Non-Secretors		Secretions of Secretors and Non-Secretors	
Secretors	Non-Secretors	Secretors	Non-Secretors
A		A, H	Negative
B		B, H	Negative
AB		A, B, H	Negative
O[H]		H	Negative

Factual Findings

20. Here are the facts as presented in the Morgan's statement, Aiken's two sexual assault reports, Mamelli's serology results, and Mamelli's.
21. The assault, as reported by Morgan, occurred at 9:30 a.m. on February 19, 1989 and Morgan arrived at the rape crisis center at 12:20 p.m. the same day where Margaret Aiken examined her.
22. Aiken reported the following facts and observations in her *Physical Examiner's Checklist* report:
 - a. There was no bloody external physical trauma to Morgan's genitalia;
 - b. She identified non-motile sperm;
 - c. Morgan was not menstruating;

² See George F. Sensabaugh, Jan Bashinski & Edward T. Blake, *The Laboratory's Role in Investigating Rape*, *Diagnostic Medicine* 4 (March 1985); PAUL C. GIANNELLI AND EDWARD L. IMWINKELRIED, JR., *SCIENTIFIC EVIDENCE* § 17.09 (2007).

- d. Morgan did not shower, bath, or douche after her assault;
- e. Morgan told Aiken her assailant did not wear a condom;
- f. Morgan reported vaginal penetration with ejaculation;
- g. Morgan did not report or mention excessive or excess drainage of vaginal fluids during or after her assault.

23. Aiken reported the following facts and observations in her *Medical Examination of Sexually Assaulted Persons* report:

- a. Aiken wrote “No trauma to vaginal or anal areas. No bleeding or discharge”;
- b. Aiken again noted that Morgan did not urinate, bath, douche, or shower after her assault;
- c. Aiken again noted that she identified non-motile sperm.

24. Mamelli performed her serology examinations on the following dates.

- a. On March 16, 1989, Mamelli tested Morgan’s blood and saliva sample.
 - i. Morgan’s had type A blood.
 - ii. Morgan’s saliva sample presented with no ABO blood antigens meaning she’s a non-secretor. As a non-secretor, Morgan’s vaginal fluid would not present with any ABO blood antigens.
- b. On March 20th and 27th 1989, Mamelli performed visual and chemical examinations on the vaginal swab from Morgan’s rape kits.
 - i. Mamelli visually identified a moderate number of “intact” sperm – or sperm with tails – on the vaginal swabs.
 - ii. Mamelli had a positive acid phosphatase (AP) result on the vaginal swab sample. The AP test is a presumptive test for semen.
 - iii. Mamelli also had a strong positive p30 result on the vaginal swab sample. P30 is a protein found in seminal fluid and its detection is conclusive evidence of the presence of semen. Here, Mamelli reported a “3” in her report indicating there was a significant amount of p30 on the vaginal swab.
- c. On August 6, 1990, Mamelli conducted an ABO secretor test on a liquid extract made from the vaginal swab.

- i. The liquid extract was a mixture of Morgan's vaginal fluid and the assailant's semen.
 - ii. The results were **negative** for ABO antigens A, B, and O.
- d. On August 6, 1990, Mamelli chemically tested Nelson's blood and saliva samples.
 - i. Nelson was determined to be an ABO type O and a secretor. As a type O secretor, the seminal plasma (the watery portion of Nelson's semen) would contain the O[H] or H antigen.
 - ii. On her report, Mamelli handwrote the word "inconclusive."

25. Mamelli testified to the following at Nelson's trial:

- a. Mamelli testified that her ABO-secretor test on the liquid extract of the vaginal swab was "inconclusive."
- b. Mamelli said her results were "inconclusive" for three reasons:
 - i. Masking;
 - ii. Dilution; and
 - iii. The fact that Nelson was a "very weak" secretor.
- c. In terms of masking, Mamelli said Morgan's vaginal fluids "masked" Nelson's H antigens.
- d. In terms of dilution, Mamelli said the following:
 - i. Morgan drained a "copious" amount of vaginal fluid during and after her assault that "diluted" Nelson's H antigens.
 - ii. Morgan may have suffered vaginal trauma and bleeding and the blood "diluted" Nelson's H antigens.
 - iii. Morgan may have urinated after her assault and the urination "diluted" Nelson's H antigens.
 - iv. Morgan's vaginal fluid "diluted" Nelson's H antigens because he's a "very weak" secretor.

Opinions and Conclusions Drawn From Factual Findings

26. Based on the factual findings, here are my opinions and explanations regarding Mr. Cooley's four questions.
27. **Question #1:** Based on Mamelli's serology results – what is my opinion as to the assailant's secretor status? In other words, is the assailant a secretor or non-secretor?
- a. In my expert opinion, **the assailant in this case is a non-secretor** for the following reasons.
 - i. Morgan is an ABO type A non-secretor, while Nelson is an ABO type O secretor.
 1. As a non-secretor, as mentioned, Morgan does not secrete her A antigens in her vaginal fluids.
 2. As a secretor, though, Nelson secretes his O[H] antigens in his seminal plasma (the watery portion of his seminal fluid).
 - ii. The liquid extract from the vaginal swab that Mamelli tested represented a **mixture** of Morgan's vaginal fluids and the assailant's semen.
 - iii. Moreover, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post coital time interval, and the facts presented in Aiken's two reports plainly indicate that the amount of semen identified on the vaginal swabs was **sufficient** to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.
 - iv. Thus, if Nelson was, in fact, the assailant, Mamelli would have identified Nelson's H antigens. Mamelli, however, **did not identify any antigen** in the liquid extract.
 - b. Consequently, based on the absence of any antigenic activity, the fact masking definitely could not occur here, and that it's extremely unlikely dilution occurred here as well, it's my expert opinion that **Morgan's assailant is a non-secretor.**
28. **Question #2:** Is Mamelli's trial testimony – that Morgan's vaginal fluid masked Nelson's H antigens – scientifically possible? In other words, can a non-secretor "mask" a secretor?
- a. Morgan's vaginal fluids **could not have "masked" Nelson's H antigens,** assuming Nelson is, in fact, the assailant.

- b. "Masking" occurs when a victim's ABO type is identical to, or inclusive of, the culprit's ABO type.
 - i. For instance, if the victim is an AB-secretor and the culprit is an A-secretor, conventional ABO typing would not detect the culprit's ABO type because it's being "masked" by the victim's ABO type. In other words, if ABO typing only detects an A antigen on the victim's vaginal swab, it's impossible to determine whether the A antigen came from the victim or the culprit because both secret A antigens.
 - ii. A non-secretor, however, cannot "mask" anyone, not even another non-secretor. A capable serology in 1990 should have known this immediately.
 - 1. Morgan is a non-secretor.
 - 2. As a result, Morgan could not have masked Nelson's H antigens.
 - iii. Consequently, Mamelli's testimony that Morgan's vaginal fluids "masked" Nelson's H antigens is false and invalid.

29. **Question #3:** Based on Morgan's statement, the post- post coital time, Aiken's sexual assault reports, Mamelli's serology reports, and SERI's serology report, is Mamelli's trial testimony – that Morgan's vaginal fluid diluted Nelson's H antigens – a likely or realistic possibility?

- a. "Dilution" – which is distinct from "masking" – occurs when the ABO antigens become no longer detectable by conventional serology analysis, even though sperm and p30 can still be detected.
- b. In sexual assault cases, dilution is always a possibility, but the likelihood dilution occurred here is extremely unlikely for the following reasons.
 - i. First, the quantity of ABO antigens in semen is extremely high, easily capable of being detected at dilutions of 1:1000.
 - 1. To fully understand the significance of this, consider that the volume of the average ejaculate is 3.5 milliliters:
 - 2. If it were to be mixed with 3.5 liters of water, the ABO type would still be detectable.
 - 3. In my own experience, I have frequently observed detection at the 1:2000 and 1:4000 range, with occasional detection at the 1:8000 range.

4. Even if the volume of the culprit's ejaculate were only 1 milliliter, an analyst would still be able to detect it if the victim had copiously secreted a liter of vaginal fluid.
- ii. Second, the quantity of intact sperm, the strong positive AP and p30 results, the three hour post coital time interval, and the facts presented in Aiken's two reports plainly indicate that the amount of semen identified on the vaginal swab was **sufficient** to detect the semen donor's ABO type and secretor status if the assailant was, in fact, a secretor.
- iii. Third, Aiken's two sexual assault reports specifically noted the following facts:
 1. Morgan did not report and Aiken did not observe excessive vaginal drainage after the assault.
 2. Morgan did not report and Aiken did not observe vaginal or anal bleeding and trauma.
 3. Morgan did not bath, douche, and urinate after her assault.
- iv. Fourth, based on Gary Harmor's April 24, 2012 report, Nelson is not a "very weak" secretor. To the contrary, he is a so-called "run-of-the-mill" secretor who secretors normal levels of antigens in his bodily fluids, including his semen.
- c. Thus, based on these facts, **it is extremely unlikely dilution occurred here.**
- d. These facts, moreover, support my initial conclusion to Question #1 which is: the **most scientifically plausible and sound** answer to why Mamelli did not identify Nelson's H antigens in the liquid extract from the vaginal swab is that Nelson is not the assailant because the assailant in this case is a non-secretor.

Conclusions and Observations Regarding Mamelli's Trial Testimony

30. It's evident from Mamelli's trial testimony she started with the assumption that Nelson was, in fact, the assailant and then worked backwards from that assumption trying to explain why her serology tests did not identify his H antigens on Morgan's vaginal and anal swabs.
 - a. Mamelli's approach was antithetical to the scientific method.
 - b. A capable serologist in 1990 should have known that the proper null hypothesis, in this context, would have been the exact opposite – that Nelson is not the assailant.

- c. With this hypothesis in place, a capable serologist would've performed her serology tests with the intent of trying to disprove the null hypothesis. Here, disproving the null hypothesis meant identifying H antigens in the liquid extract from the vaginal swab.
 - d. The serology results, however, did not disprove this null hypothesis because it did not identify H antigens in the liquid extract.
31. It's also apparent that her trial testimony is not based on facts in the record, specifically those facts contained in Aiken's two sexual assault reports.
- a. This is most noticeable when Mamelli discussed dilution and the fact that Nelson was supposedly a "very weak" secretor.
 - b. In regards to dilution, Aiken's two sexual assault reports are void of observations, facts, evidence, or comments remotely suggesting that:
 - i. Morgan drained a "copious" amount of vaginal fluid;
 - ii. Morgan suffered vaginal bleeding; and
 - iii. Morgan urinated, bathed, or douched after her assault.
 - c. In regards to Nelson's secretor status, there is absolutely no information, data, or evidence in Mamelli's serology reports that support or corroborate her claim that Nelson is a "very weak" secretor.
32. It's also clear Mamelli did not understand the critically important differences between "dilution" and "masking."
- a. Mamelli's "masking" and "dilution" claims are incorrect for the previously stated reasons.
 - b. A capable serologist in 1990 would have known the critical distinction between these two phenomena.
33. Consequently, Mamelli's trial testimony was wrong, purely speculative, and inappropriate.
- a. It was inappropriate for her to start with the assumption that Nelson was, in fact, the assailant.
 - b. It was even more inappropriate for her to *speculate* as to why she did not identify Nelson's H antigens in the liquid extract from the vaginal swab, especially when

masking was not possible and the facts contained in Aiken's sexual assault reports did not support her dilution theory.

Availability in 1990

34. While my opinions are based on my training, education, and experience, they're also based on information, literature, and scientific evidence that was available prior to Nelson's 1990 trial.
35. Moreover, had trial, direct appeal, or initial state post-conviction counsel contacted me, I would have provided the opinions contained in this affidavit.
36. Had trial counsel, Trent Hall, contacted me I would have advised him in the following ways:
 - a. I would have prepped him as to what questions to ask Mamelli on cross-examination.
 - b. I would have recommended that he have an independent serologist, like me, test Nelson's sample to determine whether Nelson is, in fact, a "weak" secretor.
37. Had Nelson's initial post-conviction counsel contacted me I could have advised him in the following manner:
 - a. I would have recommended that he have an independent serologist test Nelson's sample to determine whether Nelson is, in fact, a "weak" secretor.
 - b. I would have reviewed Morgan's statements, Aiken's sexual assault reports, Mamelli's serology results, and Mamelli's trial testimony. Had initial post-conviction counsel provided me with this material, I would have provided the opinions offered in this affidavit.

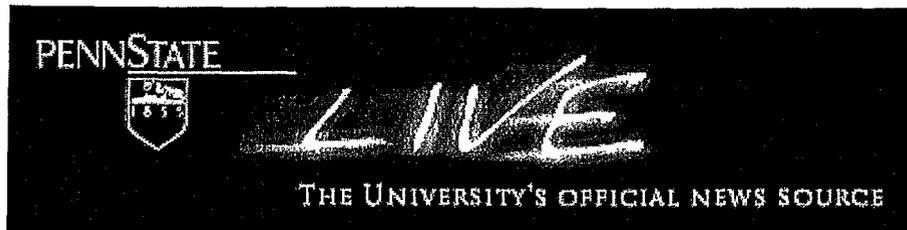
Disclosure

38. When Mr. Cooley contacted me on May 4, 2012, he did not mention that Gary Harmor and Arthur Young had already reviewed the same material and concluded that Mamelli's testimony was false and invalid and that the assailant was a non-secretor. Mr. Cooley purposely did this to prevent Harmor's and Young's conclusions and opinions from tainting, impacting, or affecting my conclusions and opinions.
39. Thus, I did not know of Harmor's or Young's conclusions and opinions when I reviewed the material Mr. Cooley sent to me. As a result, Harmor's and Young's conclusions and opinions did not impact my conclusions and opinions.
40. Only after I conveyed my opinions and conclusions to Mr. Cooley on May 12, 2012, did he inform me of Harmor's and Young's conclusions and opinions.

41. I reviewed Nelson's material and provided this affidavit to Mr. Cooley free of charge. I did not charge the Innocence Project for my services.

/s/ Robert Shaler
Robert Shaler
Serology/DNA Expert

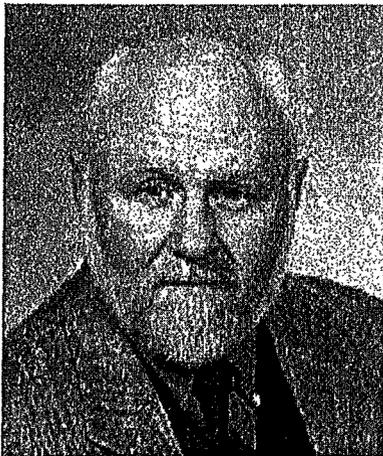
Dated: May 14, 2012



Bob Shaler, founding director of the forensic science program, retires

Bob Shaler, founding director of the forensic science program, retires

Thursday, August 12, 2010



Credit: Penn State

Robert C. Shaler, professor of biochemistry and molecular biology, has retired after having served as the founding director of the Penn State Forensic Science Program since 2005.

Robert C. Shaler, professor of biochemistry and molecular biology, has retired after having served as the founding director of the **Penn State Forensic Science Program** since 2005. Shaler is well known for supervising the massive DNA-testing effort to identify thousands of victims of the 9/11 World Trade Center attacks, and he is the author of "Who They Were: Inside the World Trade Center DNA Story: The Unprecedented Effort to Identify the Missing."

Throughout his career, Shaler made many important research contributions to the field of forensic science. Most recently, in 2010, he and Penn State colleague Ahklesh Lakhtakia created an innovative process to reveal hard-to-detect fingerprints on nonporous surfaces. Early in his career, he conducted a study on bloodstain evidence that led to the development of a bloodstain-analysis system that was used as the standard in forensic laboratories

until the early 1990s.

As a Penn State faculty member, Shaler is known for his strong commitment to teaching solid scientific principles while using engaging classroom techniques. "One of Bob's greatest qualities is his ability to relate to his students," said Mitchell Holland, associate professor of biochemistry and molecular biology and director of Penn State's forensic-science program. "Both students and other faculty members absolutely love him. In fact, we nicknamed him our resident version of Santa Claus." Shaler also has been dedicated to public outreach and education. In 2008, he led a TV show, "**Crime Scene University**" on the Investigation Discovery Channel, in which students from Penn State and other universities investigated simulated crime scenes. The online version of this course is available through Penn State's World Campus. "The course has become very popular," Holland said. "Students have ranged from the general public to working professionals such as police officers."

In addition to teaching and doing research, Shaler has served as a forensic-science consultant for government agencies and professional organizations. He was a member of the American Bar Association Task Force on Biological Evidence and was an author of a 2009 National Research Council (NRC) report, "Strengthening the Forensic Sciences -- A Path Forward," published by the National Academy of Sciences. He currently serves on another NRC committee studying the FBI's scientific response to the 2001 anthrax mailings. His other professional activities have included serving on the editorial review board of the American Journal of Forensic Pathology and Medicine and as an invited reviewer for the New England Journal of Medicine. He was a member and the chair of the New York State Crime Laboratory Advisory Committee, and he also has been an expert guest commentator for Court TV.

Prior to joining Penn State, Shaler was an adjunct associate professor of pathology and forensic medicine at the New York University School of Medicine from 1978 to 2005 and an adjunct professor and adjunct associate professor at the City University of New York from 1993 to 1995. From 1990 to 2005, he was director of the Department of Forensic Biology at the Office of the Chief Medical Examiner in New York City, where he performed and directed forensic biological analyses for all homicide investigations until 2005. From 1987 to 1989, he was director of Forensic-Science Technical Support, Training, and Business Development at Lifecodes Corporation in New York -- the nation's first forensic-DNA laboratory. In addition, Shaler served as director of serology at the Office of the Chief Medical Examiner in New York City from 1978 to 1986, and director of forensic science at the Aerospace Corporation in Washington, DC, in 1977 and 1978. He worked as a criminalist at the Pittsburgh and Allegheny County Crime Lab from 1970 to 1975, and was a research director there in 1974 and 1975. Shaler held several positions at the University of Pittsburgh, where he was an instructor of forensic chemistry and a research assistant professor of chemistry from 1974 to 1977, a clinical assistant professor from 1973 to 1975, and an assistant professor of medicinal chemistry in the School of Pharmacy from 1970 to 1973.

Shaler earned his master's and doctoral degrees in biochemistry at Penn State in 1966 and 1968, respectively. In 2003, he received an honorary doctoral degree from the State University of New York at Stony Brook. Shaler is a member of the American Association for the Advancement of Science, the New York Academy of Science, the Northeast Association of Forensic Scientists, and the New Jersey Association of Forensic Scientists.

Shaler's plans for retirement include authoring a textbook, "An Introduction to the Scientific Method in Crime Scene Investigation" (Taylor Francis publishers), and recording audio lessons for the Modern Scholar Series. He will continue to supervise research at Penn State. In addition, he plans to attend regional cooking schools in

Mexico and other countries.

Contact

- ○ **Barbara Kennedy**
- 814-863-4682
- <http://www.science.psu.edu/frontpagenews/news-and-events>

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EXHIBIT 7

PHYSICAL EXAMINER'S CHECKLIST (FEMALE)

CASE # 149
VICTIM'S NAME Frances Morgan AGE 38 RACE B
DATE/TIME OF ASSAULT 2-19-89 9³⁰A MARITAL STATUS Married
DATE/TIME OF EXAM 2-19-89 12³⁰P

1. Bloody external physical trauma excluding genitalia: Absent Present
2. Menstrual flow: Absent Present Date of last period 2-12-89
3. Bloody genital trauma: Absent Internal External Vaginal Anal
4. Sperm: Seen Motile Non-Motile Not seen Not Done
5. Douche: Yes No Don't know
- Bath, shower: Yes No Don't know
- Sponge bath: Yes No Don't know
- Condom used: Yes No Don't know
6. Last voluntary intercourse (within 4 days): Yes No Don't know
If less than 12 hours, time: _____
7. Oral act: Yes No Don't know Rinsed mouth before exam
8. Anal act: Yes No Don't know
9. Emission of semen (victim's impression):
Vaginal: Yes No Don't know Intravaginal Extravaginal
Oral: Yes No Don't know
Anal: Yes No Don't know
10. Fingernails: Clean Blood Scrapings taken not done

Margaret Aiken R.T.
Examiner's Signature

EXHIBIT 8

**MEDICAL EXAMINATION
OF
SEXUALLY ASSAULTED PERSONS**

2 copies to Police Officer
1 copy to Clinic

Case # 149

1. Identifying Information:

Name Frances Morgan
DOB 8-27-49 Age 38 Sex F Race B

Assault: Date: 2-19-89 Time: 9:30 AM
Medical Exam: Date: 2-19-89 Time: 12:00 PM

2. General Physical Exam: (Describe trauma) Normal adult black female

3. Gynecological and/or Anal Exam: (Describe trauma) No trauma to genital/anal areas. No bleeding or discharge

4. Post Assault:

- Yes No
- Urination
- Douche
- Sponge bath
- Bath/Shower
- Defecation

5. Behavior type demonstrated during exam:

- Controlled Expressed Mixed
- quiet tearful
- tense sobbing
- fidgeting yelling
- trembling loud
- listless agitated
- staring other _____

Responds to questions:

- briefly reluctantly readily

7. Summary of Evidence:

- Yes No
- Kit Collected
- Public hair
- Fingerprinting

Condition _____

- Other _____

Released to: _____

Physical/Genital exam done with:

- Yes No Yes No
- Direct visualization Cytoscope
- Bimanual Pics taken # _____

6. Additional Observation or Remarks: State that black male whom she had seen yesterday, entered her home, stole money and a ring and forced her to have vaginal sex. She felt he attempted to have anal sex but only partially penetrated her. Victim did not feel male threaten her with pocket knife.

8. Testing: Sperm

	SEEN	MOTILE	NON-MOTILE	NOT SEEN	NOT DONE
Vaginal	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		
Oral					
Anal					<input checked="" type="checkbox"/>

9. Instructions for Follow-up

- A. ORAL Yes No
- B. WRITTEN Yes No
- Agency brochures
- Medical follow-up instructions

I hereby authorize use of this report, collected evidence and any other report incidental thereto by the Memphis Police Services and/or other Shelby County cooperating law enforcement agencies.

Person Examined Frances Morgan

Examining Clinician Margaret Aiken RN

Parent or Guardian _____

Police Officer W. L. ...

Date 2-19-89

R&I # 890219005970

MRCC _____ DHS _____

CPT # _____

EXHIBIT 9

RAPE CRISIS PROGRAM
2600 POPLAR, SUITE 300
MEMPHIS, TN 38112

RAPE KIT EVIDENCE REPORT

Case: Morgan, Frances KIT NO.: 149 DATE: 2/23/89
CASE NUMBERS: 890219005470 SUBMITTED BY: M. Aiken

TRACE EVIDENCE #	SPECIMEN	TEST	RESULTS
	BLOOD SALIVA	TYPE SECRETOR STATUS	GROUP <u>A, Le</u> (a, b-) SECRETOR <u>NON-SECRETOR</u> <input checked="" type="checkbox"/>
	VAGINAL SWABS	ACID PHOSPHATASE SPERMATOZOA	POSITIVE <input checked="" type="checkbox"/> NEGATIVE <input type="checkbox"/> PRESENT <input checked="" type="checkbox"/> NONE SEEN <input type="checkbox"/> HEADS ONLY
	COTTON PAD	SEMINAL TYPE ACID PHOSPHATASE	<u>none detected</u> P-30: <u>Positive</u> POSITIVE <input checked="" type="checkbox"/> NEGATIVE <input type="checkbox"/>
	ORAL SWABS <u>none submitted</u>	ACID PHOSPHATASE SPERMATOZOA	POSITIVE <input type="checkbox"/> NEGATIVE <input type="checkbox"/> PRESENT <input type="checkbox"/> NONE SEEN <input type="checkbox"/> HEADS ONLY <input type="checkbox"/>
	ANAL SWABS	ACID PHOSPHATASE SPERMATOZOA	POSITIVE <input type="checkbox"/> NEGATIVE <input checked="" type="checkbox"/> PRESENT <input checked="" type="checkbox"/> NONE SEEN <input type="checkbox"/> HEADS ONLY <input checked="" type="checkbox"/>
	OTHER:		<u>none detected</u>

COMMENTS: 87-90: Blood and saliva collected from suspect Ricky Lee Nelson which typed O, secretor. Semen and spermatozoa were identified; but the tests for seminal type were inconclusive.

DATE: 8/10/90

ANALYST: Op Anna Mammolli VMS (HTCCO) SI

8/14/90 Testified in Div. 6 pertaining to this case.

HS-069
181-067

R&I 8902-19005970

KIT 149

Frances Morgan

DATE 2/23/89 TIME 11:30 am

SUBMITTED BY M. Aiken

BLOOD: Group A Le (a-b -)

Group A non

SALIVA:

	A	B	H
Patient	4	4	4
Known Sec.	-	-	-
NonSec.	3	2	4
Saline	2	3	3

DATE: 3/16/89

Secretor
Nonsecretor
Inconclusive

VAGINAL SWABS: 3/20/89 P30 + N3

STMP Acid Phos. (1+) - SLP/VAP

Acid Phosphatase
Positive
Negative

Intact Heads Tags N.S. Color Photo

	Intact	Heads	Tags	N.S.	Color	Photo
#1	1+					
#2						

Spermatozoa
Present
None Seen
Heads Only

	A	B	H
Nest	4	4	4
1:10	3	4	4
1:100	4	4	4
1:1000	3	4	4
Saline	3	3	3

Date: 8/6/90

Substance: none detected

Seminal Type
none detected

COTTON PAD:

Overspray (STMP) 3+ - Date: 3/27/89

Acid Phosphatase
Positive
Negative

COMMENTS / NOTES

8/2/90 AG Chris Craft wants bld + saliva on suspect ^{jailed}
Sgt Dixon will bring in Fri 10⁰⁰ am -
Snoop: Ricky Lee Nelson = O sec

Print/Do Not Print
On Report

Date: Analyser: