The Gunshot Residue Evidence of People v. Robert Blake

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Forward

On April 19, 2018 the program, "Marcia Clark Investigates The First 48 Hours – Robert Blake," aired on A&E network. On June 22, 2017 Marcia Clark and her film crew spent almost a full day going over my work on the case at my laboratory in Cardiff, California.

Steve Dowell, the prosecution's gunshot residue (GSR) "expert," testified in the murder trial of Robert Blake. The GSR evidence was the physical evidence support necessary for prosecution to go to trial. It was junk science which I present in the following report. Ms. Clark, a former prosecutor for the Los Angeles District Attorney's Office, made an obvious political decision not to include her interview with me. Why? It would show the criminal case against Mr. Blake had marginal foundation and likely would have been dismissed if I had testified. Yes, Mr. Schwartzbach, Blake's attorney, knew of my well-supported conclusion that Dowell's "science" was garbage months before trial, but chose to go with another GSR expert who did not use my report in her testimony (the junk would have been obvious to any scientist). Why?

Mr. Dowell's inability to deliver science in the courtroom was not restricted to Blake. I am aware of three other cases where the defendants were convicted with Dowell's garbage science, one of which was Corey Lyons (www.meixatech.com/DOWELLJUNK2.pdf). So, Marcia Clark's quest for the truth is tainted by a bias for the prosecution as was shown by her presentation of the Robert Blake case, glossing over the gross incompetence by the prosecution.

How many millions did it cost the taxpayer and Mr. Blake for a criminal proceeding which probably should never have gone to trial? How many other cases like Blake are there, but the defendant does not have the money to adequately defend him/her self? The corruption, exemplified by the Blake case, in the criminal justice system could well be costing billions. And Marcia Clark doesn't have the guts to expose it.

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April 24, 2018

The Gunshot Residue Evidence of People v. Robert Blake

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Abstract

Mr. Robert Blake, former television star, was accused of twice shooting his wife, Bonnie Bakley, while she was sitting in the front passenger side of Blake's car. The shots came from outside of the car. There were no witnesses to the shooting. Blake stated to the police that he had sat in the driver's side of his car before realizing Bakley had been shot. There were no measures taken by the police to protect Mr. Blake's hands from contamination while he was in the police environment (police car and station). Blake also carried a .38 pistol (not the murder weapon) at the time of the homicide. The clothing Blake wore during the shooting not only received a similar potential for contamination, but also was not collected from him at his home until the day after the shooting. That clothing was placed in an open cardboard box in the trunk of a police car for 48 hours prior to proper packaging. Despite these many mitigating factors in the case, gunshot residue (GSR) evidence of Blake's hands and clothing were presented in court by the prosecution. Even if the prosecution found convincing concentrations of GSR on any of the samplers (they did not), it would be meaningless. Additional errors were made testing the murder weapon, testing Mr. Blake's revolver and interpretation of spectra from many of the analyses. The gathering and analysis of the GSR evidence in this case was an enormous waste of resources.

Introduction

Robert Blake, former television star, was accused of the shooting murder of his wife, Bonnie Bakley, after they dined at a restaurant. The shooting occurred on May 4, 2001 at approximately 2130 while she was sitting in the passenger side of Mr. Blake's 1991 Dodge Stealth. The vehicle was parked. Ms. Bakley was waiting for her husband, Robert Blake, to return from the restaurant where they had just dined. Mr. Blake had allegedly gone back to the restaurant to retrieve his forgotten .38 revolver.

The autopsy report states that Ms. Bakley was shot twice. One bullet entered her right cheek area, went through the skin of the cheek, through the bones at the base of the skull and into the left temporal muscle (the bullet core) and the left temporal lobe of the brain (the bullet jacket). The bullet's direction of travel was right to left and slightly upward. No soot or powder stippling was noted around the entrance wound, thus the weapon was at a distant/indeterminate range. This was a fatal gunshot wound. The other bullet entered at the right shoulder, passed through the soft tissue of the neck, through the right carotid artery and ended in the area of the right cervical spine of C-7. The projectile core and jacket were recovered at this location. Again, no soot or stippling was noted around the wound. This shot was also at a distant/indeterminate range and was "potentially" fatal.

The murder weapon, a World War II vintage 9 mm Walther P38 Luger pistol, was found in a dumpster near where Mr. Blake had parked his car and was covered with dirt and motor oil.

The Gunshot Residue Case

The 9mm pistol. On November 2, 2001, the 9 mm pistol was clean and test fired. The objective was to determine if the pistol deposited gunshot residue (GSR) on the shooter's hand. It is apparent the investigators decided that the results of the scanning electron microscope/energy dispersive spectroscopy (SEM/EDS) of Mr. Blake's hand and clothing samples (analyses conducted during the latter part of May, 2001) linked Mr. Blake to the homicide. The elemental composition of the GSR that the 9 mm pistol produced was not considered; just whether or not it produced breech GSR.

Prior to the test firing, the weapon was rinsed in isopropyl alcohol "as a precaution." Two CCI

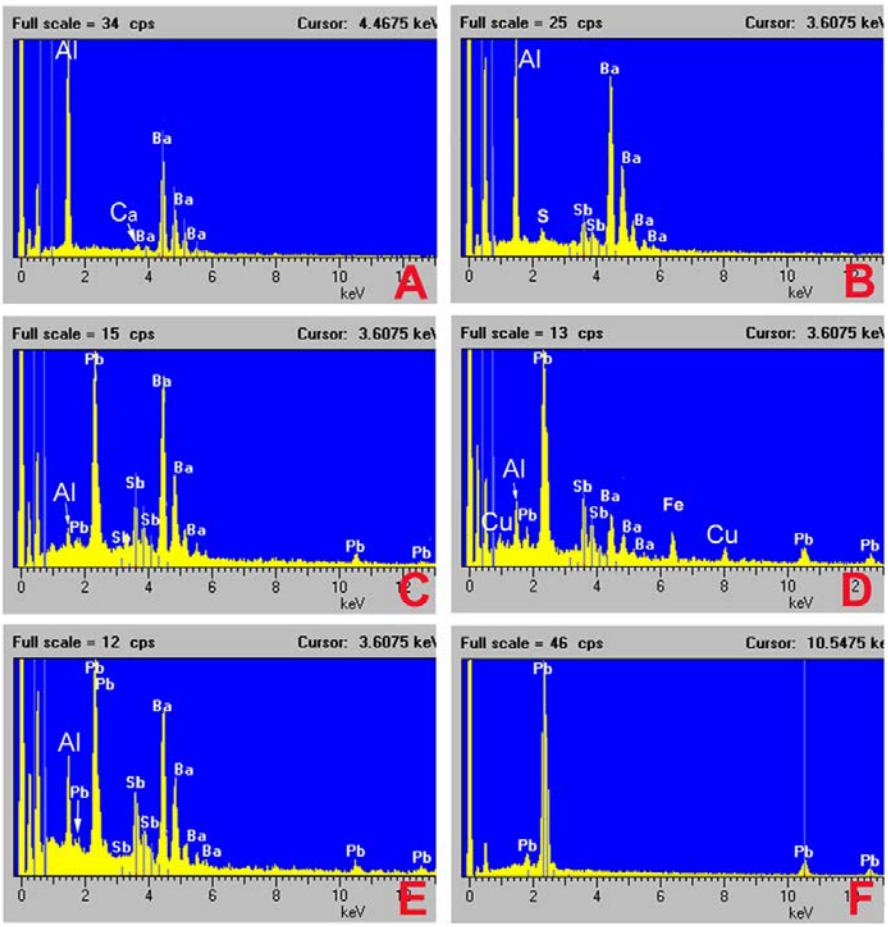

Figure 1. *Spectra of likely gunshot residue particles from the hand samples of Ms. Bakley.* ***A through E:*** *Spectra of particles from her left hand.* ***F:*** *Spectrum of a lead particle from Ms. Bakley's right hand.*

Blazer lead-free cartridges were fired prior to the two test shots of Remington 9 mm hollow point (147 gr. Bullet). Results showed that the pistol is capable of depositing GSR on the shooter.

There was no explanation as to why the pistol was rinsed with isopropyl alcohol (the exterior of the gun apparently had already been cleaned), nor was a reason provided as to why lead-free ammunition preceded the test shots. The analysis data for this test were not included in the discovery reviewed for this paper.

The test firing of the pistol ruined any chance of determining the composition of the particles (by a dry wipe sample of the bore) that were produced from the pistol prior to the test firing. However, the oil may have entered the bore of the pistol making such sampling impossible. Standard 9 mm Remington cartridges use a three-metal primer composed of lead, antimony, and barium (Remington, 2001). Remington cartridges would produce GSR particles composed of lead-antimony-barium, antimony-barium, lead-barium, lead-antimony and lead-only. The proportion of lead-only particles would likely be less than the other particle types (Burnett, 2002).

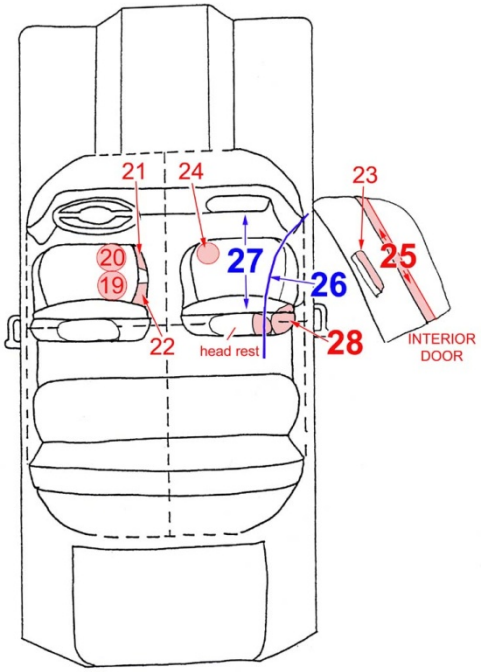

Figure 2. *Diagram of the gunshot residue sampling of Mr. Blake's 1991 Pontiac. Only samples 25, 26, 27, and 28 (larger font than other sample locations) were analyzed. Samples 26 and 27 (blue) were samples of the upper window insulation and head liner, respectively.*

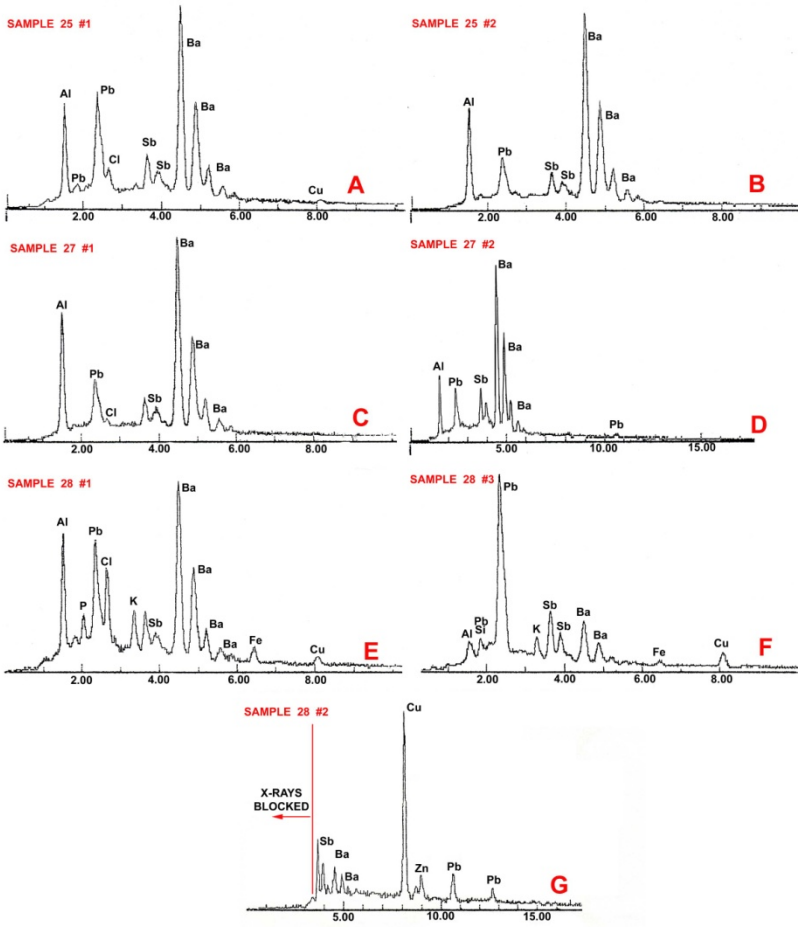

Figure 3. *Spectra of particles found in sample 25 (A and B), sample 27 (C and D) and sample 28 (E, F and G). No particles of interest were found in sample 26. Analyses performed by Mr. Yamauchi of the Los Angeles Police Department. The lack of peaks below 1.0 keV and smaller aluminum peaks (compared to spectra in Fig. 1) indicates a beryllium-window detector was used in these analyses.*

The casings found at the crime scene were not analyzed for GSR composition. Given that the bore of the pistol was not sampled, the casings recovered from the crime scene should have been. Such samples might link the type of GSR observed from the car samples, from Ms. Bakley's hands and, perhaps, from Mr. Blake's hands and clothing to the Pistol.

Gunshot Residue Samples of Ms. Bakley Hands and the Vehicle Front Passenger Area. The SEM/EDS analysis of the GSR samples from Ms. Bakley's hands revealed five characteristic (lead-antimony-barium)(Wright and Trimpe, 2006) GSR particles on Ms. Bakley's left hand and just one consistent (lead) GSR particle on her right hand. Spectra of these particles are shown (Fig. 1).

The vehicle in which Ms. Bakley was sitting was extensively sampled by standard adhesive SEM samplers. Ten samples were taken (Fig. 2), of which four (samples 25, 26, 27 and 28) were examined in the scanning electron microscope. Of these four samplers, three had characteristic

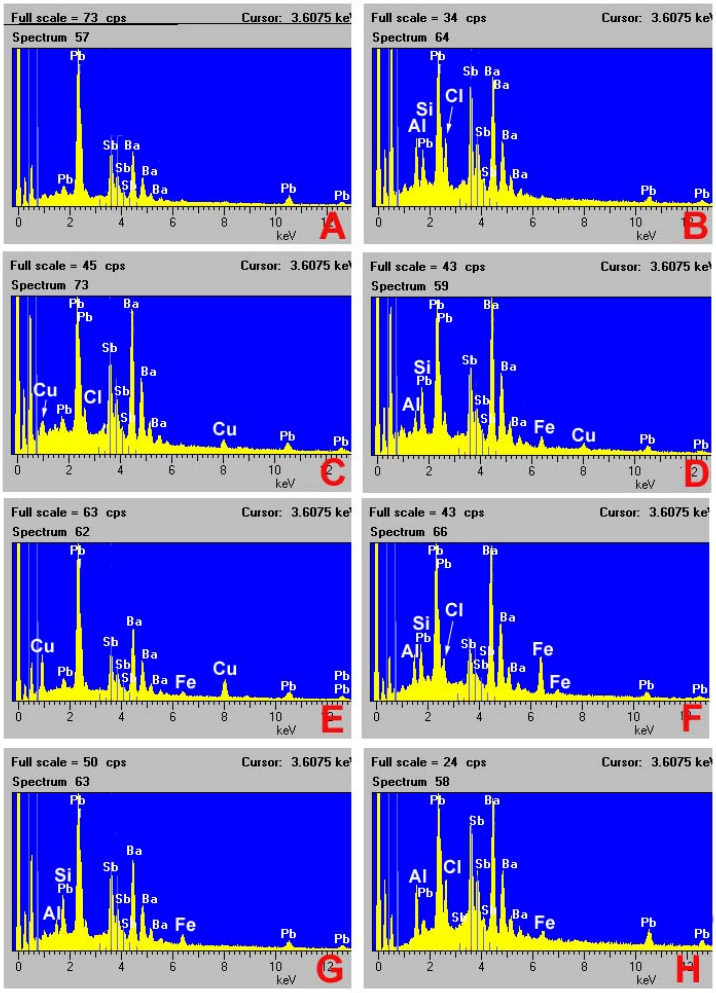

Figure 4. *Example spectra of gunshot residue particles from the test firing of Mr. Blake's revolver; analysis performed by Steve Dowell. Note that for most of these analyses, it appears that either aluminosilicate particles or separate silica and aluminum are contributing to the X-rays to the spectra.*

GSR association (samples 25, 27 and 28). The GSR data from Ms. Bakley's hands (Fig. 1) and the car (Fig. 3) show that aluminum is a common feature of this GSR along with the lead, antimony and barium. These particles were likely produced by the 9 mm pistol. However, aluminum is not an ingredient in Remington cartridges (Remington, 2001) and this may have been a component of previously fired ammunition (e.g., CCI makes ammunition with aluminum casings). An alternative explanation may be that the Remington cartridges were old and had a primer composition that included aluminum.

The analysis of the GSR samples of Ms. Bakley's hands and the vehicle shows that the 9 mm pistol was close enough to deposit GSR both on her and the interior of the car. Ms. Bakley's left hand was exposed to at least one of the two shots; the right hand was shielded by the car door.

Mr. Blake in the Police Environment. Mr. Blake was taken to the police station in a police car. His hands were sampled for GSR at approximately 2355 on May 4, 2001. The time between the shooting (2130) and the GSR sampling falls within protocol range of three hours (Wolten et al., 1977; Zeichner and Levin, 1995; Mastruko, 2002; Jaegar, 2004). However, there was no attempt to isolate Mr. Blake from possible GSR contamination while he was in the police environment. GSR contamination can come from the police car (Kowal et al., 2000) or the police station (Crowson et al.,1996) prior to GSR sampling.

Mr. Blake's .38 Special revolver. Mr. Blake was reported to be carrying a .38 Special Smith and Wesson revolver during his visit to the restaurant. He claimed that he took the revolver out of his belt holster and placed it beside him on the bench under a sweatshirt. The revolver apparently fell to the floor under the booth table as he and Ms. Bakley prepared to leave the restaurant. Ms. Bakley was shot during Mr. Blake's alleged return to recover the revolver. Contact with the revolver means that associated GSR could contaminate Mr. Blake.

The GSR sampling of the revolver included a holster, which was apparently collected the night of the shooting. Mr. Blake's revolver, like the Malther 9 mm Pistol, was also test-fired prior to sampling for GSR. Since this revolver was test-fired prior to sampling, GSR information regarding the .38 Special revolver's contribution to the crime scene has been compromised. If the exterior surface of the revolver had been sampled prior to the test-firing, those samples could have shown if Mr. Blake had the potential to be contaminated by GSR particles that were originally associated with the revolver.

Gunshot residue spectra from the sampling (after the test firing) of the .38 revolver are shown in Fig. 4. Although there are aluminum peaks in some of these spectra, the aluminum is not nearly as prominent as the GSR particles from the samples from Mr. Bakley's hands (Fig. 1) or Mr. Blake's car (Fig. 3). It is likely the aluminum contribution to many of these spectra comes from aluminosilicate particles closely associated with the analyte particles. Theoretically, given sufficient number of particles, it may have been possible to separate the GSR generated by the 9 mm pistol from those associated with the .38 revolver.

The Gunshot Residue Samples of Mr. Blake's Hands. The Standard Operating Procedure (SOP) used by the Los Angeles Department of the Coroner in their GSR examinations (Anon, 1997) :

1. The gunshot residue samplers are placed within the SEM and the samplers are automatically scanned for gunshot residue candidate particles.
2. The SEM-associated computer records the position of particles of interest. When the automated run is completed, the analyst relocates the particles of interest and performs a confirmation elemental analysis for each.
3. The analyst summarizes the data and records by hand-written notes as well as acquiring spectra and particle images.
4. A report is then written that summarizes the analysis results as well as provides a conclusion.

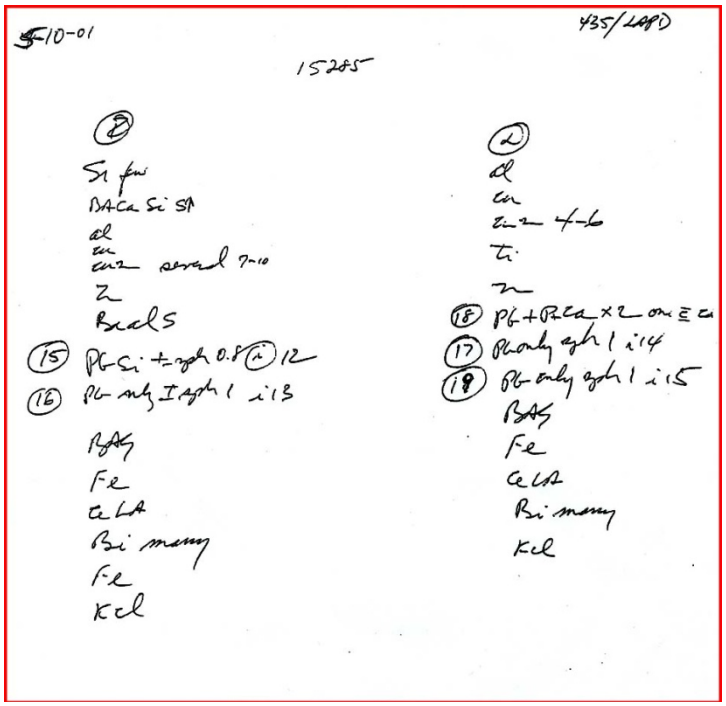

Figure 5. *Hand written notes made by Dowell that summarize the results of the analyses of the hand samples from Mr. Blake. The left column are the results from the right hand sampler. The right column are the results from the left hand. Interpretation of some of these note entries is provided in Fig. 6.*

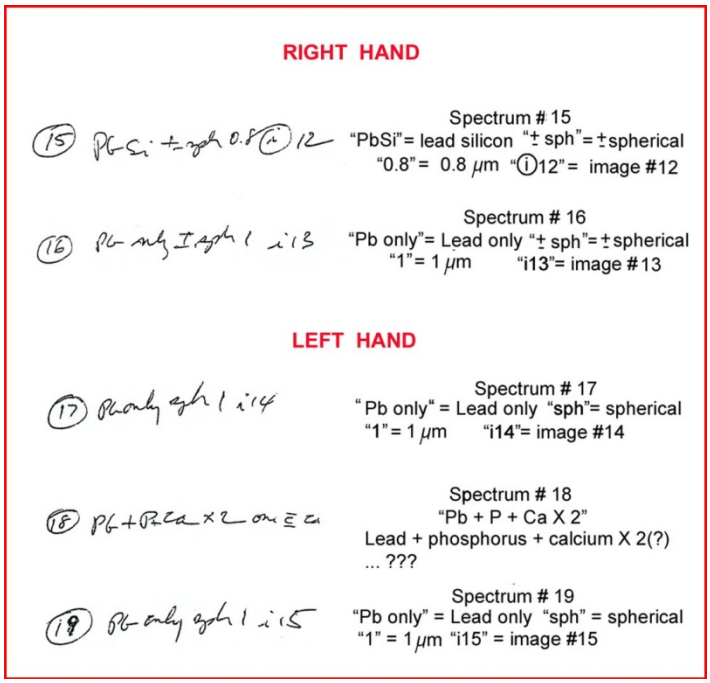

Figure 6. *Interpretation of Dowell's handwritten notes where spectra and images were recorded of the analyses of the gunshot residue hand samples of Mr. Blake.*

It has never been clear just what is summarized in 3. Is it from the computer-generated list, or did the analyst actually go to each of the particles noted in the handwritten document and confirm the composition?

Steve Dowell performed these analyses. Dowell's hand-written notes of the analyses for the Blake hand samples are shown in Fig. 5. He has not provided a key to his notes on any case that I am aware. After working on this case and a number of previous cases where Dowell was involved, I have enough an understanding of his notes to provide a translation (Fig. 6). The circled numbers (Fig. 5) are those particles that Dowell saw fit to record spectra and images. The recorded spectra and particle images (Figs. 7 and 8) are matched to Dowell's handwritten notes (Fig. 5).

The analysis of the right-hand sampler from Mr. Blake's hand revealed two possible GSR particles with two additional possible particles (Fig. 5, left column). The "BaCaSiS" and "BaAlS" may be particles of interest in this case, but neither spectra nor images were recorded for these particles. For the other two particles of interest in this sample, spectra and images were recorded (Fig. 7). Curiously, the spectra and the size values for both of these particles do not match the written description. For spectrum 15 (Fig. 7A), no silicon (Si) is apparent in the spectrum despite the handwritten note saying otherwise. (The small peak at about 1.8 keV is consistent in size with only a lead peak at this location.) The size of this particle is approximately 3.5 microns, not 0.8 microns. A small amount of calcium may be from a nearby particle. For spectrum 16 (Fig. 7B), Dowell notes "Pb only" (lead only). However, barium (Ba), antimony (Sb), copper (Cu) and a small amount of iron (Fe) are present. The reported size of this particle, 1 micron, is also incorrect. The particle measures approximately 2 microns.

Three possible GSR particles were found in the analysis of the sampler from the left hand (Fig. 5, right column). For the particle that spectrum 17 (Fig. 8A) represents, Dowell claims "Pb only" (lead only), but he has missed a prominent chlorine (Cl) peak. The particle is reported as spherical and 1 micron, but it is irregular and more than twice as large (2.4 x 5.0 microns). In spectrum 18 (Fig. 8B) the handwritten note states "P" (phosphorus) and "Ca" (calcium) are present. There are no phosphorus or calcium peaks showing in this spectrum, although his handwritten note is confusing. (Such a particle would not be considered GSR). Particle 19 spectrum (Fig. 8C) does not match the note; chlorine is represented in the spectrum. The particle is reported to be 1 micron, but is more than twice as large (2.2 x3.6 microns). It is also irregular (not "sph" = spherical).

Not one of the spectra reported for Mr. Blake's hand samples match the reported composition. Particle size determinations for all these particles are also incorrect. Dowell appears to have mixed another case with this one.

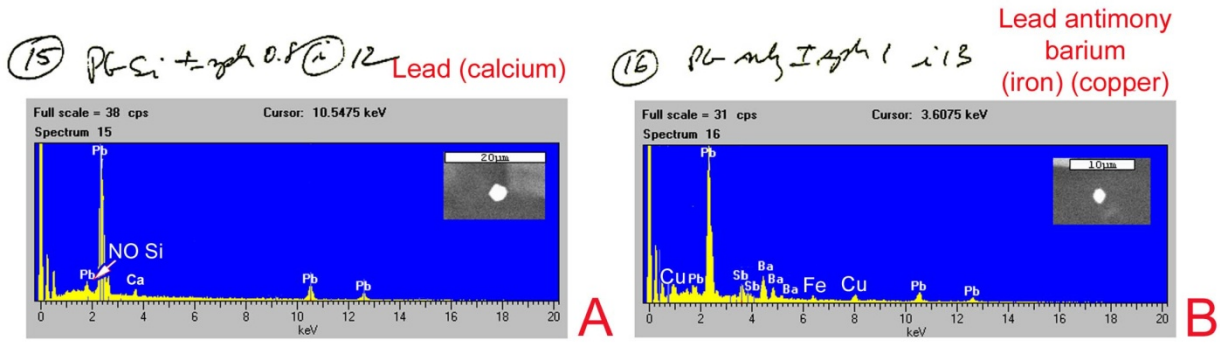

Figure 7. *Handwritten notes, spectra and particle images of the two particles that these data were recorded for the right hand. The actual elemental identity is provided in the upper right of each spectrum. Elements noted in parentheses may be from surrounding particles.* ***A:*** *Particle 15, image 12. The note "NO Si" added by author.* ***B:*** *Particle 16, image 13. Elements antimony (Sb), barium (Ba), copper (Cu), and iron (Fe) were not noted by Dowell, but are in spectrum.*

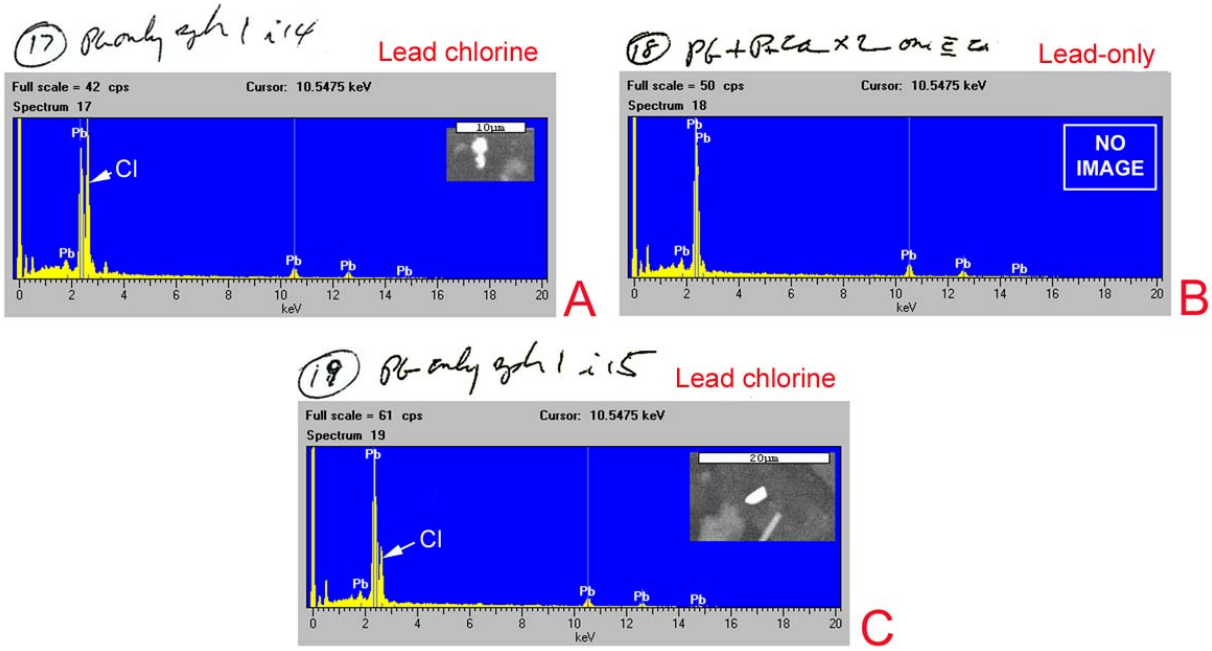

Figure 8. *Handwritten notes, spectra and particle images of the three particles that these data were recorded for the left hand. The actual elemental identity is provided in the upper right of each spectrum.* ***A:*** *Particle 17, image 14. Chlorine (Cl) in spectrum, but not noted.* ***B:*** *Particle 18, no particle image. Phosphorus (P) and calcium (Ca) are not represented in the spectra, but are claimed to be present in the handwritten summary.* ***C:*** *Particle 19, image 15. Again, chlorine (Cl) is in the spectrum, but not noted.*

The Gunshot Residue Samples of Mr. Blake's Clothing – The Storage Box. The clothing allegedly worn by Mr. Blake the night of the shooting was collected from Blake the following day by a police officer. The officer, James Goyez, stated during trial (January 6, 2005) that he "hoped and assumed it was the same clothing." The handling, analysis and interpretation of the particle burden of the clothing will be discussed. Extensive sampling and analyses of the alleged clothing worn by Mr. Blake during the shooting was again performed by Steve Dowell of the Los Angeles County Department of the Coroner.

Mr. Blake's clothing after collection was not packaged in paper bags, but was instead bulk stored in an open cardboard box in the trunk of a police car for more than 48 hrs. "Anticipating the issue of contamination with GSR from being in the trunk of a police car for 48+ hours a control was run using a newly purchased shirt. The t-shirt was placed in a similar open card board box …" (Report from Dowell, June 4, 2003). The report from Dowell indicates that there were only four of these control samples (Fig. 9). However, the presentation by Dowell (2005) suggests additional samples were taken at the time.

There were two boxes in the experiment, apparently one within the other. As to which was the "2 nd box" (Fig. 9) is unclear. It is also unclear whether there was a box-within-a-box for the storage of the evidence in the back of the police car that this experiment attempts to simulate.

The "control" samples:

The inner trunk door. This is a tape lift from the interior of the hood directly above the box. The report, dated 6/4/03, states "No particles of GSR" were found (Fig. 9). Dowell's later account in 2005 of this sampling notes, "we collected a number of samples from … different areas on the inside of the trunk." He goes on to say, "… there were some particles on the trunk lid, not directly over the area where the t-shirt was." Perhaps additional samples that were collected at that time were analyzed later, although his report (Fig. 9) does not mention this.

The outside of the box. Dowell concluded there are "no particles of GSR" (Fig. 9) from the sampler taken from the outside of the test open cardboard box. This conclusion was contrary to his hand written notes (Fig. 10) for this sampler. He has three particles of lead-barium as well as "Pb only many." Lead-barium particles from an environmental source are rare (fireworks (Trimpe, 2003) and nail guns (Lindsay and Ballantyne, 2009) are the reported sources). A firearm source for these particles is likely.

The inside of the box. Dowell found "One H.S. & two consist" (Fig. 11) which means that he identified one particle that he is calling "highly specific" (i.e., a lead-antimony-barium particle, Fig. 12A) and two that are consistent with GSR. Indeed, Dowell's report dated 6/4/03 (Fig. 9) states, "Inside of the 2nd cardboard box – One highly specific particle and two consistent particles of gunshot residue." The spectra correspond to Dowell's handwritten notes. However, for the particles that he is calling "consistent", there are not two, but three: the "PbSb" particle (no spectrum/image), the single Pb particle (Fig. 12B) and the clump of Pb particles (Fig. 12C). Curiously, Dowell (2005)

County of Los Angeles
Department of Coroner

Forensic Laboratory
Analysis Report

Agency: Los Angeles Police Department
Agency #: 01-1515091
Subject: BLAKE, Robert – Clothing Collection – Car Trunk Recreation

Microanalysis: Gunshot Residue

Specimen: Received one cotton t-shirt from trunk of car.

Purpose: Determine by Scanning Electron Microscopy / Energy Dispersive Spectroscopy (SEM/EDS) analysis if any gunshot residue particles are present.

Results: Items 51, 52, 53 and 54 (clothing and boots) were originally collected and stored in an open cardboard box in the trunk of police car for 48+ hours prior to repackaging. Anticipating the issue of contaminated with GSR from being in the trunk of a police car for 48+ hours a control was run using a newly purchased t-shirt. The t-shirt was place in a similar open cardboard box (within a larger 2nd cardboard box) in the original car trunk for 48+ hours.
GSR samples were collected and analyzed:

Sample # 157 – T-shirt, after being in the trunk for 48+ hours – No particles of gunshot residue.
Sample# 106 – Outside of 2nd cardboard box – No particles of gunshot residue.
Sample# 125 – Inside of 2nd cardboard box – One highly specific particle and two consistent particles of gunshot residue..
Sample# 127 – Inside of trunk lid, above open box – No particles of gunshot residue.
Sample# 96 – Hand sample from Det. Goyez – One consistent particle of gunshot residue.

Date of Report
6/4/03

Analyst: Steven J. Dowell
Research Criminalist

File: LAPD0191C

Technical Review:

050884

Figure 9. *Steve Dowell's report on the "Car Trunk Recreation."*

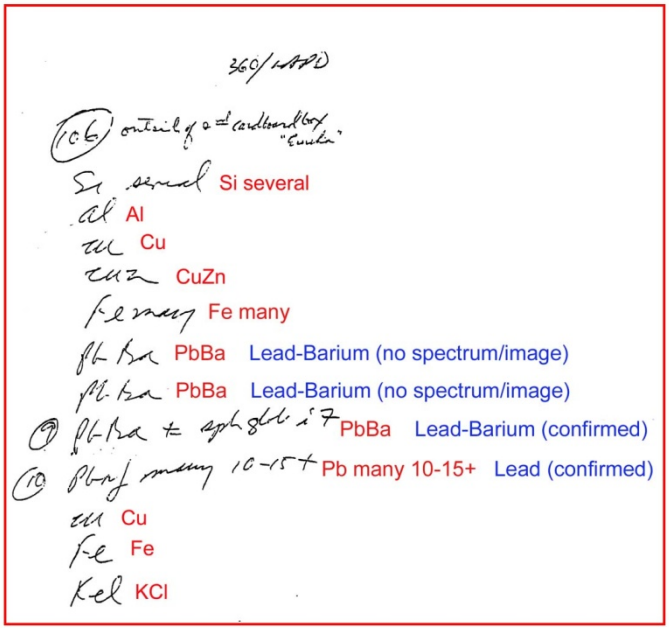

Figure 10. *Dowell's handwritten notes that summarize the results of the analysis of the SEM sample from outside of the control box. The lead-barium (PbBa) particles likely have a firearms origin. The red notes: translation of the Dowell note; the blue notes: identification of the elemental symbols and comments; confirmed) = spectrum reflects note designation.*

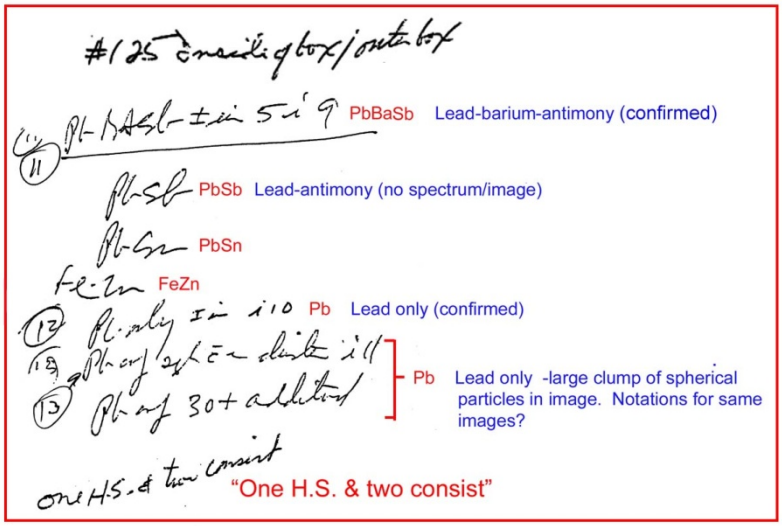

Figure 11. *Dowell's handwritten notes that summarize the results of the analysis of the SEM sample from the inside of the control box. In the interest of saving space, the particles of little or no interest (e.g. KCl, FeCl, CuZn etc.) were redacted from the notes. The lead-antimony-barium (PbSbBa) particle likely has a firearms origin. The red notes: translation of the Dowell notes; the blue notes: identification of the elemental symbols and comments; (confirmed) = spectrum reflects note designation.*

noted that this sample never existed, "They [defense counsel] criticized me for not taking a sample from the inside of the cardboard box. And at the time I said, 'Well, I did not have a really good reason why I did not take a sample from the inside of the cardboard box.' "

The new t-shirt. The new t-shirt that was placed in the box had no detectable particles with GSR-like compositions.

Even though the t-shirt was shown not to be contaminated by GSR, the presence of GSR particles on both surfaces of the box indicate any items present in the trunk of the police car were subject to GSR contamination. The account of these results given by Dowell (2005) differs markedly from his case report (Fig. 9), which, in turn differs from his notes and spectra (Figs. 10, 11 and 12).

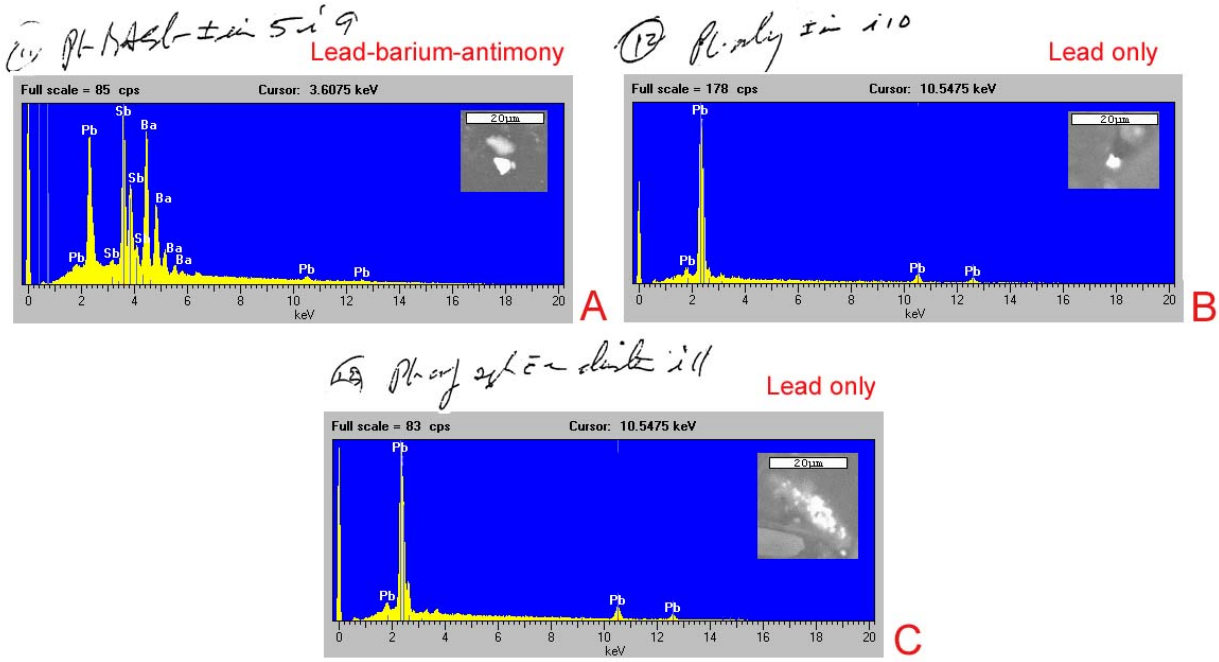

Figure 12. *Notes, spectra, and images from the analysis of the sampler from the interior of the control box (see Fig. 11). The actual elemental identity is provided in the upper right of each spectrum. In this sample, the elemental compositions match Dowell's handwritten notes, except the lower spectrum show a small amount of chlorine.*

The Gunshot Residue Samples of Mr. Blake's Clothing. A number of GSR samples were taken from the various items of Mr. Blake's clothing, despite the potential contamination from Mr. Blake's contact with the police car (Kowal et al., 2000) and station, his sitting in his car after Bakely was shot (Dowell, 2005) and while the clothing was stored in an open box in the trunk of a police car.

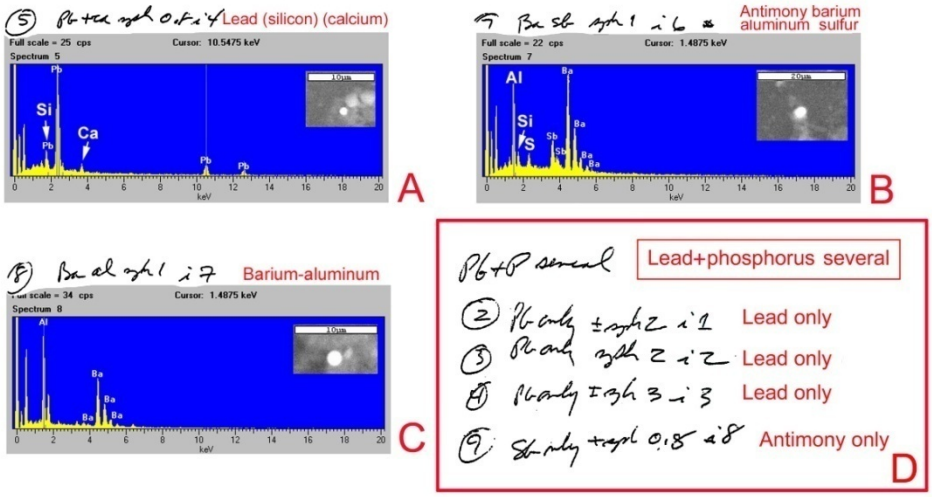

Figure 13. *Handwritten notes, spectra, and images of the particles associated with the boots sample. The actual elemental identity is provided in the upper right of each spectrum. Elements in parentheses may be from surrounding particles.* ***A:*** *Particle 5, image 4.* ***B:*** *Particle 7, image 6.* ***C:*** *Particle 8, image 7.* ***D:*** *Compilation of Dowell's handwritten notes of other lead- and antimony-bearing particles in the sample. There is no guidance provided as to how many particles were counted in, "Pb+P several."*

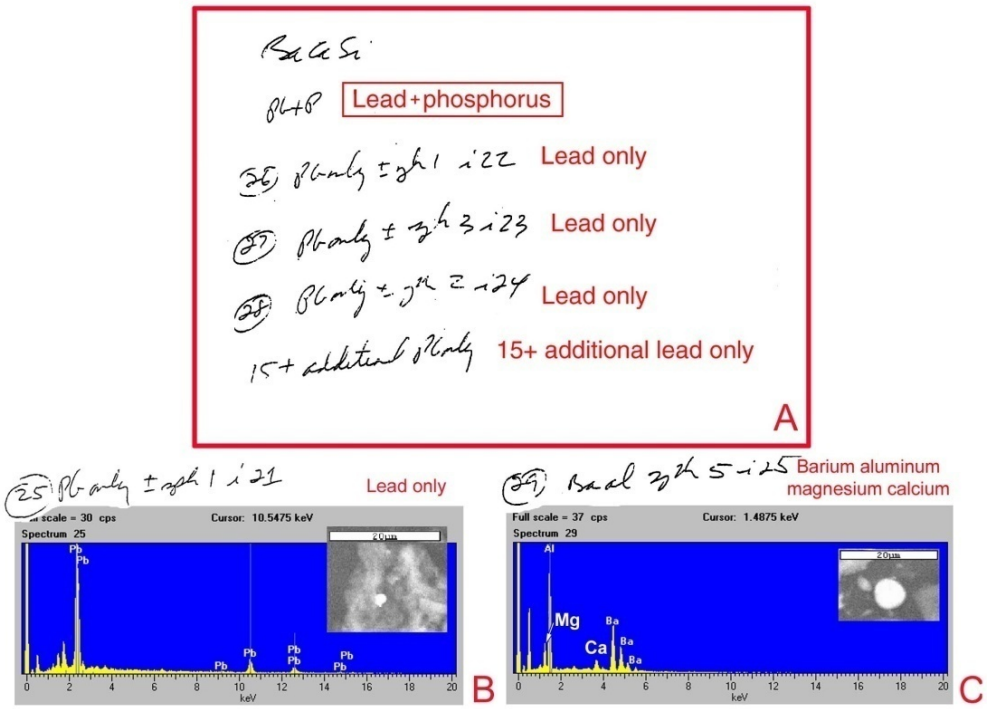

Figure 14. *Particle note summary and spectra of note from the analysis of the SEM sampler from the jeans (2nd sample).* ***A:*** *Selected listing of particle of interest in this analysis.* ***B:*** *Particle 25, image 21.* ***C:*** *Particle 29, image 25. Magnesium (Mg) and calcium (Ca) are part of this particle, but not noted by Dowell. The actual elemental identity is provided in the upper right of each spectrum.*

The scenario proffered by the prosecution is that Mr. Blake shot his wife, then the clothing he was wearing would also be subject to GSR from the 9 mm pistol. However, the following excerpt of a memo by Dowell (dated May 11, 2001) identifies yet another problem:

> "The Levi jeans appear to be 'dirty', that is they appear to have a history of use as do the black leather boots. In understanding and correctly interpreting the finding of GSR on items such as pants and boots, it is important to understand the history of the item(s) use – might the item been in contact at some other time, GSR may persist on such items for long periods of time and therefore a finding of GSR on such an item may not directly relate to the event that you are trying to understand. The presence of consistent particles of GSR on the samples collected from the hands, t-shirt and socks may have been transferred from the pants and/or boots. …"

"Survey samples" (Dowell, 2005) were taken of the t-shirt worn by Mr. Blake (item #156) and the blue jeans + belt/belt buckle (item #152). Neither handwritten notes nor spectra of the "survey samples" were made available to the defense.

Boots. Dowell reports "one highly specific particle of gunshot residue and several consistent particles of gunshot residue." Particle 5 (Fig. 13A), Dowell claims calcium as part although this particle and the small amount of silicon and aluminum are likely from a nearby particle. The "highly specific" particle appears to be the particle analyzed in spectrum 7 (Fig. 13B). Dowell has failed to note in particle 7 that aluminum (Al) as well as sulfur (S) are also present. The silicon with a small amount of the aluminum (plus small amounts of sodium & magnesium) are likely from surrounding particles. Particle 8 (barium-aluminum, Fig. 13C) also may have some silicon (Si). The sodium (Na) and a small contribution of aluminum and silicon are likely from a nearby particle.

Jeans (2nd sample). Dowell reports "several consistent particle [sic] of gunshot residue." There are 19 lead (Pb) only particles in this sample (Fig. 14A). Particle 25 (Fig. 14B) is likely correctly reported. The aluminum (Al) and silicon (Si) are probably from the nearby particles. Particle 29 (Fig. 14C) also has magnesium (Mg) as well as calcium (Ca). These elements are part of the particle. The magnesium would exclude this particle as GSR (Wolten et al., 1977).

Black belt and buckle. Particle 30 (Fig. 15A), is mistakenly reported as having "Pb only," also has aluminum (Al), magnesium (Mg) and zinc (Zn). The magnesium would exclude this particle as GSR (Wolten et al, 1979). Particle 33 (Fig. 15B), reported as having "Pb only," also has chlorine (Cl) and potassium (K). A lead-antimony (PbSb) and a lead-only particle were also reported (Fig. 15C).

Pair of black socks. Particles 11 and 12 (Fig. 16A) both also have aluminum (Al), potassium (K), calcium (Ca) and iron (Fe). The "PbSi" (lead-silicon) assignment by Dowell is not correct. These two particles are probably lead-only. The elements Si, Al, K, Ca and Fe are likely from the

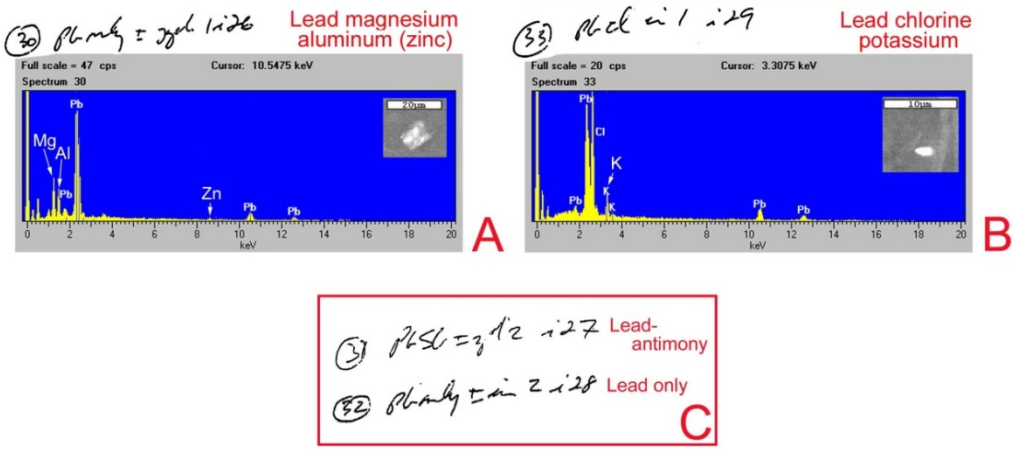

Figure 15. *Spectra of interest and particle note summary from the analysis of the SEM sampler from the black belt and buckle. The actual elemental identity is provided in the upper right of each spectrum. Elements in parentheses may be from surrounding particles.* ***A:*** *Particle 30, image 26. The presence of magnesium (Mg), aluminum (Al) and zinc (Zn) are in the particle, but were not noted in the spectrum.* ***B:*** *Particle 33, image 29. Potassium (K) was missed in the note.* ***C:*** *Selected listing of particles of interest in this analysis.*

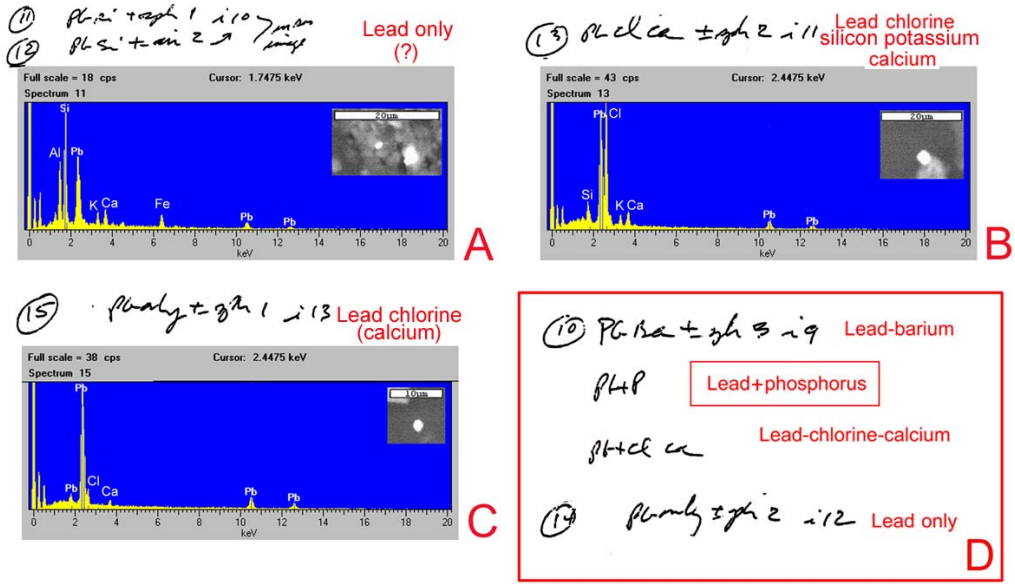

Figure 16. *Spectra of interest and particle note summary from the analysis of the SEM sampler from the pair of black socks. The actual elemental identity is provided in the upper right of each spectrum. Elements in parentheses may be from surrounding particles.* ***A:*** *Particles 11 and 12, image 10. Particles are probably lead-only, (?): the silicon (Si), aluminum (Al). potassium (K) and calcium (Ca) X-rays are likely from the surrounding debris.* ***B:*** *Particle 13, image 11. Silicon (Si) and potassium (K) are present, but not noted.* ***C:*** *Particle 15, image 13. Chlorine (Cl) and calcium (Ca) are likely part of this particle.* ***D:*** *Selected listing of other particles of interest in this analysis.*

particles closely associated with these lead particles. Particle 13 (Fig. 16B) also has silicon (Si) as well as potassium (K), which appear to be part of this particle. With particle 15 (Fig. 16C), Dowell failed to note that there is also chlorine (Cl) and calcium (Ca) associated with the particle.

Black T-shirt (2nd sample). Particle 34 also has a small amount of zinc (Zn) present. Particle 36 (Fig. 17A) reported as having "Pb only," also has chlorine (Cl), potassium (K) and calcium (Ca). Particle 37 (Fig. 17B) is reported as having "PbCl" (lead-chlorine) also has calcium (Ca). An example of the inconsistency of element assignments shown by Dowell: the proportion of chlorine to lead in particle 36 (Fig. 17A) equals that of particle 37 (Fig. 17B), yet in the former, the chlorine is not reported.

Boots (2nd sample). All the particle compositions are confirmed. The notes of Dowell of the lead bearing particles are presented in Fig. 18.

The number of lead- antimony- and barium-containing particles of interest for the six samples from the clothing is estimated to be 67 and are summarized in Table 1. Noteworthy is the lack of "highly specific" / "unique" / "characteristic" (Wright and Trimpe, 2006) GSR particles (those composed of lead-antimony-barium) in this combined sample. However, Dowell apparently calls the one particle (from the boots) with an elemental composition of "BaSb" (Fig. 13B—actually BaSbAlS (Si?)) as "highly specific." The 9 mm pistol used in this homicide could generate particles (based on the GSR deposition in the car and on Ms. Bakley) with these elements. The particles with an asterisk in the list (Table 1) have a likelihood as having been produced by a firearm. If these are particles of GSR, they could have been contamination of the clothing in the trunk of a police car, while Mr. Blake was wearing them in the police car and station or when Mr. Blake sat in his car following the shooting or from an unknown source. The overall lack of lead-antimony-barium composed particles in these samples suggest that Blake was either not the shooter or, if he was the shooter, he was not in a position to have these particles deposited on his clothing in concentrations which might be viewed as inculpatory.

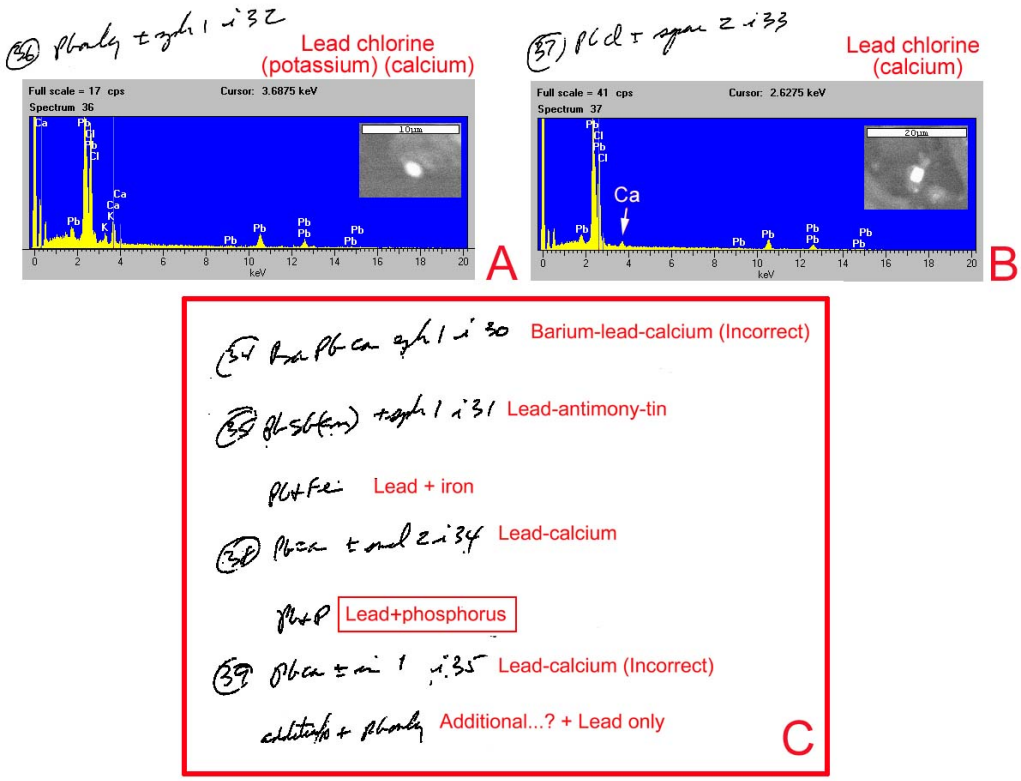

Figure 17. *Spectra of interest and particle note summary from the analysis of the SEM sampler from the black t-shirt (2nd sample). The actual elemental identity is provided in the upper right of each spectrum. Elements noted in parentheses may be from surrounding particles.* ***A:*** *Particle 36, image 32. Chlorine (Cl), potassium (K) and calcium (Ca) are in the spectrum but not noted.* ***B:*** *Particle 37, image 33.* ***C:*** *Selected listing of other particles of interest in this analysis. The actual elemental identity is provided in the upper right of each spectrum.*

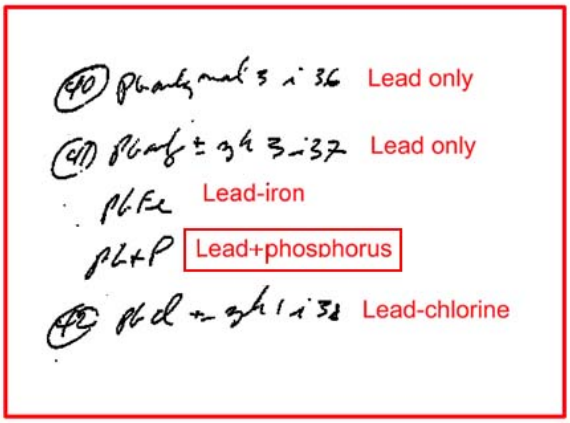

Figure 18. *Particle note summary from the analysis of the SEM sampler from the boots (2nd sample).*

Table 1. *Summary of the particles of the lead-bearing and other possible GSR particles found associated with the clothing belonging to Mr. Blake. This list was composed of the corrected element compositions where possible (i.e., a spectrum was available). Elements in parentheses are in trace amounts.*

Elements	#
Pb only	38
PbCl (Ca,K)	7
PbP	8
PbCa ± Si	3
PbFe	2
PbAlMg(Zn)	1
PbSb *	1
PbBaCa(Zn)	1
PbSbSn	1
BaAlMg(Ca)	1
PbBa *	1
BaAlSi *	1
BaSbAlSiS *	1
Sb *	1

The majority of the lead particles found on Mr. Blake are without antimony (Sb) or barium (Ba). Sources of lead (Pb) with chlorine (Cl), calcium (Ca), iron (Fe) are leaded paint, gasoline and pesticides (Wolten, et al, 1979). These lead-rich particle types would persist in the environment despite discontinued commercial use for a number of years (Cao et al., 2003). The "lead only" particles noted by Dowell, if they are indeed lead-only particles, are likely composed of lead carbonate (the carbon of the particle cannot be distinguished from background). Phosphorus (P) (actually phosphate) associated with lead is an insoluble compound (Cao et al., 2003). Fertilizers with phosphorus-bearing compounds are added to soils to remediate lead in the more toxic forms (lead-chlorine, lead-calcium, etc) to the non toxic form, lead-phosphate (Cao et al., 2003). Also, compounds of lead in soil convert naturally to lead phosphate when free phosphate is available (Cao et al., 2003). Dowell's report of May 11, 2001 notes, "The Levi jeans appear to be 'dirty', that is, they appear to have a history of use as do the black leather boots." The point is that the bulk (population) of lead particles found on Mr. Blake's clothes came from soil lead, not from a firearm.

County of Los Angeles
Department of Coroner

Forensic Laboratory
Analysis Report

Agency: Los Angeles Police Department
Agency #: 01-1515091
Subject: Clothing – One black belt and metal buckle – Second Sample

Microanalysis: Gunshot Residue

Specimen: Sample collected from the above item.

Purpose: Determine by Scanning Electron Microscopy / Energy Dispersive Spectroscopy (SEM/EDS) analysis if any gunshot residue particles are present.

Results: SEM/EDS analysis revealed **several consistent particle of gunshot residue.**

Therefore the pants, belt and buckle may have been in the environment of gunshot residue.

Date of Analysis
5/30/01

Analyst: Steven J. Dowell
Research Criminalist

File: LAPD0191B2

Figure 19. *Report concerning the results of the belt test submitted by Dowell on the People v. Blake case.*

Conclusions

The samples from the victim and car. Gunshot residue particles were found, most of which had a strong aluminum peak. It appears that the 9 mm pistol generated these particles because they were found not only on the passenger side of the vehicle, but also on Ms. Bakley's hand. The lack of this particle type (except, perhaps, for the one found on the boot sample, Fig. 13B), on the items of clothing and hands of Mr. Blake indicates that GSR from the 9 mm pistol was either not deposited on Mr. Blake or was lost if it had been deposited.

Blake's hand GSR samples. Dowell appears to have attached the wrong images of spectra and particles to the report of Mr. Blake's hand GSR burdens. Thus, the actual particle burdens of Mr. Blake's hands are uncertain.

The potential for GSR contamination of Mr. Blake when he entered the police environment is great (Kowal et al., 2000). Other jurisdictions put paper bags over the hands of a suspect before being placed in the police environment if that suspect cannot be sampled at the place of arrest

(Kimmett, 2000; Shaffer, 2001). Even if lead- or barium- bearing particles were found on Mr. Blake and are GSR, the police car or station origin cannot be ruled out. In addition, Mr. Blake sat in the driver's seat of his car after the shooting (Dowell, 2005). Gunshot residue was deposited within the car with the shooting of Ms. Bakley.

The Walther 9 mm pistol. The handling of the 9 mm pistol and casings can be viewed as incompetent. It would have been appropriate and important to have obtained a bore wipe prior to the test firing. If it was not possible to sample the bore of the pistol, then samples from the two casings may have provided information as to the nature of the GSR produced by the Walther 9 mm pistol. There was no additional mention of the casings after their collection at the scene and examination by the firearms expert.

Sweatshirts in the back seat of Blake's car. The flawed handling of this case extends to the proposed GSR analysis of two sweatshirts that were found in the backseat of Blake's car. Detective Ronald Ito had requested GSR tests on the two sweatshirts to "determine whether either one may have been used as a silencer." Colin Yamauchi of the Los Angeles Police Department's Scientific Investigation Division noted in a memo, "Explained to Detective Ito that gunshot residue particle analysis cannot prove or answer his question. Any interpretation of the presence or absence of gunshot residue on surfaces other than bare hands is unfounded and possibly misleading." First, if one of the sweatshirts was used as a silencer, a SEM/EDS analysis would not be necessary. Bullet holes as well as soot would be found by gross examination. Second, Mr. Yamauchi is mistaken; this author has worked many cases where the sampling of one or more inanimate objects associated with a crime or at a crime scene had evidentiary importance and, of course, this opinion was contrary to the extensive sampling and analysis program of Blake's clothing for GSR conducted by the Los Angeles Department of the Coroner.

Mr. Blake's clothing samples. The following can be concluded for the samplers of Mr. Blake's clothing:

1. Additional control samples are necessary to make Dowell's results meaningful. Samples should have been collected from around Mr. Blake's home. Indeed, Dowell (2005, answer to question 4) admitted that this would have been appropriate. These additional control samples may reveal lead-bearing particles similar to those found associated with Mr. Blake's clothing. Without these control samples, the results from the samples taken from Mr. Blake's clothing are pointless and it is misleading to call many of these particles "consistent" with GSR.
2. There is a discrepancy between the reported composition and the submitted spectra for many of the alleged GSR particles. The predominance of lead without antimony (Sb) or barium (Ba) suggests the lead-bearing particles are from a source other than a firearm. The presence of lead-phosphorus particles (Figs. 13D, 14A, 16D, 17C, and 18) in this particle population suggests a soil origin for many of the particles containing lead (Cao et al., 2003).
3. Contamination of Mr. Blake's clothing from the police car and station, from the trunk of the police car where the clothing was stored, from the car where Mr. Blake apparently momentarily sat beside his dying wife (Dowell, 2005) and from Mr. Blake's .38 revolver are all possible for the few particles that might be attributed to a firearm.

Spectral contaminates from surrounding particles. When the electron beam strikes an object, it generates X-rays from a volume of the target material that depends on the density (average atomic number) of that target material. Generally, that volume of target material fluoresced is around 1 cubic micron (Goldstein et al., 1981). Thus, the smaller the GSR particles, the more the X-ray contribution to a spectrum from particles that are in close proximity to that particle of interest. Indeed, for particles of interest that are less than 1 micron diameter, surrounding particles might contribute one or more major peaks to the spectrum of the particle of interest. The question, of course, is how important is it to distinguish between these two X-ray sources. It could be important to distinguish the X-ray contribution of the particle of interest from these "contaminate" X-rays, especially in assisting to distinguish "lead-only" (perhaps of firearms origin) from lead particles from other sources. A quick assessment of one or more nearby particles would solve a contaminate X-ray question. More care in this regard would have helped in the analysis of Mr. Blake's clothing.

Individual versus a population of particles. The pioneering work of the Aerospace Group (Wolten et al., 1977) is the bible for GSR analysis in scanning electron microscopy. In that text, on page 58, is the rule: "The presence of substantial numbers of inconsistent particles overrules the evidentiary significance of particles consistent with gunshot residue." Torre, et al. (2002) reported that automotive friction products (i.e., brake pads) produced by a number of manufacturers will generate GSR-like particles with combinations of lead, antimony and barium. There is a diversity of these particles that are made up of lead, antimony and barium. When found on a sample, these brake-origin particles could be mistaken for GSR. Torre, et al (2002) propose a corollary to Wolten's Rule: "…before judging a sample as positive, the type of ammunition fired in the investigated crime must always be taken into consideration: only by comparison between the sample and the ammunition's particles is it possible to attain a decisive answer." Giacalone (2002) has expressed this same position.

Kowal and Dowell (2001) state, " …we report what we see on a submitted GSR sample including consistent P-GSR [primer-gunshot residue] of both spherical and irregular morphologies. In our report we include statements about the possible origins of those consistent particles." Many of the reports by Dowell (e.g., Figs. 9 and 19), contrary to their policy, do not state the "possible origins of those consistent particles."

The defense presents their GSR case.

On Tuesday, February 22, 2005, Celia Hartnett Laboratory Director of Forensic Analytical (Hayward, California) testified in behalf of the defense of Mr. Blake. I did not participate in Hartnett's work or presentation to the court. Parts of her testimony and Dowell's rebuttal were reviewed by several news sources:

1. Los Angeles Times, "Blake had little gun residue" (February 23, 2005): "… the actor's hands would have had nearly 100 gunshot residue particles—more than 20 times what authorities detected."
2. Los Angeles Times, "Blake had little gun residue" (February 23, 2005): "With the tests as a

baseline, the lab used a formula to estimate how much residue would remain on the shooter's hand 2 1/2 hours later, accounting for normal activity and no hand washing with soap and water."

3. CNN.COM Law Center, "Defense rests in Robert Blake trial" (February 23, 2005): "Hartnett, laboratory director of Forensic Analytical in Heyward [sic], said she took into consideration that Blake handled several objects, including glasses of water, and rubbed his hands on his hair, on the grass and on his clothes before he was tested."
4. CNN.COM Law Center, "Defense rests in Robert Blake trial" (February 23, 2005): "Hartnett said the ammunition was difficult to obtain because it had gone out of production in 1994, but she said the ammo tested had the same powder, bullet style and powder load."
5. COURTTV.COM, "Expert: Evidence shows actor Robert Blake did not murder his wife" (February 23, 2005): " … Hartnett… testified that although investigators found five particles of gunshot residue (GSR) on Blake's hands after his wife's murder, the number would have been closer to 97 or 98 particles if he were the killer."
6. COURTTV.COM, "Prosecutors bolster key testimony during rebuttal in Robert Blake's murder trial" (February 26, 2005): "Blake had five particles of gunshot residue (GSR) on his hands the night his wife was murdered, and both sides agree that the small amount may be consistent with the defendant's handling his own licensed revolver that evening, which was not the murder weapon."
7. COURTTV.COM, "Prosecutors bolster key testimony during rebuttal in Robert Blake's murder trial" (February 26, 2005) Hartnett used in her estimated calculation: "… a formula published in a report by the Aerospace Corporation, Blake should have closer to 97 or 98 particles on his hands if he was the shooter."
8. COURTTV.COM, "Prosecutors bolster key testimony during rebuttal in Robert Blake's murder trial" (February 26, 2005): Steve Dowell was brought back to rebut Hartnett's testimony. "… told jurors that the 1980 [actually 1977] Aerospace formula, a method to calculate the potential fall-off rate of the sticky GSR particles on a subject's hands, was not an accepted scientific formula and he had heard no other instances when it was cited by the scientific community."

Unfortunately, I could not review Hartnett's testimony. My following comments are based on the above accounts, and on Dowell's 2005 account. I will refer to the above news accounts by their associated number in the following.

If Blake had fired the weapon — concerning his GSR hand burden 2.5 hours after the shooting. Accounts 1, 2, 3, 5 and 7 as well as Dowell (2005) indicate that Ms. Hartnett estimated the number of GSR particles remaining on Mr. Blake if he had shot his wife. This was done by estimating the number of GSR particles deposited on the hand of a shooter after twice firing the Walther 9 mm pistol. The formula that was used in this calculation was published in the Aerospace Report (Wolten et al., 1977). This estimate, as well as other estimates (ibid.) of the loss of GSR burden from hands assumes "normal activity" of the test subject following a firearm discharge. And just what is "normal activity?" Is rubbing "...his hands...on the grass…" (Account 3 and Dowell, 2005) an aspect of "normal activity?" There is no guidance in the literature as to how much GSR remains on the hands of a subject after such activity. The amount of GSR that remains on hands of a subject, regardless of the time of sampling, is highly variable.

The variability has been recognized to be so high, that until Ms. Hartnett's testimony, there have been no published attempts nor have I reviewed any testimony that attempts a quantitative estimate as to how much GSR remains after a certain time following a shooting. Mr. Blake was sampled 2.5 hours after the shooting and by witness accounts, he was quite active after the shooting. Hartnett apparently commented on the activity issue (Accounts 2 and 3), but provided no guidance as to levels of activity in relation to GSR retention. The Aerospace formula (Wolten et al., 1977) was an attempt to mathematically describe particle loss according to their data, not an invitation to estimate numbers of particles on a suspect after a certain amount of time from a shooting. Dowell (2005) agrees.

Second, most pistols are variable in the amount of breech GSR produced, a single hand burden measurement is not appropriate for estimating the population of particles on the shooter's hand immediately after the firing the pistol.

Third, the shooting was outside. Wind is known to affect GSR deposition on a shooter's hand (White & Gross, 1994). Even if it is known that the wind at the time of shooting was less than 10 mph, even a slight breeze will affect the GSR-laden cloud that emanates from the pistol.

Fourth, Hartnett accepted all the data generated by Dowell without any indication of checking the spectra and handwritten notes of Dowell. The evidence presented in this article indicates that Dowell's data are not reliable for much of his work on this case. There was no need to embark on an expensive and questionable experiment to counter Dowell's evidence.

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