Gemar Clemons v. State of Maryland, No. 70, September Term, 2005.

EVIDENCE – ADMISSIBILITY OF SCIENTIFIC EVIDENCE

Petitioner sought review of a decision by the Circuit Court for Prince George's County admitting expert testimony concerning comparative bullet lead analysis ("CBLA"). After examining the germane scientific studies concerning CBLA, the Court of Appeals held that the conclusory aspects of CBLA are not generally accepted within the relevant scientific community as required under the *Frye-Reed* test for the admissibility of evidence derived from scientific processes. Therefore, the Court of Appeals held that the conclusory aspects of CBLA are not admissible under the *Frye-Reed* test.

IN THE COURT OF APPEALS OF MARYLAND

No. 70

September Term 2005

GEMAR CLEMONS

V.

STATE OF MARYLAND

Bell, C.J.
Raker
Wilner
Cathell
Harrell
Battaglia
Greene,

JJ.

Opinion by Battaglia, J.

Filed: April 19, 2006

This case presents us with the task of determining whether certain conclusory aspects of comparative bullet lead analysis ("CBLA") are admissible under the standard enunciated in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923), and adopted by this Court in *Reed v. State*, 283 Md. 374, 391 A.2d 364 (1978), which makes evidence emanating from a novel scientific process inadmissible absent a finding that the process is generally accepted by the relevant scientific community. We determine here that the conclusory aspects of CBLA are not generally accepted within the scientific community and thus are not admissible under the *Frye-Reed* standard for admitting scientific expert testimony. Therefore, we reverse the decision of the Court of Special Appeals and remand the case to the Circuit Court for a new trial.

Background

On January 8, 2002, Kenya Bryant and his thirteen-year-old son Brandon were packing their vehicle outside Mr. Bryant's home in Suitland, Maryland in preparation for Brandon's return home to North Carolina after visiting his father during his winter break from school. Brandon went inside the house to retrieve more things, heard ten gunshots, and remained inside the home until the police arrived and informed him that his father had been killed.

Approximately eighteen hours after Mr. Bryant was shot, Lachrisha Williams notified Prince George's County Police that she had witnessed the shooting. During her interview with police, Ms. Williams provided a description of the driver, although she did not know his name at the time.

Two days after the shooting, on January 10, 2002, District of Columbia Metropolitan Police Department officers seized a Lorcin nine-millimeter handgun and bullets from an automobile in conjunction with an investigation of a traffic accident in the District of Columbia. Gemar Clemons, the petitioner, was a passenger in that vehicle and, among other offenses, was charged under the District of Columbia Code with the alleged possession of an unregistered handgun (the Lorcin) as well as possession of ammunition.[1] Clemons was subsequently acquitted by a jury of all charges associated with the traffic stop, including the charges involving the possession of the handgun and ammunition.

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[1] Section 7-2507.06 (2)(B) of the District of Columbia Code provides in pertinent part:

> A person who in the person's dwelling place, place of business, or on other land possessed by the person, possesses a pistol, or firearm that could otherwise be registered, shall be fined not more than $1,000 or imprisoned not more than 1 year, or both.

Section 7-2506.01 of the District of Columbia Code provides:

> No person shall possess ammunition in the District of Columbia unless:
> (1) He is a licensed dealer pursuant to subchapter IV of this unit;
> (2) He is an officer, agent, or employee of the District of Columbia or the United States of America, on duty and acting within the scope of his duties when possessing such ammunition;
> (3) He is the holder of the valid registration certificate for a firearm of the same gauge or caliber as the ammunition he possesses; except, that no such person shall possess restricted pistol bullets; or
> (4) He holds an ammunition collector's certificate on September 24, 1976.

Thereafter, police were able to determine that the Lorcin handgun seized in the District of Columbia was consistent with that used to shoot Mr. Bryant, but could not conclusively identify it as the weapon. After Clemons was arrested in the District, Ms. Williams also was asked to view a photographic array, and she selected Clemons's picture as that of the man who shot Mr. Bryant. Clemons was arrested on July 2, 2002, and on August 6, 2002 was charged with four counts related to the Bryant murder: murder under the Maryland Common Law,[2] robbery with a deadly weapon in violation of Maryland Code (1957, 1996 Repl. Vol., 2001 Supp.), Article 27 Section 487,[3] theft in violation of Maryland

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[2] Under Maryland law the crime of murder remains a common law crime, although first and second degree murder have been delineated by statute. *See Sifrit v. State*, 383 Md 116, 138, 857 A.2d 88, 100 (2005); *Mitchell v. State*, 363 Md. 130, 146-47, 767 A.2d 844, 854 (2001).

Section 407 of Article 27 defined first degree murder as:

> All murder which shall be perpetrated by means of poison, or lying in wait, or by any kind of wilful, deliberate and premeditated killing shall be murder in the first degree.

Maryland Code (1957, 1996 Repl. Vol.), Article 27 Section 407 was recodified without substantive change as Maryland Code (2002), Section 2-201 of the Criminal Law Article.

Section 411 of Article 27 defined second degree murder as:

> All other kinds of murder shall be deemed murder in the second degree.

Maryland Code (1957, 1996 Repl. Vol.), Article 27 Section 411 was recodified without substantive change as Maryland Code (2002), Section 2-204 of the Criminal Law Article.

[3] Section 487 of Article 27 provided in pertinent part:

(continued...)

Code (1957, 1996 Repl. Vol.), Article 27 Section 342,[4] and use of a handgun in a felony or crime of violence in violation of Maryland Code (1957, 1996 Repl. Vol.), Article 27 Section 36B (b).[5]

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[3] (...continued)

> (a) *Prohibition.* – A person may not commit or attempt to commit a robbery under § 486 of this subheading with a dangerous or deadly weapon.
> (b) *Violation; penalty.* – A person who violates this section is guilty of a felony and on conviction is subject to imprisonment not exceeding 20 years.

Maryland Code (1957, 1996 Repl. Vol., 2001 Supp.), Article 27 Section 487 was recodified without substantive change as Maryland Code (2002), Section 3-403 of the Criminal Law Article.

[4] Section 342 of Article 27 provided in pertinent part:

> (a) *Obtaining or exerting unauthorized control.* – A person commits the offense of theft when he willfully or knowingly obtains control which is unauthorized or exerts control which is unauthorized over property of the owner, and:
> (1) Has the purpose of depriving the owner of the property; or
> (2) Willfully or knowingly uses, conceals, or abandons the property in such manner as to deprive the owner of the property; or
> (3) Uses, conceals, or abandons the property knowing the use, concealment, or abandonment probably will deprive the owner of the property.

Maryland Code (1957, 1996 Repl. Vol.), Article 27 Section 342 (a) was recodified without substantive change as Maryland Code (2002), Section 7-104 of the Criminal Law Article.

[5] Section 36B (b) of Article 27 provided in pertinent part:

> (b) *Unlawful wearing, carrying, or transporting of handguns; penalties.* – Any person who shall wear, carry, or transport any

(continued...)

Prior to trial, when it became clear that the State would attempt to prove that the handgun recovered during the traffic stop when Clemons was the passenger in the District of Columbia was the same gun used in Mr. Bryant's murder, Clemons filed a motion *in limine* to exclude the evidence of the gun that was recovered in the traffic stop premised upon his argument that admission of the evidence would violate the prohibition against double jeopardy because Clemons had previously been acquitted of possessing the gun. Moreover, Clemons asserted that, because of his acquittal in the traffic stop case, the State should be collaterally estopped from relitigating the issue of whether he "possessed" the handgun on January 10, 2002. The trial court denied the motion in a pretrial hearing, determining that double jeopardy did not apply because Clemons's first trial was conducted in the D.C. federal courts whereas the case *sub judice* was conducted in state court in Maryland. Furthermore, the court noted, the doctrine of collateral estoppel was inapplicable because the crimes were separate and distinct, because the murder occurred in Maryland on January 8, 2002, while

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[5] (...continued)
handgun, whether concealed or open, upon or about his person, and any person who shall wear, carry or knowingly transport any handgun, whether concealed or open, in any vehicle traveling upon the public roads, highways, waterways, or airways or upon roads or parking lots generally used by the public in this State shall be guilty of a misdemeanor; and it shall be a rebuttable presumption that the person is knowingly transporting the handgun;

Maryland Code (1957, 1996 Repl. Vol.), Article 27, Section 36B (b) was recodified without substantive change as Maryland Code (2002), Section 4-203 of the Criminal Law Article.

the D.C. gun violation occurred on January 10, 2002.

Clemons also filed another motion *in limine* in which he asked the court to exclude the testimony of the State's expert witness, Charles A. Peters, a forensic chemist from the Federal Bureau of Investigation ("FBI"), who was represented to be an expert on CBLA, a three-step process that involves the comparison of the elemental composition of bullets in an effort to determine whether different bullets originated from the same vat of lead. In his motion, Clemons specifically challenged the admissibility of CBLA. At the pretrial hearing, Clemons agreed to the court's decision to defer addressing the motion to exclude Peters's testimony until trial.[6]

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[6] Judges have discretion to defer a pre-trial ruling on a motion *in limine* and ordinarily do so where the issue can be better developed or achieve a better context based on what occurs at trial. Where evidence is subject to challenge under *Frye-Reed*, however, the issue should, whenever possible, be dealt with prior to trial. The evidence bearing on whether the challenged evidence is actually the product of a novel scientific technique and, if so, whether that technique is generally accepted in the relevant scientific community will usually be collateral to the substantive issues at trial and may, itself, be inadmissible with respect to those substantive issues. That alone justifies resolving the issue prior to trial. Dealing with the issue pre-trial also avoids delays and diversions at trial that may inconvenience both witnesses and the jury. *See* Maryland Rule 5-104 (c) ("Hearings on preliminary matters shall be conducted out of the hearing of the jury when required by rule or the interests of justice."). As we pointed out in *Reed*, *supra*, the inquiry in *Frye-Reed* is entrusted to the judge rather than the jury to prevent "the trial of the technique rather than the trial of the issues involved in the case." *Id.* at 389, 391 A.2d at 372, quoting *State v. Cary*, 239 A.2d 680, 684 (N.J. Super. 1968). We observed in *Reed*:

> *Frye* was deliberately intended to interpose a substantial obstacle to the unrestrained admission of evidence based upon new scientific principles. . . . Several reasons founded in logic and common sense support a posture of judicial caution in this area. Lay jurors tend to give considerable weight to 'scientific'

(continued...)

At trial, the State called Peters to testify as an expert witness. Immediately prior to Peters's testimony, both parties recognized that the scientific process providing the foundation for Peters's testimony was subject to examination.[7] Clemons's counsel requested

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[6] (...continued)

> evidence when presented by 'experts' with impressive credentials. We have acknowledged the existence of a '. . . misleading aura of certainty which often envelops a new scientific process, obscuring its currently experimental nature.' . . . '[S]cientific proof may in some instances assume a posture of mystic infallibility in the eyes of a jury.'

Reed, 283 Md. at 386, 391 A.2d at 370, quoting *People v. Kelly*, 549 P.2d 1240, 1245 (Cal. 1976). Maryland Rule 5-103 (c) also provides support for our conclusion that *Frye-Reed* examinations are better conducted in pre-trial hearings in its admonition that "[p]roceedings shall be conducted, to the extent practicable, so as to prevent inadmissible evidence from being suggested to a jury by any means, such as making statements or offers of proof or asking questions within the hearing of the jury." Conducting the hearing outside the presence of the jury would preclude its members from improperly considering evidence that is irrelevant to the task at hand and ensure that the verdict is derived from evidence properly before it.

If the issue is to be dealt with at trial, it should be addressed, in its entirety, as a preliminary matter prior to admission of the challenged evidence, not, as here, by having the challenge made only to Peters's status as an expert during the State's case and then receiving most of the evidence bearing on whether the inferences sought to be drawn from CBLA are generally accepted in the relevant scientific community during the defense case, after the challenged inferences have already been admitted. If a party raises a *Frye-Reed* objection, all evidence bearing on admissibility of the challenged evidence should be presented and considered *before* a ruling is made on the challenge.

[7] Both parties erroneously claimed that Maryland follows the Supreme Court's reasoning in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993), where the Supreme Court announced that the adoption of the Federal Rules of Evidence superceded the *Frye* test and explicated the issues that the trial court must consider when expert scientific testimony is proffered, including whether "the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue;" "whether the theory or technique has been subjected to peer review and publication;" the known or potential error (continued...)

that Peters's voir dire occur outside the presence of the jury. The judge permitted the challenge to the admissibility of Peters's testimony and required that it occur in the presence of the jury. During Peters's voir dire examination, he described the methods that he employs in CBLA:

> We find if we look at the composition of the lead bullet, these are elements that make up the leads of a bullet, we look at things like antimony, copper, bismuth, silver, cadmium, tin. We look at these various elements and if they're in the same concentration in the victim bullet as in say cartridges left in a gun or partial box that can be related back to the suspect we can then narrow down and say they match in composition. We can say they're analytically the same. We can't tell them apart. That tells us that they were manufactured or they were likely manufactured in the same pot of lead at a bullet manufacturer. So out of the whole population of nine billion or so cartridges that are produced here in the United States, we can narrow it down to tens of thousands of bullets being produced that would have the same composition.

Peters's further described the general ammunition manufacturing process:

> It's pretty simple. It starts with actually your car battery. When they go bad, the lead in those car batteries are recycled. In a very small portion of that lead is reprocessed and goes into the making of bullets. They call that a secondary lead smelter. They'll crack these batteries open, they'll reprocess the lead. The bullet manufacturers will actually order lead from secondary smelter in certain alloys.
> The alloy in lead is defined generally in the antimony placed in

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[7] (...continued)
rate; and the acceptance within the relevant scientific community. *Id.* at 592-94, 113 S.Ct. at 2796-97; 125 L.Ed.2d at 482-83. Maryland has continued to adhere to the *Frye* test rather than the *Daubert* standard. *See Wilson v. State*, 370 Md. 191, 201 n.5, 803 A.2d 1034, 1040 n.5 (2002).

the lead. The antimony either makes the bullet soft or the lack of it – the lack of it makes it soft, more of it makes it hard.
This will be shipped to the bullet manufacturer, the bullet manufacturer will remelt this lead. They will pour it into what we call a billet. It's just a mold that's a cylinder of lead anywhere from between 80 to 120 pounds. It's a round cylinder that will dry or become hard as a piece of lead. And with that billet they will force it into an orifice or a die of the diameter of the bullet that they want to make.
It's sort of like making spaghetti, but it takes a hardening of that being forced through an orifice and out comes this wire of lead. It's this wire lead that they'll cut into segments which they call a slug. The slugs will then be molded by pressing into the shape of a bullet and then from there they can add a jacketing such as the copper jacket which is all copper. They can add a brass jacketing which is copper and zinc and the various different things they do to the bullet is for the various uses of the bullet. Hollow point so when they hit the game or something they'll spread out and give more stopping power.

* * *

So we're down to the making of the bullet. Then these bullets are stored in bins. Then another time in the process they'll be so-to-speak married with the cartridge case which is a brass piece, will be filled with gunpowder. The bullet will be loaded into the cartridge case will end up with what's called a cartridge. These cartridges will be loaded into boxes. And the boxes go into cases and the cases are sent throughout the United States for retail sale.

Q. Now, can you describe the analytical techniques that are used to analyze bullet lead?

A. It is the one technique that we use to analyze it called Inductively Coupled Plasma-Optical Emission Spectroscopy. We call it ICP for short. It's just an instrument that we use that can identify the elements in the bullet lead. It's a big name but it's being used all over the world for all kinds of uses that we need to know the elements of compositions that are shown is

there.

* * *

Q. And how many bullet lead analyses have you performed over your years with the FBI?

A. I have done tens of thousands of analyses.

Q. And have you or your colleagues engaged in research in this field?

A. Yes, we have. We're a working lab, but we have found some time to do some research. In 1988 we actually started to use the technique of ICP. Before that time we used a technique called neutron activation analysis which is the use of a nuclear reactor where we radiated the lead that tells us the composition of these elements in the lead. That was the transition between the two techniques showing that they got comparable results. And in 1991 we published a paper where we went and got boxes from various manufacturers and analyzed them. And also I have just recently published a paper that describes the whole process of comparative bullet lead analysis and some data that was from off the line of these extruded wires coming off the Winchester line showing that the smelt will have the same composition and the next smelt will have a slightly different composition.

Q. And have you ever testified as an expert in the field of comparative bullet lead analysis?

A. Yes.

Q. Approximately how many times?

A. Over 80.

[THE STATE]: At this time, Your Honor, the State will proffer Charles Peters as an expert in the field of comparative bullet lead analysis.

[DEFENSE COUNSEL]: I object to that, Your Honor.

The trial court permitted defense counsel to cross-examine Peters. On cross-examination, defense counsel established that the FBI had requested the National Academy of Sciences to study the validity of CBLA as a result of challenges to its validity in judicial proceedings.

Overruling defense counsel's objection to the witness's qualifications and the general acceptance of the scientific process that was the subject of his testimony, the court noted:

> Comparative bullet lead analysis. All right. I'll tell you what I'm going to do. I'll admit him as an expert. I heard a lot of voir dire on these interesting questions, challenges. So I'm going to admit him as an expert in this field because he's been in this field for a long time. He's done tens of thousands of these analyses. He's been around since the '70's. This test called ICP, Inductively Coupled Plasma, OES[8] version is what this witness intends to testify about. And the fact that there are some challenges, it doesn't mean that it's such a novel and scientific kind of test that the court finds as a matter of law that it shouldn't be submitted to the jury. And I'm going to accept the witness's qualifications in this field and of course limit his testimony to this particular test in this particular field.

Immediately following this statement, Peters testified as follows with respect to the comparison of Exhibit 50, unfired cartridges containing bullets recovered on January 10, 2002, in the District of Columbia and Exhibits 26 and 27, bullet fragments numbered K101 and K102, respectively, recovered from Mr. Bryant's body:

> [THE STATE]: And as a result of that examination, were you able to reach any conclusion?

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[8] Inductively Coupled Plasma-Optical Emission Spectoscopy was the technique used for CBLA up to the time of its discontinuation by the FBI Laboratory. National Research Council, FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE 15-16 (2004).

[PETERS]: Yes, I was.

Q. Can you go through each one of your conclusions?

A. In this particular case there were exhibit –

Q. State's exhibit number 50. Showing you what's been admitted into evidence, which will be the ammunition recovered from the District of Columbia.

A. There were five of these cartridges. A cartridge is an unfired round. It has a bullet, the gunpowder, the primer, and its hasn't been fired. We took ammunition from them and compared them to bullets that were physically the same. One of the bullets that was physically the same was exhibit number 26.

Q. Is that K101 as well?

A. Yes.

Q. Okay.

A. We compared this to these five cartridges and one of the five cartridges from here was analytically the same. And basically the way I can explain it to you, if I gave you these two samples and said put them in your hand behind your back and give them back. I can tell you which one was which and analyze them. Elementally I couldn't tell them apart. That elements such as antimony, arsenic, silver, and copper was analytically the same in both of those samples. And that tells me that this likely came from the same pot of lead at the manufacturer, but in this case is Winchester.

[DEFENSE COUNSEL]: Objection. He said likely. It's not the conclusion in this report.

[THE STATE]: Well –

THE COURT: Is it likely or is it the same? I thought that likely

was you compared it to bullets that are physically the same. Physically likely the same or physically the same? What is your testimony?

[PETERS]: Where the bullet and the cartridges are analytically indistinguishable so they're the same in the composition. What does that mean? It means they're likely or consistent as my report says. Well, it came from the same smelt of lead.

[DEFENSE COUNSEL]: The word likely is not in your report, sir. The word consistent with is.

[THE STATE]: Objection.

THE COURT: You can ask him about that.

[THE STATE]: Now with State's exhibit – State's exhibit number 27, K102, did you have occasion to analyze that?

A. Yes.

Q. And what were your results with that?

A. Here again this is another bullet and I analyzed it and compared it to these five cartridges. And one of these cartridges was analytically indistinguishable to each other. Different composition that the first group I talked about. So they would each come basically from a different smelt of lead made at Winchester.

Q. So they're consistent with having been originated or made from the same manufactured source?

A. Yes.

On cross-examination, Clemons's counsel did not question the validity of CBLA, but rather, requested that Peters restate his conclusions based on the analysis.

To counter Peters's testimony, Clemons presented the testimony of William Tobin,

a consulting forensic metallurgist who had been a special agent at the FBI for twenty-seven years and who had been assigned to the FBI Laboratory in Quantico, Virginia as a forensic metallurgist prior to his retirement in 1998. Tobin testified that when he retired he initiated a study of CBLA because he noticed a "contradiction between metallurgic [principles] and the [principles] required to accept the practice of comparing bullet leads." After collaborating with other chemists in the lead industry, Tobin had concluded that the practice was "seriously flawed;" he testified:

> The three basic premises are assumptions required for validity have been proven by our research to be false premises. And it's our general conclusion that the practice of comparing bullet lead has limited, if any, forensic value.
> In fact the German FBI doesn't even use it nor does the ATF over here in the U.S. for anything other than investigative purposes. They do not use it for evidence of guilt. So our conclusion is that we – I don't take issue in the study and prior to my publication in the area I decided it will be very convenient for understanding to bifurcate the process into three stages or three phases.
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> * * *
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> The first phase being the actual sample preparation and then sticking it in the machine and – very complicated and high tech machine.
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> * * *
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> But the first phase I chose to characterize as the analysis phase where the sample is being prepared and analytically analyzed for what compositions are in the lead. I'm sorry, what elements, chemical elements are in the lead. In other words, what the composition of the lead is.
> The second phase I considered the grouping phase. Where once

the machine spits out what the composition of the bullets are or what the samples are, the analyst then decides to group. To make a decision as to which of these compositions he or she considers analytically distinguishable or which ones are considered close enough to be considered analytically indistinguishable on the division of the analytical requirement. Because there's always errors in these analyses.

The third phase I designated the inference phase. In other words, what conclusions will the examiner now reach after the grouping phase. In other words, what is the examiner going to conclude after he or she has looked at these compositions to decide which ones they will call analytically indistinguishable and which ones are considered analytically distinguishable.

We generally do not challenge phase one of the practice. We don't take issue with the analysis phase. We do challenge the grouping basis for several reasons and we strenuously challenge the inference phase or conclusions that have been rendered in courtrooms for that. And maybe a good one line analogy to compare the basis for our challenge will be similar to blood testing. For example, a sample of blood is taken from me and a sample of blood is taken from anybody in the courtroom. A generally accepted technique. And the blood is analyzed for sodium, potassium, iron, copper, HDL, LDL. Normal analytes that blood is analyzed for.

Then let's presume that those two blood samples from someone in the courtroom and my blood are found. The analytes are found to be analytically indistinguishable. We don't challenge the analysis of the blood. That's a generally accepted practice. However, the practice as I have seen it practiced for over three decades is the inference phase. The conclusions, therefore, that because the analytes in by blood and the analytes in someone's blood in this courtroom are analytically indistinguishable, therefore, the two of us came from the same source as to parents. It's clearly an unjustifiable extrapolation. And that has been occurring in over three decades in this practice and that's one of the objections of about 18 to the practice because it basically summarizes.

The other primary challenge that we have is for the current proceeding relates to forensic value. And the analogy there is because of the retail study of the distribution studies that I have

> conducted or we are conducting as well which confirms my original hypothesis. And, that is, what is the value of making these associations when it's very possible that every citizen in the County has bullets of the same composition. Those are called distribution considerations.
> What we have found is that is analogous to an expert testifying that he has made an association between two denim fibers. Everyone knows how prevalent blue – what is the value of the blue denim match? Next to nothing because of the prevalence of blue jeans. We find that very similar to what is being offered in court as to a bullet lead composition. It's very bad with .22 caliber. That's the highest turnover caliber out there in the industry.
> And those are the basis of my studies to date. In Juneau, Alaska and in Fredericksburg, Virginia. It's even worse for calibers. The more expensive and low turnover calibers such as 9mm's, which I believe is involved in the case at Bar. So the second primary major objection that we have is what is the forensic value of such associations. There has never been any studies conducted to determine that prior to my own studies as in this past year.
> Also the University of California is now currently actively associated with my study and they're actually conducting studies as well on the West Coast. I have conducted the studies in Juneau, Alaska. Extremely shocking results we find from those and in Fredericksburg, Virginia.

On the bases of the National Institutes of Sciences study, an Iowa State University Study, and the German FBI and United States ATF, Tobin concluded:

> At this time the best – the only scientifically valid conclusion that can be rendered is under the best of circumstances is that it's possible that two bullets came from the same source. But we found in our studies that the practice is as invalid for exclusion as it is for inclusion. So I would point out as well that bullets could be totally, radically different compositions and still come from the same source. And I can demonstrate that later with the easel if you like.
> But to reiterate it's our individual and collective assessment and

> opinion that the best conclusion that can be rendered is that it's possible two bullets came from the same molten source. So then we are all in agreement as well as to what was the forensic value to that association. And the analysis I use again is with the blue denim fiber.

At the close of the trial, the jury convicted Clemons of second degree murder and use of a handgun in the commission of a felony. On February 27, 2004, the court imposed an aggregate sentence of forty-two years imprisonment. Clemons thereafter noted his appeal to the Court of Special Appeals. The Court of Special Appeals, in an unreported opinion, determined that Clemons did not preserve the issue of the admissibility of CBLA because he failed to renew his objection to the admission of Peters's testimony regarding CBLA at trial.

On July 27, 2005, Clemons filed a petition for writ of certiorari with this Court and presented the following issues for our consideration, which we have renumbered:

> 1. Was the issue of the admissibility of "expert" opinion testimony concerning comparative bullet lead analysis preserved for review, where the parties litigated the admissibility of expert opinion testimony in this field, and the trial court rules it admissible, immediately preceding the witness's testimony?
>
> 2. Is the testimony of an "expert" in the field of comparative bullet lead analysis admissible, where that field is not generally accepted in the scientific community, where there has been no showing that comparative bullet lead analysis is reliable?
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> 3. Where Mr. Clemons's alleged possession of a handgun and bullets was a critical component of the State's case, was evidence of his prior acquittal of those charges admissible, where the acquittal took place in the District of Columbia?[9]

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[9] At trial, the prosecution also elicited testimony from two District of Columbia (continued...)

On October 3, 2005, we granted the motion and issued the writ. *Clemons v. State*, 389 Md. 124, 883 A.2d 914 (2005). We hold that CBLA is not admissible under the *Frye-Reed* standard because it is not generally accepted within the scientific community as valid and reliable. Because we will reverse the decisions of the Court of Special Appeals and the Circuit Court on the basis of that error alone, we will not address the issue of whether Clemons's acquittal in the District of Columbia is admissible.

Standard of Review

It is well settled that "the admissibility of expert testimony is a matter largely within the discretion of the trial court, and its action in admitting or excluding such testimony will seldom constitute a ground for reversal." *Oken v. State*, 327 Md. 628, 659, 612 A.2d 258, 273 (1992), quoting *Stebbing v. State*, 299 Md. 331, 350, 473 A.2d 903, 912, *cert. denied* 469 U.S. 900, 105 S.Ct. 276, 83 L.Ed.2d 212 (1984); *see also State v. Smullen*, 380 Md. 233, 844 A.2d 429 (2005). Appellate review of a trial court's decision regarding the admissibility of expert scientific testimony under *Frye*, and *Reed*, however, is *de novo*. *Wilson v. State*, 370

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[9] (...continued)
Metropolitan Police Officers regarding a gun that was recovered from a car in which Clemons was a passenger during a routine traffic stop. Clemons argued that he should be permitted to introduce evidence concerning his acquittal of gun possession charges in the District of Columbia. The trial court admitted the testimony of the officers as well as the handgun and did not allow defense counsel to inquire as to whether Clemons was charged with anything as a result of the traffic incident, ostensibly leading to his acquittal of the possession charges, because the State did not do so on direct examination. The Court of Special Appeals held that Clemons did not properly preserve the issue for appellate review because he did not attempt to raise the issue of his acquittal following the prosecution's questioning of the police officers.

Md. 191, 201 n.5, 803 A.2d 1034, 1040 n.5 (2002). Moreover, we are not limited to the information contained in the record and "can and should take notice of law journal articles, articles from reliable sources that appear in scientific journals, and other publications which bear on the degree of acceptance by recognized experts that a particular process has achieved." *Id.* at 201, 803 A.2d at 1040. *See Reed*, 283 Md. at 399, 391 A.2d at 377 ("Thus, based on our examination of the record in the instant case, the judicial opinions which have considered this question, and the available legal and scientific commentaries, we do not believe that "voiceprint" analysis has achieved the general acceptance in the scientific community, at this time, which is required under *Frye*."); *Wilson*, 370 Md. at 203-207, 803 A.2d at 1041-43 (addressing numerous studies on sudden infant death syndrome which were not included in the record); *Collins v. State*, 296 Md. 670, 695-700, 464 A.3d 1028, 1041-43 (1983) (examining a variety of articles and studies on hypnosis not contained in the record).

Discussion

Clemons argues that he preserved the issue of the admissibility of Peters's testimony because at the time of the trial court's ruling, his objection to the testimony was still outstanding. Moreover, he asserts that it is apparent from the record that when the trial court issued its ruling that the testimony was admissible at the close of Peters's voir dire, it issued a final ruling on the objection to both the admissibility of expert testimony on CBLA and on the admissibility of Peters's testimony in particular. Therefore, he contends that it was unnecessary for him to restate the objection before the court ruled on his motion *in limine* to

exclude the evidence.

Clemons also argues that expert testimony on CBLA is not admissible because the process is not generally accepted in the scientific community as required under the *Frye-Reed* test. Furthermore, Clemons asserts that the State cannot produce any published studies that recognize CBLA as reliable when introduced as evidence that a bullet associated with the defendant and a bullet recovered from a crime scene were derived from the same source of lead. Therefore, according to Clemons, the trial court erred in admitting Peters's testimony concerning CBLA.

Conversely, the State counters that neither of the issues presented to this Court has been properly preserved for appellate review. According to the State, Clemons waived his objection to the admission of Peters's testimony regarding CBLA because he failed to object at the conclusion of Peters's voir dire or when Peters testified to his conclusions that two bullet fragments recovered from the victim were analytically indistinguishable from cartridges recovered from a handgun seized at the time of Clemons's arrest in the District of Columbia. Moreover, the State contends that the issue also was waived when Clemons introduced expert testimony regarding CBLA during the defense case.

The State also argues that Clemons's argument based on the *Frye-Reed* standard is meritless. According to the State, CBLA conducted through inductively coupled plasma-optical emission spectroscopy ("ICP-OES") is generally accepted in the scientific community as required under the *Frye-Reed* test. Moreover, the State argues that if the admission of

Peters's testimony on CBLA was error, it was harmless beyond a reasonable doubt based on the other evidence introduced.

Issue Preservation

As a threshold issue we must address Clemons's contention that the Court of Special Appeals erroneously concluded that he did not properly preserve his objection to the admission of Peters's expert testimony because he did not restate his objection after the completion of Peters's voir dire or during Peters's testimony.

Maryland Rule 4-323 (a) mandates that "[a]n objection to the admission of evidence shall be made at the time the evidence is offered or as soon thereafter as the grounds for the objection become apparent. Otherwise, the objection is waived." As we have repeatedly noted, generally, "when a motion *in limine* to exclude evidence is denied, the issue of the admissibility of the evidence that was the subject of the motion is not preserved for appellate review unless a contemporaneous objection is made at the time the evidence is later introduced at trial." *Klauenberg v. State*, 355 Md. 528, 539-40, 735 A.2d 1061, 1067 (1999). *See also Reed v. State*, 353 Md. 628, 638, 728 A.2d 195, 200-01 (1999).

In *Watson v. State*, 311 Md. 370, 535 A.2d 455 (1988), however, we recognized an exception to the general requirement of contemporaneous objection for preservation of the issue. Watson, charged with rape and various lesser included offenses, filed a motion *in limine* asking the court to rule that his 1982 Virginia attempted rape conviction and a prior theft conviction could not be used for impeachment. The trial judge denied Watson's

motion. At trial, Watson testified on his behalf and at the close of his testimony, the prosecutor informed the court of his intention to impeach Watson on cross-examination through the use of Watson's prior convictions, which the trial judge permitted without a contemporaneous objection being made by Watson's counsel. The prosecutor then cross-examined Watson as to his attempted rape and theft convictions without objection.

This Court found that Watson's objection to the use of his attempted rape conviction for impeachment was preserved for appellate review despite the fact that Watson's counsel did not object when Watson was subject to cross-examination about his convictions. *Id.* at 372 n.1, 535 A.2d at 457 n.1. We observed that normally Watson's prior objection to the court's pretrial ruling regarding the admissibility of the convictions would not be sufficient to preserve the issue for our review. *Id.* We noted, however, that because the trial court affirmed his pretrial ruling immediately prior to the prosecutor's cross-examination of Watson, requiring Watson to make "yet another objection only a short time after the court's ruling to admit the evidence would be to exalt form over substance." *Id.* Thus, we concluded that the issue of the admissibility of Watson's attempted rape conviction was preserved for appellate review.

The case *sub judice* presents a similar factual scenario. In the case at bar, after the State questioned Peters regarding his qualifications and offered him as an expert in CBLA, Clemons objected regarding the admissibility of the proffered scientific evidence and the trial court permitted him to conduct a voir dire examination of Peters without ruling on his

objection. After the State asked several more questions on redirect, the State again proffered Peters as an expert in CBLA without objection by Clemons. The trial court then stated that it would qualify Peters as an expert in CBLA and permit him to testify concerning CBLA, and effectively overruled Clemons's prior objection. Although when additional information is adduced after the initial objection is made, the better practice is to renew the objection to ensure that the court is aware that the party intends to maintain its objection to the admission of the testimony, based on the facts of this record, the trial judge clearly understood that he was ruling on the defense's prior objection during voir dire to Peters's admission as an expert and the admissibility of the underlying scientific evidence, as well as the defense's outstanding motion *in limine* regarding Peters and CBLA. Moreover, there were no circumstances from which a reasonable person could infer that defense counsel, based on the subsequent voir dire, intended to withdraw his objection at the close of all voir dire. Furthermore, based on the proximity of Clemons's objection and the trial judge's ruling regarding the admissibility of the scientific evidence, we find no reasonable basis for distinguishing the present case from that before us in *Watson*. Therefore, we determine that to require Clemons to restate his objection minutes after he originally made it would be to elevate form over substance and conclude that Clemons preserved the issue of the admissibility of Peters's expert testimony regarding CBLA and its implications for appellate review.

The *Frye-Reed* Test

In *Reed v. State*, 283 Md. 374, 391 A.2d 364 (1978), this Court adopted the standard set forth in *Frye v. United States*, 293 F. 1013 (D.C. 1923), to determine the admissibility of scientific evidence and expert testimony. *See Reed*, 283 Md. at 389, 391 A.2d at 372; *Wilson*, 370 Md. at 201, 803 A.2d at 1039 (affirming this Court's adoption of the *Frye* standard). Writing for this Court in *Reed*, Judge Eldridge observed that prior to the admission of expert testimony based on the application of novel scientific techniques, the party seeking to use the expert testimony must establish that the particular methodology is valid and reliable. *Reed*, 283 Md. at 380, 391 A.2d at 367. As we noted in *Wilson*, through our discussion of the reasoning in *Reed*,

> Where the validity and reliability is so broadly and generally accepted within the scientific community, as is the case of ballistic tests, blood tests, and the like, a trial court may take judicial notice of its reliability. Likewise, a court may take judicial notice that certain procedures, widely recognized as bogus or experimental, are unreliable. When the reliability of a particular technique is not subject to judicial notice, however, 'it is necessary that the reliability be demonstrated before testimony based on the technique can be introduced into evidence. Although this demonstration will normally include testimony by witnesses, a court can and should take notice of law journal articles, articles from reliable sources that appear in scientific journals, and other publications which bear on the degree of acceptance by recognized experts that a particular process has achieved.' The Court concluded that the proper test for establishing the reliability of scientific opinion is whether the basis of that opinion is generally accepted as reliable within the expert's particular scientific field.

Wilson, 370 Md. at 201, 803 A.2d at 1039-40 (citations omitted). If the trial court determines that the test is admissible, on appellate review, this Court must independently apply the *Frye*-

Reed test to the scientific techniques at issue. *See Wilson*, 370 Md. at 201 n.5, 803 A.2d at 1040 n.5; *Reed*, 283 Md. at 399, 391 A.2d at 377 ("Thus, based on our examination of the record in the instant case, the judicial opinions which have considered this question, and the available legal and scientific commentaries, we do not believe that "voiceprint" analysis has achieved the general acceptance in the scientific community, at this time, which is required under *Frye*").

To better understand the scientific procedures at issue in the case *sub judice* and the application of the *Frye-Reed* standard, a brief discussion of the bullet manufacturing process and the development of CBLA is required. The lead used to manufacture bullets is derived from secondary lead smelters which salvage lead from recycled automobile batteries. Charles A. Peters, *The Basis for Compositional Bullet Lead Comparisons*, 4 Forensic Sci. Communications (2002). After separating the batteries into their main components, plastic, acid, and lead, the smelters mix the lead derived from batteries with lead from other sources and melt the mixture in kettles with capacities up to one hundred tons. *Id.* The scrap lead is then processed into ingots[10] (also called "pigs" in relevant publications). *Id.*

The lead is provided to bullet manufacturers in one of several forms: ingots, which vary from sixty-five to eighty pounds; billets, which range from one hundred to three hundred pounds; and sows, which are approximately two thousand pounds. *Id.* If the lead is provided

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[10] Ingot is defined as "a mass of metal cast into a convenient shape for storage or transportation to be later remitted for casting or finished." Webster's Third New Int'l Dictionary, 1162 (2002).

in one of the latter two forms, it is remelted in seven- to ten-ton pots and combined with lead remnants from the bullet manufacturing process, which may include rejected bullets, excess lead from the bullet molding process, or other scrap lead in the facility. *Id.* "The molten lead is then poured into a billet mold and allowed to cool and solidify." *Id.* The quantities of lead are made into wire by squeezing them through a narrow opening, which is then cut into slugs. *Id.* Slugs are shaped into bullets through a process called "swaging," which involves a die that applies compressive force by hammering radially on the slug, then tumbled for smoothness and loaded along with gunpowder into cartridge cases. *Id.* The cartridges are loaded into boxes and stamped with a packing code. *Id.* The number of bullets manufactured from a single melt varies widely. "For example, a melt pot of 200,000lbs will yield 35,000,000 .22-caliber bullets, which a pig or ingot will yield 10,000 to 20,000 bullets. The yield for larger caliber bullets will be smaller." Michael O. Finkelstein & Bruce Levin, *Compositional Analysis of Bullet Lead as Forensic Evidence*, 13 J. L. & Pol'y 119, 121 (2005).

With this manufacturing process in mind, we turn to the origin and processes of CBLA. During the 1960's, researchers at Gulf General Atomic explored the possibility of analyzing the elements found in bullet lead as a forensic tool in criminal investigations through neutron activation analysis ("NAA") under a contract with the United States Atomic Energy Commission. William A. Tobin, *Comparative Bullet Lead Analysis: A Case Study in Flawed Forensics*, 28 Champion 12, 15 (July, 2004); Edward J. Imwinkelried & William

A. Tobin, *Comparative Bullet Lead Analysis (CBLA) Evidence: Valid Inference or Ipse Dixit?*, 28 Okla. City U. L. Rev. 43, 48 (2003). Gulf General Atomic used a nuclear reactor to irradiate the lead alloy and then analyzed the radiation emitted from the lead to identify the chemicals present and measure their concentration. *Imwinkelreid*, *supra*, at 48. The Gulf General Atomic researchers stated:

> It has been found that the number of (chemical) elements observable (in lead analysis by NAA), and thus the number of points of comparison, is generally limited to three elements, due to the dominance of antimony radioisotopes in the activated bullet lead specimens. This factor, coupled with a high degree of composition uniformity of bullet lead from at least one major manufacturer, imposes some limitations on the method . . . . (T)wo bullets with the same patter of only three identification points are not usually definitively identified as having a common source. (M)atching concentrations of all three elements does not indicate that two bullets came from the same lot.

Id., quoting H.R. Lukens, H.L. Schelsinger, V.P. Guinn & R.P. Hackleman, Forensic Neutron Activation Analysis of Bullet-Lead Specimens, United States Atomic Energy Commission Report GA-10141 (June 30, 1970).

In the late 1980's and early 1990's, analysts shifted from NAA to a different methodology, inductively coupled plasma-optical emission spectroscopy ("ICP-OES"). The National Research Council described the process for ICP-OES as:

> For analysis, samples generally are dissolved to form an aqueous solution of known weight and dilution. The solution is aspired into the nebulizer, which transforms it into an aerosol. The aerosol then proceeds into the plasma, it is transformed into atoms and ions in the discharge, and the atoms (elements) are excited and emit light at characteristic wavelengths. The

> intensity of the light at the wavelengths associated with each element is proportional to that element's concentration.
> The ICP-OES torch consists of three concentric tubes – known as the outer, middle, and inner tubes – usually made of fused silica. The torch is positioned in a coil of a radio-frequency generator. The support gas that flows through the middle annulus, argon, is seeded with free electrons collide with the argon gas and form Ar^+ ions. Continued interaction of the electrons and ions with the radio-frequency field increases the energy of the particles and forms and sustains a plasma, a gas in which some fraction of the atoms are present in an ionized state. At the same time, the sample is swept through the inner loop by the carrier gas, also argon, and is introduced into the plasma, allowing the sample to become ionized and subsequently emit light.
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> * * *
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> Each element emits several specific wavelengths of light in the ultraviolet-visible spectrum that can be used for analysis. The selection of the optical wavelength for a sample depends on a number of factors, such as the other elements present in the sample matrix. The light emitted by the atoms of an element must be converted to an electric signal that can be measured quantitatively. That is achieved by resolving the light with a diffraction grating then using a solid-state diode array or other photoelectric detector to measure wavelength-specific intensity for each element emission line. The concentration of the elements in the sample is determined by comparing the intensity of the emission signals from the sample with that from a solution of a known concentration of the element (standard).

National Research Council, FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE 14 (2004) ("NRC Report"). The main purported advantage of ICP-OES over NAA was that ICP-OES permitted the laboratory to analyze six or seven elements present in the lead alloy: antimony, arsenic, bismuth, cadmium, copper, silver, and tin. *Imwinkelreid*, *supra*, 48; NRC

Report at 15.

After obtaining the elemental composition numbers, the samples are categorized "according to similarity of compositional presence." *Tobin*, *supra*, at 13. "Compositions similar to a crime scene bullet(s) are put in one group and considered 'analytically indistinguishable'; compositions considered dissimilar are placed in different groups and considered 'analytically distinguishable.'" *Id.* From that data, the expert witness will draw a conclusion as to the probative significance of "finding 'analytically indistinguishable' (similar) compositions in both crime scene and 'known' bullet samples." *Id.* The entire process is premised upon three assumptions: the fragment being analyzed is representative of "the composition of the source from which it originated"; the source from which the sample is derived is compositionally homogeneous; and "no two molten sources are ever produced with the same composition." *Id.* at 13-14.

Recently the assumptions regarding that uniformity or homogeneity of the molten source and the uniqueness of each molten source that provide the foundation for CBLA have come under attack by the relevant scientific community of analytical chemists and metallurgists.

In 1991, at the International Symposium on the Forensic Aspects of Trace Evidence, hosted by the FBI, various experts in the field "cautioned that 'the variability (of the elemental mix) within a production run . . . has not been addressed in a comprehensive study.'" *Imwinkelried*, *supra*, at 50, quoting Ernest R. Peele, et al., Comparison of Bullets

Using the Elemental Composition of the Lead Component, Proceedings of the International Symposium on the Forensic Aspects of Trace Evidence 57, 57 (1991). In 2002, another study was published which detailed the metallurgical phenomena that occur in the lead refining and casting processes and result in inhomogeneity within a single smelt as well as analytically indistinguishable lots produced with relative frequency by lead smelters. E. Randich, Wayne Duerfeldt, Wade McLendon & William Tobin, *A Metallurgical Review of the Interpretation of Bullet Lead Compositional Analysis*, 127 Forensic Sci. Int'l 174, 182 (2002) ("The Randich Study"). That study derived its conclusions from an analysis of secondary lead refiners' production data, which is currently the only source of molten source composition data in existence. This analysis revealed that the elemental composition of samples taken from the beginning, middle, and end of 100-ton molten source pours at a single refiner "could vary in antimony by almost 12 percent, copper by 142 percent, tin by 1,871 percent, or arsenic by 31 percent, from the beginning to the end of the pour." *See* William A. Tobin & Wayne Duerfeldt, *How Probative is Comparative Bullet Lead Analysis?*, 17 Crim. Just. 26, 28 (Fall, 2002). Moreover, the Randich Study noted that

> [v]ariability in composition within each individual pig [ingot] is also caused by a phenomenon known as segregation that occurs during the solidification of the pig. As the cast pig cools, it solidifies first at the (cooler) exterior surface. The center of the pig is the last region to solidify. Impurity elements that are more soluble in the liquid phase and hence become more concentrated at the center of the pig. Because of the nature of the various binary elemental phase diagrams . . . and depending on the amounts of each element present in the alloy, this phenomenon is expected to be more pronounced for elements like antimony,

> to have only a minor effect for elements like [bismuth], and to have little effect on elements that are present at less that 10 [parts per million] level such as tin and arsenic . . . . The effects for the other elements of interest would strongly depend on the amounts present and on cooling rates. Segregation thus increases the lack of homogeneity in each individual pig. This is a basic metallurgical phenomenon and tendency known to exist in all casting processes. Note, also, that differences in cooling rate alone can result in significantly different compositions from the surface of the pig to the center, and between samples taken from two different pigs of identical, overall (average) composition.

Randich, *et al.*, *supra*, at 179. Thus, as these studies indicate, the assumption that an ingot or vat of lead is homogenous as required for CBLA to be valid is not generally accepted by the scientific community.

The assumption that each molten lead source is unique is also being questioned by analytical chemists and metallurgists. A recent article in the Oklahoma City Law Review noted that the use of lead reclaimed from automobile batteries undermines the confidence in the assumption of uniqueness. *See Imwinkelried*, *supra*, at 52. The authors observed that "secondary refiners obtain their bullet lead from scrap automobile batteries. Battery manufacturers observe 'relatively tight specifications because of electrical conductivity, corrosion, (and) processing.'" *Id.*, quoting William A. Tobin & Wayne Duerfeldt, *How Probative is Comparative Bullet Lead Analysis?*, 17 Crim. Just. 26, 28 (Fall, 2002). Moreover, Professor Imwinkelried and Mr. Tobin concluded that because most lead produced by secondary refiners is used in the manufacture of new automobile batteries and the manufacturers follow "stringent compositional specifications" with respect to the lead

intended for both battery and bullet manufacturing, "the probability increases that in a given year manufacturers will produce coincidental repeats whose compositions are analytically indistinguishable." *Imwinkelried*, *supra*, at 52, citing *Tobin & Duerfeldt*, *supra*, at 27, 34. Essentially, the higher quality of lead produced by manufacturers of automobile batteries increases the probability that coincidental identical compositions will occur.

This suspected probability was borne out in the research published in the Randich Study. Randich and his colleagues determined that "multiple indistinguishable shipments of lead alloys from secondary lead refiners to the ammunition manufacturers are made each year and over a period of many years." *Randich*, *et al.*, *supra*, at 174 ("Data for lead alloys supplied to two major ammunition manufacturers confirm that multiple indistinguishable shipments of lead alloys from secondary lead refiners to the ammunition manufacturers are made each year and over a period of many years."). Similarly, FBI researchers discovered two sets of bullets manufactured seven months and fifteen months apart respectively that were analytically indistinguishable. *Tobin & Duerfeldt*, *supra*, at 30-31, citing Ernest R. Peele, et al., Comparison of Bullets Using the Elemental Composition of the Lead Component, Proceedings of the International Symposium on the Forensic Aspects of Trace Evidence, 61-62 (1991).

Furthermore, at least one study conducted by Dr. Robert D. Koons, a research chemist with the FBI Laboratory in Quantico, Virginia, and Dr. Diana M. Grant, a forensic examiner with the FBI Laboratory in Washington, D.C., observed an error rate, which includes false

positives and negatives, of twenty-five to thirty-three percent. *See* Robert D. Koons & Diana M. Grant, *Compositional Variation in Bullet Lead Manufacture*, 47 J. Forensic Sci. 950 (2002). There has been no study of the error rate for the process when used in the field. Moreover, there is no incentive to finance such a study because currently the FBI, which was the only laboratory engaging in CBLA analysis in the United States, has ceased conducting CBLA for forensic purposes. *Tobin & Duerfeldt*, *supra*, at 29.

The only consensus that can be derived from all of this is that more studies must be conducted regarding the validity and reliability of CBLA. Although scientific unanimity is not required to satisfy the *Frye-Reed* test's requirement of general acceptance, *Wilson*, 370 Md. at 210, 803 A.2d at 1045, it is clear that a genuine controversy exists within the relevant scientific community about the reliability and validity of CBLA. Based on the criticism of the processes and assumptions underlying CBLA, we determine that the trial court erred in admitting expert testimony based on CBLA because of the lack of general acceptance of the process in the scientific community.[11]

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[11] In *State v. Behn*, 868 A.2d 329 (N.J. Super. Ct. App. Div. 2005), New Jersey's intermediate appellate similarly recognized the recent scientific studies that questioned the validity of CBLA and concluded that the expert testimony adduced at Behn's first trial was "based on erroneous scientific foundations and its admission met the requirements for granting a new trial on the ground of newly discovered evidence." *Id.* at 331-32. Moreover, the court noted that the assumption that the chemical composition of a bullet from one batch will never match that of a bullet from a different batch has "been called into question, if not totally undermined, by the new research studies discussed above." *Id.* at 344.

The State also presented several cases admitting CBLA into evidence; however, none of the cases addressed the issue of scientific opinion testimony was admissible under *Frye*

(continued...)

The State argues that any error, under the circumstances of the case at bar, would be harmless error in light of the testimony of an eyewitness to the murder. In *Reed*, however, we observed that "[l]ay jurors tend to give considerable weight to 'scientific' evidence when presented by 'experts' with impressive credentials." *Reed*, 283 Md. at 386, 391 A.2d at 370; *Wilson*, 370 Md. at 212, 803 A.2d at 1046. The same holds true in the case at bar. Although the case *sub judice* was not entirely dependent upon the expert testimony at issue, we are unable "to declare a belief, beyond a reasonable doubt, that the error in no way influenced the verdict." *Wilson*, 370 Md. at 212, 803 A.2d at 1046, quoting *Dorsey v. State*, 276 Md. 638, 659, 350 A.2d 665, 678 (1976).

Conclusion

We conclude that CBLA does not satisfy the requirement under the *Frye-Reed* test for

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[11] (...continued)
or even *Daubert*. *See United States v. Davis*, 103 F.3d 660, 673-74 (8th Cir. 1996) (noting that the defendant did not "attempt to demonstrate that ICP is not a scientifically valid technique for determining the trace elemental composition of bullets"); *Commonwealth v. Fisher*, 870 A.2d 864, 870-72 (Pa. 2005) (affirming the lower court's denial of defendant's petition for post-conviction relief due to lack of timeliness and determining that, even if it were timely, the new information attacking the validity of CBLA likely would not have compelled a different verdict); *State v. Noel*, 723 A.2d 602, 606 (N.J. 1999) (stating without reasoning that "ICP is an accepted method of bullet lead analysis"); *Commonwealth v. Daye*, 587 N.E.2d 194, 207 (Mass. 1992) (noting that at trial there was no objection made to the expert's testimony and no request for a voir dire hearing to determine its admissibility); *State v. Krummacher*, 523 P.2d 1009, 1017-18 (Or. 1974) (determining that the CBLA evidence was admissible based on the fact that its probative value outweighed its prejudicial impact and without examining the admissibility of the evidence under either the *Frye* or *Daubert* standards). Moreover, it is important to note that only one of the cases, *Fisher*, was published after the results of the studies were released to the public, and it did not address the issue.

the admissibility of scientific expert testimony because several fundamental assumptions underlying the process are not generally accepted by the scientific community. Therefore, we reverse the judgment of the Court of Special Appeals and remand the case to the Circuit Court for Prince George's County for a new trial.

JUDGMENT OF THE COURT OF SPECIAL APPEALS REVERSED. CASE REMANDED TO THAT COURT WITH DIRECTIONS TO VACATE THE JUDGMENT OF THE CIRCUIT COURT FOR PRINCE GEORGE'S COUNTY AND REMAND THE CASE TO THE CIRCUIT COURT FOR A NEW TRIAL. COSTS IN THIS COURT AND IN THE COURT OF SPECIAL APPEALS TO BE PAID BY PRINCE GEORGE'S COUNTY.