

Final Analysis Forensics

Death Investigation Criminalistics Forensic Analysis

Date: December 10, 2003

To: Mrs. Sherry Swiney
PO Box 1891
Alabaster, AL 35007

Mr. Clay Crenshaw, Assistant Attorney General
State of Alabama
Office of the Attorney General
Montgomery, AL [zip code illegible]

Re: *State of Alabama v. Patrick Swiney & Final Analysis Forensics Report dated July 2, 2003 as commented upon in a report by Mr. Ed Moran, Alabama Department of Forensic Sciences, attached as Exhibit B*

My own education and background

A copy of my CV detailing my education and experience as a consultant in forensic science and forensic medicine has been previously provided. As you may also know, I am a founding member of the Department of Homeland Security as well as a scientific consultant with the FBI currently charged with helping to establish and publish forensic techniques and practices which are based upon sound natural scientific methods as an aid to those current forensic practitioners who may be lacking a sound scientific background.

My independent gunshot residue testing in this case

The physical evidence in any homicide can provide critical information on both the nature of the crime and, in some cases, on the identity of the criminal or criminals. Part of that physical evidence in this case includes *facts about the nature and function of the .22 cal AR-7 RIFLE* alleged to be involved. I had no access to any of the physical evidence in this case, including the actual weapon, and no access to any reports of the scientific testing done on any of this physical evidence. So my extensive scientific report, dated July 2, 2003, did not report any testing with the actual weapon involved in this case. Since that weapon was unavailable, as were the relevant items of clothing evidence from both the victims and from Mr. Swiney, I tested another .22 cal AR-7 rifle with the same features.

Absent the actual weapon, these *facts about the nature and function of the .22 cal AR-7 RIFLE* are restricted to what we call “class characteristics” or general properties common among all such .22 cal AR-7 rifles. By applying generally accepted scientific methods, the deposition of gunshot residues from the rifle at specific distances between this rifle and its targets, and on any shooter firing 8 rounds in a confined space were investigated. In place of the actual clothing, experiments involved testing Tyvek suits which were worn by the experimental shooter for GSR analysis.

Correcting potential misperceptions of my July 2, 2003 report

Jon J. Nordby, Ph.D. & Associates

Phones: (253) 627-2739
(253) 627-0350

Street address: 820 N. 10th St. Tacoma WA. 98403

FAX:

Email: finalanalysis@msn.com Website: finalanalysisforensics.com

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In a thoughtful discussion of GSR issues, presented to me simply as “Exhibit B,” Mr. Ed Moran of the Alabama Department of Forensic Sciences states both obvious and well accepted facts about gunshot residues in general, including references to their lack of durability on any shooter’s hands, their collection, and their laboratory testing. These comments arise in direct reference to my report dated July 2, 2003, as noted above.

First I wish to correct some misunderstandings of the scientific claims supported by my work and as discussed by Mr. Moran. The most obvious misunderstanding arises in his point # 7, on page 6, quoted as follows:

Nordby’s assertion that a negative result for gunshot residue is proof that the “person tested did not fire a weapon” is erroneous.

Obviously no one who knows basic logic, let alone gunshot residue analysis, would advance such an absurd claim – of course negative results for GSR are not, *ceterus parabus*, proof of anything at all! I certainly know both logic and gunshot residue analysis; further, I made no such simple assertion in my report¹.

My assertion with respect to GSR, as advanced in my report, ***was much more specific, directed at someone actually firing eight .22 cal long rifle cartridges in an AR-7 RIFLE***, not simply a single round in a .22 cal hand gun of some unspecified type, and firing that rifle these 8 times in a relatively confined space. I stated that the collection locations for GSR evidence differ between hand guns and rifles. This fact has been well documented, and is included, for example, among the guidelines published in the famous so-called ‘Aerospace Report of 1977,’ a landmark study of GSR evidence. It not only varies weapon to weapon, but it also can vary from ammunition to ammunition. [See Wolten, G.M., Nesbitt, R.S., Calloway, A.R., Loper, G.L., and Jones, P.F., *Final Report of Particle Analysis for Gunshot Residue Detection*, ATR-77 (7915)-3, The Aerospace Corporation, El Segundo, CA, 1977.]

Mr. Moran also states that the methods described in my report of July 2, 2003 for detecting gunshot residues on clothing are “irrelevant” because they **differ** from the single method reportedly used by Higgins for detecting gunshot residues on the suspect’s hand swabs. Of course I had [and still have] no way of knowing *what* method Higgins used *on any* of the evidence other than what Moran states in his exhibit: recall that I have

¹ The Assistant Attorney General, Clay Crenshaw, has also mischaracterized my report’s scientific results by stating, on page 19 of the *State of Alabama’s Motion to Dismiss*, that “Despite Nordby’s unfounded contrary allegation, the fact that Higgins obtained a negative result for primer residue is not an indication that Swiney did not fire a gun.” In my report, I advanced no unfounded allegations of any sort. My statements all involved the results of actual physical testing for GSR, as it is defined in the *AFTE Glossary*, with a specific AR-7 RIFLE. Other errors not even worthy of direct mention include the claim that I supposedly said that the paraffin test was used by Higgins in testing Swiney for gun shot residue. I did not know what if any test was used. I was asked to address historical testing for educational purposes, and only in that capacity did I mention the so-called paraffin test. I might add that after reading Moran’s report, I still do not know what test Higgins used to conclude that antimony was absent from the sample tested.

access *neither* to the physical evidence in this case, nor to any reports detailing specific scientific tests which were performed on that evidence.

Mr. Moran is incorrect in stating that my methods are “irrelevant” because **he is incorrect in assuming that they relevantly differ**. First, all scientific tests for gunshot residues have the identical objective of determining the presence, absence and relative concentrations of specific elements constituting that residue – each method is relevant in that all share this common objective. Second, what Moran calls “FAAS” [see below] depends upon the identical laws of physics as those involved in IR spectroscopy, fluorescence *spectrophotometry* and micro IR *spectroscopy*.² Each depends upon specific physical properties of gunshot residue particles: they either absorb or emit light when bombarded with light of specific wavelengths. So not only are they relevant because they have identical objectives; they are relevant because they each depend upon the same physical properties of the residues which will react the same way in the presence of light from a specific wavelength. The only difference [which depends upon the specific test in the specific situation] is whether the residues *emit* light or *absorb* light during the particular test.

Clarifying misconceptions and terminological issues in Moran’s report

Specifically, firing a .22 cal RIFLE was known to be at issue in the homicides when Higgins performed an FAAS analysis on cotton swabs **taken of Swiney’s hands**, presumably pre-moistened with 5% nitric acid solution before the sampling occurred. Further, Moran states, on his page 2, Exhibit B, that:

From reviewing the DFS file, I ascertained that Higgins tested for the presence of primer residue by using the flameless atomic absorption spectrophotometry (FAAS) [sic].

The use of FAAS to mean “flameless atomic absorption spectrophotometry” can be somewhat confusing for modern-day scientists. In the current usage of scientific acronyms, ‘FAAS’ has come **to mean Flame Atomic Absorption Spectrometry**, not “flameless atomic absorption spectrophotometry.” The word ‘flameless’ has been largely abandoned since actually there is no such thing as an atomic absorption method, now or ever, which is strictly ‘flameless’ in character. The only relevant differences among AA techniques involve either the type of flame, or, in the ‘flameless’ method, the use of a small, electrically heated graphite tube, called a cuvette, which is heated to 3000 degrees C, in place of the flame, in order to generate a cloud of atoms by vaporizing the sample. In current scientific usage, the latter is referred to as **GFAAS** or **Graphite Furnace Atomic Absorption Spectrometry**.

This must be the ‘flameless’ test Higgins used, as referred to by Moran. In the 1970’s and the 1980’s the flame atomic absorption technique exhibited a bright flame, while the ‘flameless’ graphite furnace atomic absorption exhibited no bright flame. None-the-less, the methods remain practically identical for our purposes, and while the flame is invisible

² Traditionally, ‘spectroscopy’ entails measuring light *emission*, while ‘spectrophotometry’ entails measuring light *absorption*. In most crime labs, however, the terms are in fact used interchangeably.

in GFAAS.

Simple FAAS uses either an air/acetylene or a nitrous oxide/acetylene *flame* to vaporize the residues formed when any GSR particles, soluble in the nitric acid, vaporize into their component parts; simple GFAAS uses an electrically heated graphite tube to vaporize the samples. In each method, when the light from a hollow cathode lamp, selected for the specific element to be tested, passes through the cloud of atoms, the atoms of interest absorb the light from the element-specific lamp. The absorbed light is then measured by a detector and used to calculate the *concentration* of that element in the sample [including its concentration among the other elements present as determined by further tests]. Hence, there is no relevant difference between the flameless [GFAAS] and flame [FAAS] methods. Flame vs. flameless remain merely semantic issues.

The practical limitations of FAAS and GFAAS, at the time that Higgins performed his analysis, include the fact that for each analysis, only one element can be detected. To detect another element, a different hollow cathode lamp must be selected, installed, and the sample run repeated. Apparently, if Higgins used what we now call GFAAS, he terminated his analysis when he failed to detect antimony (S_b). And apparently the only analysis accomplished was performed on cotton swabs **taken of Swiney's hands**. What about testing samples of the clothing? Knowing that a .22 cal LR cartridge fired from a RIFLE was involved, several scientific issues arise.

First, at that time in 1987, the presence of antimony would not have been expected since it was well known not to be present in pre-1989 Remington .22 cal LR rim-fire ammunition. Therefore a negative result for antimony (S_b) should have been *expected* by Higgins as a matter of routine. Secondly, for GSR in general, meaning GSR from ordinary center fire ammunition with antimony (S_b) as well as barium (B_a) and lead (P_b) present, the issue is not simply the *presence or absence* of antimony (S_b) but its *concentration* relative to the other elements thought to be unique to GSR. In fact it is the *ratio* of barium (B_a) to antimony (S_b) that is important, not its simple presence or absence. To be indicative of GSR, in fact, its concentration should be 8.3 +/- 2 (B_a) to 1 (S_b) otherwise the elements may have a source other than a gunshot.³

The relevant samples from Swiney for the potential detection of someone firing a .22 cal RIFLE involve testing the **clothing**, including the shirt at the shoulders, collar, chest and arms as well as the pants. Samples must also be taken from the suspected shooter's **face, including both nostrils and both ears**, and not simply from the suspected shooter's hands.

The purpose of my scientific study and report was to raise clear scientific questions which can be definitively answered though properly applying scientific principles to the

³ What I in fact objected to in my report dated July 2, 2003, from Higgins's report involved the error involved in the inference from the **absence of antimony**, supposedly supported by Higgins's mystery flameless science, what ever it was, **to the conclusion that THEREFORE, Swiney fired a .22 cal weapon** since that weapon lacks antimony in the primer!! That inference is even more outrageous, and certainly much more prejudicial, than the one Moran falsely accuses me of advancing.

Jon J. Nordby, Ph.D. & Associates

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(253) 627-0350

Street address: 820 N. 10th St. Tacoma WA. 98403

FAX:

Email: finalanalysis@msn.com Website: finalanalysisforensics.com

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actual evidence from Swiney's case, especially to the clothing worn by Swiney at the time of the shootings. From my perspective as an independent forensic scientist, and in point of neutral scientific fact, this proper analysis has just as much chance of proving him guilty as it does of proving him innocent.

Regardless, from Moran's report attached as Exhibit B, it remains unclear to me just which sample(s) Higgins tested.

Questions of how long GSR evidence remains attached to shooting suspects

Moran states in several ways, including by attaching a 1991 article from the FBI Bulletin, that GSR is fragile and transitory trace evidence. Of course this is certainly true as far as the analysis goes; it is certainly true with respect to the fragility of GSR on human HANDS. This is why many if not most forensic and crime laboratories across the country do not perform routine GSR tests on samples taken from the HANDS of suspected shooters. As the article and Mr. Moran correctly point out, the residues are too transitory and fragile to be definitive evidence of anything, one way or the other. Someone might simply obtain such residues on the hands from touching a recently fired weapon, or from being in close proximity to a weapon when it is fired. In neither of these cases is the person with a positive test for GSR necessarily the shooter. So I certainly agree that the hands remain both practically and scientifically useless as potential sources for meaningful GSR testing.

However, as I have detailed in my July 2, 2003 report, the weapon at issue in this case was not a hand gun, but a RIFLE. For example, the ears, usually both oily and waxy, and in males, often hairy, remain very good sources for potential GSR/GPR when a rifle is fired. They are not easily subject to the type of shaking or wiping contact characteristic of GSR loss from the hands, and they are not subject to the same vectors associated with the force of gravity.

And the main source of GSR samples, currently both well known and well accepted by forensic and crime laboratories across the nation for being a much more receptive vessel for trace evidence analysis, remains the CLOTHING evidence, not evidence from hand swabs. This is confirmed in my scientific work as detailed in my July 2, 2003 report. I agree with the points made in the attached FBI Bulletin article with respect to the proposed analogy between GSR on the hands and chalk dust on the hands. But now I ask you to apply that same analogy of chalk a bit further, in order to make the comparison relevant to the well accepted scientific points presented in my July 2, 2003 report. Toss a bunch of chalk dust onto a blue woolen blazer, for example, and NOW simply try to shake it off, or wipe it off with a towel. The attempt is guaranteed to fail. In fact, those attempts may even imbed the residues deeper into the fabric. That is my point with respect to the durability of the *relevant GSR evidence in this case. It has nothing to do with hands.*

New science & general acceptance

Moran further states in his report that:

The information in the DFS file indicates that Swiney's hands were swabbed at least two

removed from a suspects hands, DFS had no reason to take hand swabs three hours after the shooting.

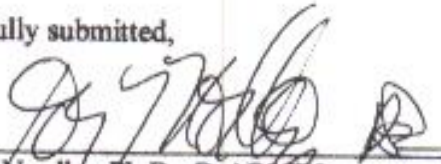
But my report demonstrates that testing the actual clothing with the techniques I applied [and as discussed in the literature] we can reveal evidence of .22 cal rim fire ammunition residues by finding boron glass residues *fused* with barium and lead residues. This parallels finding these rim-fire ammunition residues with finding center fire ammunition residues such as antimony and barium fused with lead. Neither type of *fused* residue appears in nature. That's why concentrations are relevant, not just their element's presence or absence. And worse, not just finding or failing to find a single element.

The novel scientific contention is that these boron glass frictionizer residues *as fused with barium and lead at high temperatures* do not appear in nature other than as residues from firing certain rim fired ammunition. We know that they do not appear in all fireworks residues. And they do not appear in all brake lining residues. So far, each individual element or other combinations of these elements with high-temperature features are already classified as characteristic of gunshot residues. Nothing can develop these scientific facts further except more and better science.

Unfortunately, neither "better science" nor a clear reading of my report appears evident in Mr. Moran's obviously sincere but potentially misleading statements attached as Exhibit B.

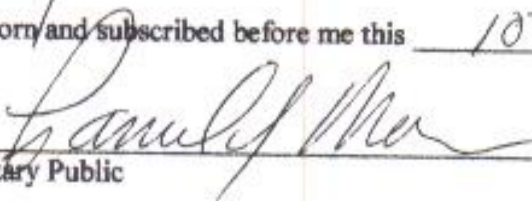
I declare under penalty of perjury that the foregoing is both true and correct.

Respectfully submitted,



Dr. Jon J. Nordby, Ph.D., D-ABMDI
Consultant in Forensic Science & Forensic Medicine

Sworn and subscribed before me this 10th December day of November, 2003.



Notary Public

My commission expires on 1-29-07



Jon J. Nordby, Ph.D. & Associates

Phones: (253) 627-2739 Street address: 820 N. 10th St. Tacoma WA 98403 FAX: (253) 627-0350
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