IN THE CIRCUIT COURT OF THE
NINETEENTH JUDICIAL CIRCUIT
IN AND FOR ST. LUCIE COUNTY,
FLORIDA

CASE NO.: 562004CF003127B

STATE OF FLORIDA,

PLAINTIFF,

vs.

ALWIN CHARLES TUMBLIN,

DEFENDANT.
----------X

Certified Copy

VOLUME XIV

FRYE HEARING

TRANSCRIPT OF PROCEEDINGS

This cause came on for hearing before the Honorable Dan L. Vaughn, Judge of the Circuit Court, at the St. Lucie County Courthouse, 218 South Second Street, Fort Pierce, Florida, beginning at 9:39 A.M. on the 5th day of August, 2011.

The appearances at said time and place were as follows:

FOR THE PLAINTIFF:
OFFICE OF THE STATE ATTORNEY
BY: DARYL ISENHOWER, ESQ.
LYNN PARK, ESQ.
THOMAS BAKKEDAHL, ESQ.
411 S. 2nd Street
Fort Pierce, Florida 34950

FOR THE DEFENDANT:
ASSISTANT REGIONAL COUNSEL CRIMINAL CONFLICT AND CIVIL REGIONAL COUNSEL
FOURTH DISTRICT
BY: THOMAS F. BURNS, ESQ.
SHARI LEIGH VROD, ESQ.
107 N. 2nd Street
Fort Pierce, Florida 34950

I N D E X

MISCELLANEOUS

(Whereupon, the following is a continuation of the proceedings had on August 5, 2011:)

HE COURT: Okay. Thank you, all. Ms. Vrod is present, Mr. Bakkedahl is here for the State.

Is Mr. Burns here?

Do you all --

Ms. Vrod, do you want him here?

MS. VROD: Mr. Burns will be here in a minute. He just went to grab a --

THE COURT: Okay. We're going to start without him. He can come in when he's ready.

Ms. Vrod is present.

This is a Defense request on a Frye issue hearing. The Defense has filed a request for me to take judicial notice of Mr. Tobin's affidavit here.

Mr. Bakkedahl, do you all object to me taking judicial notice of all of that?

MR. BURNS: We do.

THE COURT: Okay. Let me hear your objection.

MR. BAKKEDAHL: Your Honor, the Defense, as you've indicated, filed this motion. I believe that I received a notice with the attached affidavit this morning, approximately 10 o'clock or so. I did have the affidavit via e-mail yesterday. They filed a request for judicial notice under

Section 90.2026. I would conceive that the plain reading of that statute authorizes the Court to take judicial notice of the contents of a court file. However, they must also comply with 92.03, which is a two-step process.

The first is timely written notice filed with the Court. I'm not going to object on that point, I think it's technical. Of course, if it were timely and being applied with the State, this would clearly be untimely, but as the Defense, I'm not going to fight on that issue.

The second, however, is that they furnish the Court with sufficient information to enable it to take judicial notice of the matter.

What you have before you is -- I don't know what it is, but I know one thing it's not, it's not sworn to, it's not signed, it's not dated. I don't know what case this was filed in, I don't know what court this was filed in, I don't know what jurisdiction this was filed in, I don't know the manner or the matter in which this was filed. There is no -- how are you supposed to take judicial notice of an affidavit that simply is entitled, "Affidavit of William A. Tobin in Support of Defendant's Motion to Exclude Firearm-Related

Toolmarks"?

So, number one, this is clearly not something that the Court should take judicial notice of because the Defense has in no way, shape or form established, you know, what this is or where it came from.

Let me move on, and I'll give you all my arguments in total and then the Defense can respond.

Secondly, I want to provide the Court with the case of -- and for the record, I'm giving a copy to the Defense. It's going to be Dufour versus State. And it's going to be a Florida Supreme Court opinion, not even published yet. It's at 36 Florida Law Weekly 7 -- or S 57. If you'll go to notes 14 and 16, the case involves a situation where during a second subsequent post-conviction relief hearing, the Defense, or the State, I believe, asked the Court to take judicial notice of the entire proceeding, post-conviction relief proceeding as well as the court file and all their documents attended thereto.

The Florida Supreme Court came back and held, "The fact that a record may be judicially noticed does not render all that is in the record

admissible. For instance, the fact" -- excuse me, "for instance, the Court's authority to take judicial notice of records cannot be used to justify the wholesale admission of hearsay records within those court files."

There's some great language in here, particularly, I point you to Stoll, which is cited on page 13 of the document as printed and it says, "In Stoll, we held documents contained in a court file," and again, I'm not even conceding that these were contained, are contained or have ever been contained in a court file, "even if that entire court file is judicially noticed, are subject to the same rules of evidence to which all evidence must adhere.

"In so holding, we note an observation of another appellate court that there had been a," quote, "seemingly widespread but mistaken notion that an item is judicially noticeable merely because," quote, "it is part of a," quote, "'court file.' Court files are often replete with letters," and I emphasize, "affidavits, legal briefs, privileged or confidential data, in camera materials," et cetera, et cetera, "as well as depositions that may contain unredacted gossip and

all manners of hearsay and opinion."

Then they conclude by saying, "Thus, while the court may take judicial notice of the documents in a court file that were placed -- properly placed there, this notice would not make the contents of the documents admissible if they were subject to a challenge, such as when a document is protected by privilege or constituted hearsay."

At this time, I would formally lodge a hearsay complaint to the affidavit. The affidavit itself contains impressions and opinions of this, quote, unquote, "expert," and I use that term very loosely because -- and I'll explain in a minute why.

Furthermore, it references an underlying case and information imparted to him. Not only is it hearsay in and of itself, it contains hearsay within hearsay, and is therefore inadmissible for the truth of the matter asserted.

And finally, just in the event the Defense anticipates, or just in the event the Defense attempts to argue that because this is a Frye hearing, the rules of evidence are in some fashion suspended, I provide you with, and the Defense, a copy of Ramirez v. State. This is going to be Ramirez, too - apparently there are three published

Ramirez opinions - at 651 So.2d 1164.

First, I start off, before I get to Ramirez, Florida Statute Section 90.103, which is at the very beginning of the evidence code says, "that this act," meaning the evidence code, "shall apply to -- " quote, "shall apply to a criminal proceedings related to crimes committed after the effective date of the code." And I think the code dates back to, you know, '85, '75, I'm not exactly sure.

But moving forward, my -- the point is that this is a criminal proceeding. We would argue that the rules of evidence are to be strictly adhered to during the course of this proceeding.

Now, in Ramirez, what happened was on the first trial, the State offered evidence of toolmark -- toolmark evidence relative to a knife inflicting -- excuse me, a knife creating markings on a bone. It had never been done before, whatever. It was really irrelevant. It was reversed. It was brought back. They had what was entitled a Frye hearing, but effectively, it looks like they conducted a Frye hearing. And what happened during the course of that hearing was the State put on the evidence of their expert, they put on evidence and

testimony and so forth. At the conclusion, the Defense wanted to call their own expert, but they were precluded by the trial court. That case was subsequently reversed because the Defense didn't have an opportunity to challenge the general acceptance of this particular type of evidence.

I think what's important and why I bring this to your attention is that at footnote six and seven of that opinion, the court says, and this is the Florida Supreme Court, "That just as important as the burden of proof is, the fact that the hearing must" -- "the hearing must be conducted in a fair manner. There is no question that a hearing on the admissibility of novel scientific evidence is a, quote, adversarial proceeding in which conflicting evidence is presented to the trial judge as the trier of fact."

Now, here's the deal. Nobody in this courtroom would love more than me for Mr. Tobin to show up, but he's not here for a very particular reason. Number one, this affidavit is not sworn to, and I think there's a good reason for that. Probably because to the extent there are half truths and potentially outright lies in there, he doesn't want to be confronted with that on the witness stand.

MS. VROD: Judge, excuse me. I'm just going to object as to the speculation for the nonappearance for Mr. Tobin.

THE COURT: Okay. Well, I'll consider this Mr. Bakkedahl's argument and --

MR. BAKKEDAHL: I'll offer evidence in support of that, and an opinion authored by Judge Richard Wells, the Superior Court of Massachusetts, regarding this expert. He says, when that expert was testifying in the area, he prepared a bullet lead analysis, a different matter, but nonetheless as a metallurgist, he says, "His" -- quote, "His testimony smacks of partisan crusader rather than a dispassionate scientist. His lack of credibility is underscored by his inability to directly answer a question. His instance" -- "his insistence on giving preplanned recitation and it is constant self promotion."

This judge can think of no expert witness he has found less credible. So I think, you know, I think I got a good foundation of making assertions that that's why Mr. Tobin is not here. This is an adversarial proceeding. The State, the People said this is a death penalty case. The State of Florida has an absolute right to confront any witnesses

that the Defense might rely upon in an effort to attack the underlying science at question here, which is firearm toolmark examination.

That's my first argument I make as a threshold. If you want me to continue to my next arguments, I will, or if you want me to stop and give the Defense an opportunity to respond, I can do that.

THE COURT: What I'm interested in knowing is what other objections you may have to the Court taking judicial notice of this, then I'll let the Defense respond as a preliminary issue. Because if I don't take judicial notice of this, I don't. If I do, then I do, so.

MR. BAKKEDAHL: Okay. And I'll just be clear, I mean, I'm going to speak ahead that I -- even if you don't take judicial notice of the affidavit, which I think you should not, we're going -- we would ask to proceed with the evidence to create a record for review by the Florida Supreme Court because to the extent they may deem that this is a matter properly subject for a Frye hearing, which I don't think it is, they're entitled to do a de novo review. So they can consider anything they want to, and I would like to put evidence on the record and documents in evidence to assist them in that

manner.

THE COURT: Well, hang on just a second. If you still wish to proffer testimony into the record, even if I don't take judicial notice of this, and we've got witnesses here, why don't we do that.

MR. BAKKEDAHL: Yes.

THE COURT: We can argue that issue later, but there's witnesses here. Let's get them on and present their testimony and get that done. Because I've got 47 jurors that I'm hanging in the balance here.

MR. BAKKEDAHL: And I appreciate that. I just don't want to do it again in three years, and that's why I'm doing this.

THE COURT: I understand. So if you've got testimony, even if I rule adversely for the Defense and favorably for the State, let's put it on anyway.

MR. BAKKEDAHL: Yes, sir.

My next argument goes to the fact that this evidence --

THE COURT: Yes, ma'am, Ms. Vrod?

MS. VROD: I just was going to say, at this point we're invoking the rule, not only for Frye

purposes, but for purposes of the trial.

MR. BAKKEDAHL: I would object to the invocation of the rule. I think it can be suspended for purposes of this hearing because the testimony -- first of all, the only witness that we intend on calling is Gabriel Hernandez from the Miami-Dade Crime Lab. Seated at the table with me is George Hertel, who we intended on calling, but he had reviewed the original affidavit that was submitted by the Defense, was unable to thoroughly review the subsequent affidavit, so I don't envision that he is going to testify.

However, to put the Court on notice, if you're inclined to allow the affidavit into evidence, then I'm going to need to put Mr. Hernandez on, and then continue the hearing until a later date when Mr. Hertel has had an opportunity to fully examine the affidavit.

THE COURT: Okay. Well -- all right.

MR. BAKKEDAHL: Experts are excluded from the rule, is what I'm getting to.

THE COURT: I know that.

MR. BAKKEDAHL: Okay.

THE COURT: Okay. Can you all stop talking a minute and let me make a ruling?

MR. BAKKEDAHL: All right.

THE COURT: Is that okay with everybody?

MR. BAKKEDAHL: I'm trying to speed it up for you, Judge.

THE COURT: Duly noted and appreciated, Mr. Bakkedahl, but I'm happy to make a decision on it.

If you're only going to -- anticipate only calling this fellow here as one witness, that's fine. I will, after you're done proffering his testimony, I will make a decision promptly today whether I'm going to take judicial notice of the other Defense documents. Would I like to have more time to consider this? Certainly. Do I have more time? Absolutely not.

So let's -- if you want to present him, you may.

All right. But that being said, he's the only witness you intend to call --

MR. BAKKEDAHL: Yes.

THE COURT: -- in your first case?

Okay. Well, let me -- before I make a decision whether to invoke the rule of sequestration, do you wish to make any opening statement before he testifies?

MR. BAKKEDAHL: Yeah, I'll probably make a brief statement, but -- yes, I'll have a comment for the Court.

THE COURT: Well, I recognize the rule provides for -- the sequestration rules provide that an expert witness may be present in the courtroom.

To be safe, sir, I'll just have you wait outside for a minute, whichever -- please don't discuss your testimony with anyone, allow anyone to discuss it in your presence, please. You're free to talk to the lawyers, if you wish. But if you'll just step outside, we'll call you shortly when it's your turn. Thanks for bearing with us.

MR. BAKKEDAHL: Okay. Judge, the next step in my objection involves the question of whether or not this is new or novel scientific evidence. Of course, we start off with the proposition that the Frye test is the controlling test for the admissibility of scientific evidence in the State of Florida. Despite the fact that the federal government is now on a Daubert standard and many states have adopted a Daubert standard, in the State of Florida, it is simply Frye.

Frye says, "When dealing with, quote, new or novel scientific evidence, the proponent of the

evidence," in this case the State, "must establish that the evidence is accepted in a relevant scientific community."

The problem for the Defense is that this is not new or novel. As the Florida Supreme Court stated in Spann v. State, where we offered into evidence handwriting exemplars, this is at 857 So.2d 845, "Frye only applies when an expert is relying upon new or novel scientific evidence."

For the record, I would like to cite the following cases across the nation on this issue: Commonwealth of Massachusetts versus Jason Meeks, 2006 WL 28, 1923, Superior Court of Massachusetts; U.S. v. Willock, 696 F Supp.2d 536, U.S. District Court Maryland. I will not cite any additional federal cases. They're all in compliance or in agreement with Willock. People versus Givens, 912 NYS 2d 855, New York, 2010; State v. McGuire, 16 A. 3d 411, Superior Court New Jersey; Commonwealth versus Foreman, 797 A. 2d 1005, Pennsylvania Superior Court 2002; People versus Genrich, 928 P. 2d 799, Colorado Court of Appeals 1996; State v. Armstrong, 2004 Ohio 5635, Ohio Court of Appeals, 11 District; State v. Legnani, 951 A. 2d 674, Appellate Court Connecticut 2008; People v.

Johnson, 335 NE 2d 144, Third District Illinois 1975; State v. Fuentes, 228 P. 3d 1181, Court of Appeals New Mexico 2009; Bowden v. State, 610 So.2d 1256, Court of Appeals Alabama; People v. Cowan, 11 -- 113 Cal. Rptr. 3d 850, California Supreme Court 2010; and finally, Flemming v. State, 194 Maryland Appeal 76 Maryland, 2010.

Each and every one of those cases has deemed that this evidence is admissible under either Frye or Daubert or both and is not new or novel.

More importantly, for the Court's consideration, I hand you the third in the series of Ramirez cases, which, you know, you may wonder, you know, why am I giving you Ramirez because it's a situation where a toolmark evidence relative to a knife mark, marking left by a knife was not deemed admissible. But the reason is, is that, again, that, and I don't want to belabor the point on Ramirez, but it had something to do with the nature of the receiving end the tool. Because it was bone or cartilage, there hadn't been sufficient testing and so forth to validate the utilization of the underlying principle of toolmark.

The holding in that case, at the third hearing, there was a full-blown Frye hearing where they

considered expert testimony, scientific and legal publications and judicial opinion, which I think is important because I've now provided you with judicial opinions, I'm going to give you publications and I'm also going to give you expert testimony.

But what they said is important, and that's going to be at footnote, or, excuse me, section three of the opinion. It says, "Traditional knife mark evidence is a subgroup of the broader category of evidence commonly referred to as toolmark evidence. The theory underlying toolmark evidence, which is explained below, is, quote, 'generally accepted in the scientific community and has long been upheld by courts,'" end quote.

So, again, this involves a firearm, and we recognize that, but the firearm examination is nothing more than a subcategory or an outgrowth of toolmark examination and it has long been recognized to be generally accepted within the relevant community, which is the community of firearms and toolmark examiners.

So my final argument or objection to this is that this is not new or novel evidence.

THE COURT: All right. Do you want to proffer

the testimony of the witness? I know they've come from Miami or something. Do you want to have them come in and testify --

MR. BAKKEDAHL: Sure.

THE COURT: -- and I'll hear -- Ms. Vrod or Mr. Burns, I'll hear you all's responses, but as a courtesy to him, have him testify so we get that in the record.

His name?

MR. BURNS: His name is Gabriel Hernandez.

THE COURT: If you could have Mr. Hernandez come in, please.

MS. VROD: Do you mind if we swing around, Judge?

THE COURT: No, ma'am.

THE BAILIFF: Mr. Hernandez, right here. Standing here, facing the Judge, raise your right hand to be sworn in.

THE COURT: Do you swear or affirm, sir, the testimony you are about to give shall be the truth, the whole truth and nothing but the truth?

THE WITNESS: I do.

THE COURT: Thank you, sir.

Watch your step.

Just for what it's worth, I understand what the

issue or issues are, so if you all when asking him questions can give me the courtesy of getting to the point.

Go ahead, Mr. Bakkedahl.

MR. BAKKEDAHL: Did you want some type of an opening statement, I --

THE COURT: If you wish.

MR. BAKKEDAHL: -- neglected to that. The witness is here and I don't know if that creates a problem. I don't -- I mean, I generally do not think anything I can say can affect his opinion here.

THE COURT: Okay. If you wish to give an opening comment, you may.

MR. BAKKEDAHL: Just very briefly.

As the evidence will indicate during the course of this hearing, basically we are here today as a result of a report issued through the National Association of Science, or something to that effect, and they'll give you the correct title, that called into question certain issues arising in the forensic community in general. As a result of this well-intentioned report and a report that has been particularly -- embraced by, in particular, the firearm and toolmark examiners community, the

various individuals out and about have taken up this as a cause, if you will, in an effort to attack what has traditionally been accepted as reliability and admissible evidence.

So that's really what we're doing here today, and what I want to -- what I'm going to point out to the Court is that the evidence, the NAS report does not say what the Defense is suggesting that it says, which is that this evidence or this science is junk science. So that's what we intend to establish through the course of Mr. Hernandez's testimony.

THE COURT: Okay. If you want to -- Ms. Vrod, I don't know if you want to make any opening comment or anything. You may. I was just -- what I'm interested is doing is proffering Mr. Hernandez's testimony.

MS. VROD: No, thank you.

THE COURT: Get that in the record.

Okay. When you all are ready.

///

///

///

///

///

THEREUPON:

GABRIEL HERNANDEZ,

a witness called by the State, being first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. BAKKEDAHL:

Q. Please introduce yourself to the Court.

A. Well, my name is Gabriel Hernandez.

Q. And, sir, how are you presently employed?

A. I am a criminalist supervisor of the Miami-Dade Police Department Crime Laboratory. Actually, Forensic Services Bureau. We changed names recently.

Q. Okay. How long have you been employed in that capacity?

A. Since August of 2005.

Q. All right. And is that as a supervisor or is that the total duration with which you've been with Miami-Dade?

A. That is the total duration. I first came on as a Criminalist I, went through my firearm and toolmark training and then became a Criminalist II when a position became available. And then when a position became available for the criminal supervisor position, I applied and I -- I was granted that position.

Q. All right. And in your supervisory capacity, can you kind of give the Court an idea of what your

responsibilities are at the lab?

A. Sure. Well, I'm the criminalist supervisor with the firearm and toolmark unit. That still makes me a firearm and toolmark examiner. And besides my supervisory and administrative duties of reviewing casework and other things like that, I still evaluate questioned casings and bullets to any questioned guns that are submitted to the laboratory.

Q. Okay. And in that capacity, do you have the occasion to train other firearm and toolmark examiners within your agency?

A. I have.

Q. All right. And furthermore, have you had the occasion during the course of your career not only to train, but then to subsequently reexamine or confirm the findings of examiners within your agency and outside of your agency?

A. I have in both counts. We have a verification process that's part of our quality assurance system where a second trained examiner will verify any identifications to firearms, for example. I've done this numerous times, more times than I suppose I could count, in Miami-Dade and the Forensic Services Bureau, and I've also done this with Indian River Crime Laboratory.

Q. Okay. Now, can you give us a description of your

educational background and your schooling?

A. Sure. I have a Bachelor of Arts in biological sciences from Rutgers University in New Jersey and I have a Masters of Science in forensic science from John Jay College of Criminal Justice in New York.

Q. Okay. And as you've been with the Miami-Dade Crime Lab, that's the term I'll use, maybe perhaps it's not, you know, correct, but have you undergone continuing education and training in the area of firearm and toolmark examinations?

A. Absolutely.

Q. Okay. And can you give us a list of some of the cases -- or, excuse me, some the classes relevant to this particular field that you've taken over the years?

A. Sure. Well, first, let me start with my two-year formal training program that I underwent when I first was hired. Training consisted of study, observation, experimentation, lab practicals and research projects. We covered in training modern firearms design, firearms identification, serial number restoration, distance determination or muzzle to target distance determination, history of firearms development, coverage of safety and other topics that encompass that first two years of my training. It was as though I was going to school all over again when I was employed.

My training started there in-house. And most firearm and toolmark examiners are trained in-house.

Outside of the laboratory, I've taken several armorers courses held by manufacturers such as Sigarms, Glock and Smith & Wesson. I've taken a Smith & Wesson pistol and revolver course and then a Glock pistols course and Sigarms pistols course.

Now, armorers courses are structured to provide a practical understanding of particular makes and models of firearms that these manufacturers make, and one gains an appreciation for how the individuals parts work in concert with each other within firearms. And also an appreciation for how the safeties work on these firearms and also how these firearms are made.

Besides that, I've taken two courses with the Federal Bureau of Investigation, one on muzzle to target distance determination and one on bullet trajectory analysis. With the Bureau of Alcohol, Tobacco and Firearms and Explosives, I've taken a course on silencers, or rather noise suppression devices, as they're also called. And also, a course on how to use the National Integrated Ballistic Information Network, or -- it's the instrument that inputs casings into the National Integrated Ballistic Information Network known as IBIS.

Furthermore, I've taken several courses through

the Miami-Dade Public Safety Training Institute covering topics such as crime scene investigation, footwear and tire track examination and several other administrative courses that are in line with my supervisory position as well. I've attended several educational conferences. As far as that, there's the Association of Firearm & Toolmark Examiners yearly conference and I have attended the 2008, the 2009, and the 2010. At the 2010 conference, I also presented a paper based on research that my laboratory is performing and -- and the reason we're doing that research is because we received a grant from the National Institute of Justice to evaluate consecutively manufactured breechfaces on Ruger, or Ruger slides, rather.

I've also attended the 2006 International Association of Identification educational conference where I took several classes in -- in the subject area of footwear and tire track examination. And I'm a member of the Association of Firearm & Toolmark Examiners, a regular member at this time. I'm also certified in the field of firearms evidence, examination and identification through the Association of Firearm & Toolmark Examiners.

Q. If you had to give us just a rough estimate, how many hours of continuing education do you think you've received through these courses, conferences and other training that you've undergone over the period of time that

you've been doing this?

A. It would amount in the hundreds.

Q. I know from reviewing your C.V. that you've indicated that you've visited numerous firearms manufacturers; is that correct?

A. That is correct.

Q. Okay. And we've often wondered, as prosecutors, why that is something that you people think is important to inform a jury on. Can you explain to the Court why it's important for you as a firearm examiner to visit the manufacturer of firearms?

A. Absolutely. It's very important, as you might imagine. Firearm and toolmark examiners will visit and tour firearm manufacturers to see firsthand the manufacturing processes that go into the manufacturing of the barrel, the manufacturing of the breech of a slide, for example, the extractor, the ejector, the firing pin, and see the interaction between tool and work piece as those firearms are being made.

Ultimately, the -- the markings that are made incident to manufacture within a firearm in the case of a barrel or on a surface in the case of a breech or breechface will leave identifiable marks on any ammunition components that are fired through that constructed gun. So it's important for firearm and toolmark examiners to see

those firsthand to understand it, see these individual parts of a firearm come off the line, even in a consecutive manner, and gain that appreciation.

I've toured the factories of Smith & Wesson, Sig, Wilson barrels, Marlin, Mossberg shotguns as well as Colt and Glock. Actually, both their factories in Austria.

Q. And I understand from conversations you and I had on Tuesday that you actually traveled to Austria recently to assist them in a project; is that correct?

A. That is correct. I had mentioned just a few moments ago about how I presented a paper based on research that we were able to do because of a grant. That one was on Ruger -- I'm sorry, Ruger slides.

However, we also were awarded a second research grant in our laboratory and I was a co-recipient of that grant and I was tasked or the research question was to evaluate a particular type of barrel that Glock manufactures that only law enforcement can use. Part of that was to go to Austria, to go to the actual factory and see these barrels made consecutively so I could attest to their consecutive manufacture, understand how that process actually is -- is done and then write down the serial numbers of those barrels so that when they send them to me, we can go ahead and make a validation study based on -- on these barrels.

Q. Okay. And these two grants that you've just referenced, the one they required you to go to Austria and the other one relative to the perform -- validation set that you all compiled, those were done as a direct result, if you will, from funding provided in response to this NAS report?

A. Yeah. Ultimately, the NAS report had three main recommendations, and really that's what the NAS report did. They -- they made recommendations to improve all forensic sciences. One of them, and probably the main recommendation, was for more research to be done. And as a result of that, the National Institute of Justice provided monies for these research projects to be -- to be applied for. So our laboratory applied for two and we received two, so we're two for two.

Q. All right. Now, in this capacity, other than having taught just simply within your department or your agency, you've also had the occasion to teach on issues of firearm and toolmark examinations outside of the Miami-Dade Crime Lab?

A. Sure. I mean, besides trainees and -- that come into our laboratory and go for -- through the training or two-year training, I also teach on -- outside the laboratory, and I've been teaching for many years. I started teaching as an adjunct professor at John Jay

College of Criminal Justice while I was working on my master's degree, and I teach general forensic science classes, which there are chapters that -- that cover firearm and toolmark examination.

Q. All right. Have you co-authored any publications in this area?

A. I have. The -- the report that we are sending to the National Institute of Justice, for example, on the Ruger research study, the one that has been completed, the one that we have presented already at the Association of Firearm & Toolmark Examiners conference recently, that was in Chicago at end of May, beginning of June, I'm a co-author on that particular research project, paper.

Q. Do you belong to any professional organizations?

A. Yes, AFTE, or the Association of Firearm & Toolmark Examiners. I am a regular member. I'm also a member of the International Association of Identification, and I'm also a member of the Florida Division of the International Association for Identification. Both -- the first two, AFTE and IAI, or -- I serve on committees on both the -- in both those organizations.

Q. Can you tell us just a little more detail on what the Association of Firearm & Toolmarks Examiners does?

A. Sure. It's a -- it's -- Firearm and Toolmark Examiners Association is made to basically have a place

where people like me, firearm and toolmark examiners, could present research, present findings, present new and cutting edge findings in our field in either publication format in their quarterly journal or through their annual meeting or training seminar through presentations that are done there. They've been around since 1969 doing the service for our community.

Q. All right. And then they developed and -- you know, pardon, you know, my improper use of terminology, but have they developed policies and procedures that they recommend be utilized in the course of conducting a firearm or toolmark examination?

A. Absolutely. Firearm and toolmark examiners will follow these guidelines that are set forth by the Association of Firearm & Toolmark Examiners and they, for example, have a code of ethics that is followed. They have the AFTE glossary where definitions for a myriad of firearms-related words are located. They have guidelines for examination protocols. And they also have a training manual which is used as a baseline training manual across several crime laboratories, probably all crime laboratories as far as firearm and toolmark examination goes.

Q. Okay. When you talk about the accreditation of a lab, I understand we'll get to it in a minute, but accreditation of a lab is done through a different creature

than the -- than AFTE; correct?

A. That is correct.

Q. But when a lab is accredited and has a firearm and toolmark examination -- examiners section, do they apply to AFTE? Is it generally accepted as a best practice is to apply the policies and procedures as outlined by AFTE?

A. Well, the -- the entity that you're speaking of is American Society of Crime Laboratory Directors, Laboratory Accreditation Board, and this entity will evaluate a full crime laboratory, and part of crime laboratories is the firearm and toolmark unit, and they will evaluate the standard operating procedures of these laboratories for quality and for conformance to set standards put out that crime laboratories have to follow.

So if the particular lab has, for example, the AFTE training manual as a reference to their training manual or as a baseline to their training manual, this -- this organization, ASCLD/LAB, will review that and see to it that that's being followed as well. So, in essence, yes.

Q. Okay. Now, do you hold any certifications?

A. I do. I have a certification from AFTE in firearms evidence, examination and identification.

Q. And how do you obtain that, what qualifications must you have?

A. First you have to become eligible. You need two years of training and then three years on the bench to become eligible to even take the test.

Once you become eligible, you have to take a written exam and successfully pass it. And the written exam is -- the preparation for the written exam takes months, perhaps.

After successfully passing the written exam, a practical test is sent to your laboratory of, say, casings and projectiles to test -- like unknown casings and projectiles to known casings and projectiles and the examiner is asked to evaluate them and then write down the results as though they were following proper laboratory procedures and then they send those results away and those are scored as well.

Q. Okay. Now, in the area of accreditation, we talked about briefly, you know, the agency responsible for doing accreditation. Have you had the responsibility of going in and conducting accreditation studies, if you will, of crime labs in the State of Florida?

A. As far as my own crime laboratory to Miami-Dade Police Department, I was actively involved in -- in preparing our SOPs so that they were in conformance with the latest set of standards, which is the ISO 17205 standard that ASCLD/LAB International sets forth.

I've done audits of laboratories outside of Florida, though. I've audited Washington State Police Laboratory through ASCLD/LAB where I'm a certified assessor.

Q. Okay. And with respect to the Indian River Crime Lab, have you had the occasion to do any accreditation work there or auditing at that lab?

A. No, not me personally.

Q. Okay. Are you aware of people within your agency who have?

A. Yes.

MS. VROD: Objection, Judge. Relevance.

MR. BAKKEDAHL: Well, I mean, I think I have to establish that our lab is accredited --

THE COURT: I'll overrule the objection.

BY MR. BAKKEDAHL:

Q. All right. Yes?

A. Right. And also, I happen to know that the Indian River Crime Laboratory is accredited through ASCLD/Laboratory -- I mean ASCLD/LAB.

Q. I think we indicated at some point in time, you've been up to this lab. What was the purpose of your visit to the lab?

A. At the time, there were two firearm examiners at the crime laboratory, and one was going through training.

Now, standards put forth that a verification of identifications to, say -- from, say, a casing to a gun or a projectile to a gun, have to be verified by a second qualified examiner or a second fully trained examiner. So at the time, they had one fully trained examiner and one trainee. So Indian River put a request out to neighboring laboratories, Miami-Dade, to please come and verify some of their work, and that was the mode where I visited the Indian River Crime Laboratory.

Q. Okay. And during the course of that verification process, you then become familiar with the policies and procedures utilized by the lab as they conduct firearm and toolmark examinations?

A. Right. There's a review of the case notes and the conclusions as part of that verification process and also an evaluation of the actual evidence that was being compared. And everything in -- that was shown to me showed that a sound examination protocol was followed.

Q. Okay. So to sum up as it relates specifically to our lab here in the 19th Circuit, that lab is conducting examinations in the area of firearm and toolmark evidence in accordance with generally accepted policies and procedures as laid out by AFTE?

A. Yes. And -- and laid down by ASCLD/LAB as well.

Q. Right. Okay. Now, can you give us an estimation

approximately how many firearm and toolmark examinations you conducted in your career?

A. An estimation would be in the hundreds, and maybe even thousands at this point.

Q. Okay. And have you ever qualified as an expert in the court of law in the area of toolmark and firearm examination?

A. Yes, I have, in firearms examination.

Q. And what courts?

A. In Miami.

Q. Okay. And how many times would you estimate you've been qualified in a court of law as an expert?

A. I've testified ten times.

Q. Okay. All right. Were you asked to review some materials relative to an examination conducted by Mark Chapman of the Indian River Crime Laboratory relative to this case?

A. I reviewed Mr. Chapman's report and I reviewed his work notes.

Q. Okay. Did you also have the occasion to review trial testimony that he gave in a prior proceeding in this case?

A. I skimmed through some of that testimony, but I haven't read it fully book to book -- I mean cover to cover.

Q. Okay. And you indicated that you reviewed a copy his case file; is that correct?

A. That is correct.

Q. All right. And did you also have an opportunity to speak with him directly about what he did and the policies and the procedures that he complied with?

A. Correct. My conversation with him was more towards the policy that -- that he follows and also I had questions about the AFTE training manual and if their training manual is based on the AFTE training manual, and he confirmed that their training manual is based off the AFTE training manual.

Q. All right. In reviewing his file, did you have an opportunity to see his report?

A. Yes.

Q. Did you have an opportunity to review his bench notes?

A. Yes.

Q. Photographs?

A. Yes.

Q. Okay. Determine whether or not there had been a validation of his findings in this case?

A. Correct. In conversation with Mr. Chapman, he verified to me that a verification of his -- his work was indeed done.

Q. Okay. Now, you've indicated already that the Indian River Crime Lab here is certified; is that correct?

A. It's accredited by ASCLD/LAB.

Q. Okay. Accredited, excuse me.

And was Mr. Chapman's work, as you observed it from his file and bench notes and what you reviewed in the deposition, conversations with him, your understanding of the operation of the crime lab here, was it in accordance with accreditation standards?

A. Yes. It fulfills all -- all the standards.

Q. Can you just very briefly click off what you mean by that? What are we talking about that has to be done?

A. Basically, we're talking about an evaluation of evidence. I believe in his case, there's projectile evidence, there's casing evidence and there's also a firearm. There's a comparison of the casings and projectile back to tests made with the particular gun and that evaluation was sound, as I saw in his bench notes.

Q. Okay. And just for purposes of the AFTE policies and procedure manual and the conducting of these examinations, let's start off first with what type of a credential must the examiner have? What type of experience must they have before they can do this?

A. Right. The examiner must have completed the training manual.

Q. Okay. And that's the training that you referred to that you underwent?

A. Correct.

Q. Okay. And there's every indication that Mr. Chapman has undergone that training?

A. Yeah, every indication is there that he has.

Q. In fact, you know he has?

A. Correct.

Q. Okay. Number two, as it relates to the actual processing of it and examination of the evidence, what are some of the things that are required to do as it relates to documenting the examination?

A. For example, there would be some sort of narrative about -- about the evidence that is there, which Mr. Chapman has done. He also has documented the -- his identifications with pictures.

Q. Okay.

A. And he's also verified his results.

Q. Okay. And those are all things that are required --

A. In -- in the protocol.

Q. In the protocol, okay.

Based upon generally accepted and employed procedures and methodologies for conducting a firearm examination, do you have an opinion as to whether or not

Mr. Chapman performed his examination in compliance with those standards?

A. I believe that he has performed his examination in compliance with those standards.

Q. Okay. All right. Let's go ahead and move to your Powerpoint, then, if we can, at this time.

THE WITNESS: May I step down, Your Honor?

THE COURT: Yes, sir.

THE WITNESS: Thank you.

BY MR. BAKKEDAHL:

Q. Okay. I think as I indicated to the Court in the brief opening statement, essentially this, for lack of a better term, this brouhaha developed over the issuance of this NSA -- this NAS report; correct?

A. Correct.

Q. In 2009, and that's going to be the strengthening --

A. Right, the Strengthening Forensic Science in the United States: A Path Forward, written by National Research Council through the National Academy of Sciences. And effectively, we call it the NAS report. Okay?

Basically, the NAS report is what brought about some of these, I suppose, criticisms that have arisen. And basically, the charge, the original charge of the committee members of the NAS report was to improve forensic science

and give a clear path on how to do that.

The report is not meant to discredit the current work product of crime laboratories. It was never intended to do that, nor does it. And at no time does the report state that firearm and toolmark identification is invalid. It never said that.

And it gives recommendations for improvement for all the disciplines of forensic science, not just firearm and toolmark identification. And the main thrust of those recommendations were to perform more research much in the individual disciplines of forensic science, to -- for individual laboratories to seek laboratory accreditation, because it is voluntary, and last, but not least, for individual examiners, when they do become eligible, to seek certification through whatever certification -- certifying body exists for their discipline.

Q. And we talked a little bit about, like, for instance, the recommendation of the committee to perform more research. We now know that you're -- the relevant scientific community or firearm and toolmark examiners has begun doing additional research, not that you haven't done research, but are doing additional research as a result of this report; correct?

A. Actually, it's a little more than that. Research had been constantly done and is currently being done,

however, there is more resources available now, in terms of dollar signs. What's possible now with these extra resources is larger tests where you can reach more firearm and toolmark examiners and get an evaluation from -- from that larger population of participants.

Q. Okay. Now, I want to make sure that the record is abundantly clear on the ultimate issue, which is at the conclusion of the NAS report, while they may have made recommendations, suggestions and criticisms, they at no point in time indicated anywhere in that, and I think the Defense is going to offer it, and we don't have any objection to the admissibility of the report, but at no point in time did they ever suggest that the foundation or the fundamental underlying methodologies of premises of firearm and toolmark examination is in question?

A. Correct. It never says that the science is invalid at all.

Q. Okay. Now --

A. All it says is that further research to build on the foundation that exists should be done.

Q. Okay. One of the criticisms that's arisen through this group of individuals who are out attacking this -- this field of study is that it is not scientific, it is not a science; is that correct?

A. Correct.

Q. Okay. Let's talk about that.

A. Okay. So the outline of my full presentation will cover a basic overview of science and forensic science and then will cover the fundamentals of firearm and toolmark identification, will cover fulfilling admissibility and last, but not least, we'll do a summary. So first we'll start with a basic overview of science and forensic science.

Q. Okay. And I want to talk about -- I want you to talk about this in the context of establishing for the Court that what you people do is science.

A. Correct.

Q. Okay?

A. All right. Great. Basically, what is a science? A science is a systematic gathering of knowledge. The observation, identification, description, experimental investigation and the theoretical explanation of phenomena, that is the definition of a science.

What is a scientific method? They're procedures for the systematic gathering of knowledge and these procedures generally involve stating a problem, developing a hypothesis, testing that hypothesis, and if that hypothesis holds up over rigorous testing, a theory can be formed and then that theory can be used to predict events.

To be scientific, the theory must be testable,

okay? And the theory must be validated through the testing of fundamental propositions upon which the science is based. All of these things are elements of firearm and toolmark identification.

Q. Let me stop you just on that particular issue. When we talk about testability of a scientific theory, if you will, if somebody were to engage in some experiment and then come to a conclusion, or reach a result as a result of the experiment, render an opinion, if that could never be reproduced, or tested, if you will, that would not be a valid scientific theory; correct?

A. It wouldn't be. You need to validate a hypothesis repeatedly and -- until it becomes a theory. And then continue on in that motion.

Q. Okay.

A. So we talked about science generally. Now, let's bring it into forensic science, all right? Forensic science, the most general is the application of the science to law. And a discipline of forensic science is firearm and toolmark identification. Now, firearm and toolmark identification is a science that is validated and sits on a strong foundation of research.

Now, let's put it into the framework of the scientific method, which is the slide I just had up here. What is the problem with firearm and toolmark

identification? Basically, can you identify or eliminate a toolmark back to the firearm or tool that produced it? When you develop the hypothesis from that problem, a toolmark can be identified or eliminated to the firearm or toolmark that produced it and then you test that, and you test it rigorously with validation studies and research.

Q. And in your field of firearm and toolmark examination, has there been validation studies -- and we're going to get into those in details, but have there been?

A. Yes.

Q. Okay.

A. Absolutely. And then the hypothesis will undergo validation studies and research, and if it holds up through that rigorous testing, the hypothesis then could be formed into a theory in firearm and toolmark identification as the Association of the Firearm and Toolmark Examiners Theory of Identification. Then that theory can be applied.

So the fundamentals of firearm and toolmark identification. We'll cover some definitions. We'll cover fundamental propositions 1 and 2, the examination method and some range of conclusions.

Q. All right. Let me just stop you for a second because I -- just to go back. You don't have to go back, but in summation, as it relates to the scientific method in that last slide we went through where you articulated the

problem, the hypothesis and so forth, as a result of that in the scientific -- excuse me, in the firearm and toolmark examination fields, does that make it a scientific field?

A. Yes, it does.

Q. Okay. Go ahead.

A. So, now that we talked about science and showing how firearm and toolmark identification fulfills those precepts, let's talk about some definitions, fundamental propositions 1 and 2, the examination method and some range of conclusions.

So how would you define firearm and toolmark identification? Basically it's an empirical comparative analysis that can determine if a striated or impressed mark was produced by a particular tool.

I mentioned tool. Let's define tool, okay? The harder of two objects that comes into forceful contact with one another, resulting in the softer object being marked. A tool can be a pair of bolt cutters, it can be a hammer, it could be a flathead screwdriver, it could be a pair of wire snips, it could be a mallet or even a knife. A tool can also be a firearm where the interior portions of that firearm will leave markings on softer metal that's found on the, say, ammunition components that are fired through it.

What is a toolmark? A toolmark are features imparted to -- on an object by the contact and force

exerted from a tool. There are two types of toolmarks. There are impressed toolmarks and striated toolmarks. Impressed toolmarks are features produced when a tool contacts an object with enough compressive force that it leaves an impression.

What I have here are two pictures. On the left-hand side, I have a picture of what is an impression from the face of the hammer in soft lead. And you see the impression of that hammer there, and -- and that is basically showing the face of that hammer on that work piece. In other words, it's a toolmark from the face of that hammer.

On the right-hand side, I have a picture of the casing. A casing, upon fire -- pulling a trigger, a firing pin will come and strike the casing in the primary of the cartridge. That firing pin will leave an impressed mark in that primer, and it's referred to as a firing pin impression. Now, the same time as -- after that primer has been struck, it's going to send a jet of flames into the interior of the casing and ignite the gunpowder. An extreme amount of pressure will build. That extreme amount of pressure is going to push that casing back into the breech of the firearm and that -- those breechface marks from the firearm will then be impressed on that primer and potentially on the rim of the casing. And those are these

marks here. And then this is the firing pin impression.

Now, we talked about impressed marks. Let's cover striated toolmarks. Now, impressed marks is basically one tool coming to a work surface and leaving an impression and then coming away. A striated toolmark, there's lateral force involved. The tool comes into contact and then it is moved where scratches -- will become scratches, or striations is another word for it. So striated toolmarks are features produced when a tool contacts an object with lateral force and motion.

And we have two examples of striated toolmark here. On the left is a picture of a striated toolmark made by a flathead screwdriver that has stabbed into a surface and then drawn across that surface leaving striated markings. On the right-hand side is a picture of a fired bullet. This bullet has gone down the barrel of a firearm and received striations on its surface, particularly in the areas of the land impressions, the high areas that are found inside a rifled barrel, and those striations will appear here because it's -- it's -- as the bullet goes down the barrel, there's lateral force from those lands on the surface of that bullet creating these striations.

So the science of firearm and toolmark identification is based on two fundamental propositions. The first proposition is that toolmarks imparted to objects

by different tools will rarely, if ever, display agreement sufficiently to lead a qualified examiner to conclude the objects were marked by the same tool. That is, a qualified examiner will rarely, if ever, commit a false positive error, a misidentification. That's the first proposition.

A firearm and toolmark examiner will use pattern matching to do this, to evaluate two items, see if they do or do not have the same toolmark. So firearm and toolmark examiners will use this. And pattern matching, as defined, is a visual comparative examination of the topographical features of two different toolmarks. The relative height and depth, width, curvature and spatial relationship and -- spatial relationship of the features are defined for one toolmark and are then compared to the corresponding topographical features in the other toolmark.

So basically all of these individual markings of height, depth, width, curvature and spatial relationship of these features will have to be the same between two tools in order to render an opinion of an identification. That was the first proposition. Now, the first proposition is an examiner will rarely, if ever, commit a misidentification.

Proposition number 2 is that most manufacturing processes involve the transfer of rapidly changing or random marks onto work pieces such as barrel bores,

breechfaces, firing pins, screwdriver blades and the working surfaces of other common tools. This is caused principally by the phenomena of chip formation and tool wear, or by the electrical/chemical erosion that some processes or some manufacturers use. Microscopic marks on the tools may then continue to change from further wear, corrosion or abuse.

Now, proposition 2 talks about chip formation and that interaction between chip formation and the tool that makes, say, a barrel. So I have an example here of a cut rifled gun barrel. So we can talk about these manufacturing processes in the framework of proposition 2, and ultimately, through this example. So, first you have a cylinder of steel, okay? It's drilled. You make the hole that will ultimately become the barrel of this firearm. The drill head, I have an example of a drill here, or a drill bit, rather, will cut into that tool and then the chips will form along these channels on the side, these spiraling channels on the side of the tool as it goes down this cylinder of metal. As it does that, those chips will interact with these cutting surfaces of this tool and cause individual changes and minute microscopic changes that are completely random and unique. All right? That's from drilling.

After drilling, a reaming tool will go into the

barrel and cut -- and a reaming tool, instead of cutting from the front, like a drill, it actually cuts on the side. And what this is done -- used for, rather, is to make the rough cuts from the drill less as this reaming tool goes in. Now --

Q. Let me just stop you for a minute. So when the barrel is being reamed out after it's initially been drilled -- it's initially drilled and it imparts all of these random, unique, individual characteristics?

A. Right. And then the reaming tool comes in and imparts more random, unique characteristics.

Q. Okay.

A. Maybe erasing some of the ones that were there prior because of the drilling marks, but making their own. So the tool is cutting constantly, repeatedly over marks that were made.

Q. And it's more a product of the -- the remnants of the drilling process than the tool itself?

A. Correct. It's an interaction of both. It's an interaction of chip formation and the cutting surface of the tool that will ultimately leave the identifiable marks on the lands of the barrel.

Now, the next step is a barrel broach would come in and cut the grooves in, but what's remaining are the lands. And then the lands have reaming marks on their

faces, and those reaming marks are what -- are going to leave the striations and the land impressions that are impressions that are seen when a bullet is fired through a barrel.

Q. Just so we're clear on that for the record, the land is, if you envision it, it would be a raised portion and then it would come down into like a little valley which would be a groove and then --

A. Correct, the raised portion and then -- the lands and grooves of rifling are cut into a gun barrel and they're cut into in a helical manner. All right? There are raised portions and lower portions. The bullet will -- after being fired, the bullet will engage this rifling and then start turning. Now, the reason that happens is when the bullet comes out the front of this firearm, it's going to be turning on its central axis so that bullet could remain true on its trajectory, much akin to a quarterback throwing a football and having the tight spiral. If it has a tight spiral, it's going to continue on on its intended trajectory. If it doesn't have that spiral and falls end over itself, it's going to lose stability and not hit its intended target.

Q. Okay, so the bullet traveling down the barrel, then, it comes into contact with the lands and the grooves, it picks up some these of individual markings; correct?

A. Correct. In the areas of land, the land will leave striations on the bearing surface of that bullet, and then the reaming marks that I mentioned earlier are perpendicular to the direction of travel of that bullet as it goes through the barrel.

So, sort of in summary, manufacturing operations create microscopic random imperfections on or in work pieces that give rise to the individual characteristics that are later seen on bullets and cartridges.

Q. Okay, let me stop you. There is no question in any scientific studies, in any opinions, it doesn't matter who you are or where you are about this proposition right here, that the manufacturing process imparts unique individual characteristics?

A. Correct. This is proposition number 2 of our science, that in manufacture, these items are individual.

So let's define some of the class characteristics that are seen. Class characteristics, to define the term class characteristics are general and/or measurable features of a specimen which indicate a restricted group source. They result from design factors, and are therefore determined prior to manufacture.

Here are some examples of class characteristics: We're looking down the barrel of the gun here. Okay? This particular example has one, two, three, four, five, six

lands. The lands are the high portions, the grooves are the low portions. Okay? This barrel also exhibits a right-hand twist. Okay? So that's a class characteristic of this barrel. Other barrels of the same make and model will also have six lands and grooves, right-hand twist. Another class characteristic of this barrel is the width of the lands and the width of the grooves. The class characteristics from that barrel will be imparted on a bullet that is fired through it. So a bullet that is fired from this barrel will have six lands, six grooves, or have impressions from six lands and six grooves, and will also have the width of these lands and the grooves, the width of these grooves seen on their bearing surface. So in other words -- so in other words, if you see a projectile casework that had eight lands and grooves with a left-hand twist, it couldn't possibly have come from this barrel, it had different class characteristics.

Q. Now, when we talk about, and I don't mean to be disparaging to your field, but when you talk about class characteristics, it's like if I've got a Cadillac and I've got a Yugo, I know they're different.

A. Right.

Q. And effectively, you folks as experts will look at evidence initially for class characteristics and immediately be able to say not related; correct?

A. Right.

Q. Again, not to be offensive, that's not rocket science?

A. Right. Right. If they don't have the same class characteristics, they could not have come from the same source.

Q. Okay. So we're narrowing the field with this?

A. Correct. This is the beginning. The first part of the analysis. So an evaluation of class characteristics.

Now, in reference to tools, let's give the example of a flathead screwdriver, and a flathead screwdriver stabbed in this metal in the drawing caused striations, but the width of that tool is a class characteristic of -- that is seen in the impression. All right? So this tool can't possibly make a toolmark that is larger than the width of its head. Okay? So that's a class characteristic, an eliminating factor if something came in that was different.

Q. All right. Before you get into this definition and this -- and we look at the examples of this, this is, again, if we talk about the, quote, unquote, controversy surrounding the firearm and toolmark examiners' community, this is one of the issues that the enemies of the science have raised as effectively invalidating or calling into question the methodologies or your -- maybe not the

methodologies, but your ability to make an identification; is that correct?

A. That is correct.

Q. Okay. So let's go ahead and talk about this and explain how that's not the case.

A. Okay. Subclass characteristics, let's first define them, are features that may be produced during manufacture that are consistent among some items fabricated by the same tool. These are not determined prior to manufacture and are more restrictive than class characteristics. Okay?

So let me give an example of a subclass characteristic. A breech of firearm, for example, might be a step broach in order to -- to smooth out that -- that breech during manufacture. If there is a chip in one of the blades of the step broach or in the consecutive step broach, or one of the last blades of the step broach, rather, a course line will form where that chip is, that notch is in that blade. It will be -- it will reproduce on any slides that are affected by that step broach during manufacture. So you might have a run of, say, ten to 12 or 50, just a broad number, where this defect from the step broach is seen on the working surface of the breech, for example.

Q. Okay. There is --

A. So that's a subclass characteristic.

Q. And it's a subclass because it wasn't designed to be that way, it wasn't --

A. It wasn't designed to be that way. It's more restrictive than class characteristics because these over this limited run have the same class characteristics of all of the same -- the same make and model, but only through this limited run where there's some sort of damage in the tool that manufactures, you'll see this subclass characteristic come up. Okay?

So firearm and toolmark examiners are aware of subclass characteristics and the potential for subclass carryover. And they gain this knowledge and this training through their training. In the beginning, the first two years of formal, structured training.

So what are the steps? What happens when there's an inspection for subclass carryover? An examiner will examine the tool and toolmarks for subclass influence. They'll first have established knowledge of manufacturing processes that they received during training and visits to the firearm and toolmark manufacturers, for example. And they will look for evenly appearing non-random contours that are either impressed or striated. They will also look for prominent striated markings on the interior of a gun or barrel bore that remain unchanged through the entire length

of the barrel. Meaning, muzzle down through chamber, all right, going in the same direction as the travel of the bullet, typically heavier than -- these will be typically the heavier -- they will be typically course in appearance, so, in other words, typically the heavier the marking, the greater chance of this occurring.

And then last, but not least, impressed striations transferred to the tool working surface that remain unchanged across the entire working surface.

Q. Okay. So let me stop you for a second. Again, going back to my original question regarding this all of a sudden becoming an issue as a -- as a science in a community. Has the firearm and toolmark examiners community recognized the issue of subclass for years?

A. Yes.

Q. I mean, this is not something that came up in 2009 or 2010?

A. No, no, absolutely not.

Q. And as a result of your recognition of that, have there been studies to address the issue of subclass identification?

A. Carryover.

Q. Carryover?

A. Yes. There has been studies that study this, and also training has been constructed to evaluate this and

notice it.

Q. Okay. And you've got some pictures of this for us?

A. Correct, correct. I actually have some pictures from one of these studies that advertised and showed to the community some subclass carryovers and that were seen in two different models of a Smith & Wesson SW40VE Sigma pistols.

What's seen here are pictures of casts of the breechface of the two different firearms. A firearm and toolmark examiner will use a comparison microscope where they can view two things at the same time under one field of view. And that's what this view is. This is a cast from one gun.

Q. When you say "a cast," what is a cast?

A. A casting, basically it's like a microsil cast. It's a casting material, kind of a putty type of material that will be injected or transferred onto a surface, allowed to harden, and then it's -- it's sort of rubbery in touch when it's removed. And then when it's removed, you'll have a casting of any impressions that are on that surface.

Q. Okay. So this is a casting of impressions from what?

A. From a breechface or two breechfaces of two Smith

& Wesson firearms.

Q. Okay.

A. Pistols.

What I'd like to show, first and foremost, that this casting is from one firearm and this casting is from a second firearm. This is a view from a comparison microscope, so this hairline can be moved in between the two. We're looking at two things under one field of view here. You can see parallel lines covering the entire surface of the breechface and -- and showing that there is subclass carryover in this example. And then there's two different pictures of the same castings.

Q. What's that thing? What's the thing in the middle?

A. Okay. Since this is a casting -- I'm glad you asked. The breech of the firearm basically is the area where the cartridge rests prior to firing and then the firing pin strikes the primer, right? The firing pin has to go through a firing pin aperture or a little window that it has to jet through in order to strike the primer.

So that's what that -- this is. Since it's a cast, the casting materials filled the hole where the firing pin would come out and you see this extra rubber or casting material that has been hardened in this appearance. So this is where the firing pin -- firing pin would jut

out.

Q. All right. So this is an important fact because this is an issue of some contention, rightly, or, quite frankly, wrongly, and what I need you to be a little more descriptive in it is why this is class characteristics? When you look at this, why -- you know, I talked about that Cadillac and the Yugo, it jumps out. Does this jump out to you as an expert as class characteristics?

A. It jumps out to me as a subclass --

Q. That's what I meant. I'm sorry.

A. Right, right. Going back to here and these different examination procedures that a firearm and toolmark examiner will undergo, this fits in here. Impressed striations transferred to the tool working surface that remain unchanged across the entire working surface.

Q. So, in other words, it looks -- it looks consistent, it looks continuous --

A. Right.

Q. -- they're the same width, they're the same -- they're all -- they don't stop, they don't move and wiggle?

A. Well, actually --

THE COURT: I understand.

MR. BAKKEDAHL: You got it?

THE COURT: I got it.

MR. BAKKEDAHL: All right. You sure you don't want me to go over it one more time?

THE COURT: Possibly.

THE WITNESS: So that's from the breech. It becomes a lot more understandable when you look at actual casings that were fired from these two different guns.

Okay. So what we have down here is a picture of two casings that were fired from the two different guns and you see parallel markings that run the entire length of -- of the surface of this -- of this head of a casing. All right? These parallel markings are even seen on the rim of this casing and will run across.

The person that wrote this article noticed this and noticed that he had two different guns and they had these subclass characteristics in between them that look -- that look like they match up. But a firearm and toolmark examiner that has been properly trained will know and be aware that there's a red flag whenever he sees, or she sees striations imparted that go across the full working surface, in this case, it's a head of a casing.

So what's -- what they're trying to show in this picture is that these two are from different

guns and share that same subclass characteristic on the -- on the breechface marks.

But that's just the breechface mark. There's firing pin impressions that a firearm and toolmark examiner will look at. A firearm and toolmark examiner will also look at firing pin aperture shearing, this area right here. A firearm and toolmark examiner also look at the ejector mark and the extractor mark and chamber marks, even, on the body of the casing, which do not have that subclass carryover. Okay?

So this shows that -- that subclass carryover between two different guns. However, this picture shows a clear example of how the shearing marks from the firing pin aperture are different between these two guns.

BY MR. BAKKEDAHL:

Q. And let's talk just briefly. And so assume that you're -- you have a qualified trained examiner and he looks at this and says, wow, I think I have -- you know, look at these -- everything is lining up; I think I've got a match here. They think, don't stop there. They go and they continue to look at, for instance, the fire pin -- the firing pin impression; right?

A. Yeah, examiners will look at -- again, there's

different parts within a firearm that will leave individual markings. There's the firing pin, there's the extractor, there's the ejector, there's the breechface also, and then there's also the chamber.

Q. So when they go -- after they see these original impressions and they go and look at the firing pin impression, if it's not the same, they automatically know, oh, this must be --

A. Right. Honestly, I don't know what order this hypothetical examiner might look at. They might start with the firing pin impression or they might start with the shearing, they might start with the chamber marks. So it wouldn't necessarily be that. But right off the bat, when a trained examiner sees parallel striations going across a full surface of the -- of the casing head, that's a red flag of subclass characters, therefore, they will rely on shearing, firing pin impression marks and -- and other markings that the gun produces, yes.

Q. What I'm getting at, I'm just trying to make a worse case -- even assuming the examiner screws that up and misses the subclass, they're not going to stop there. They're going to go to look at other aspects of the casing, if you will, to include the firing pin, and there they'd see, oh, this doesn't match at all?

A. What I'm trying to say is a trained examiner

wouldn't screw it up --

Q. I understand that.

A. And -- but would look at other areas as well.

Q. Okay. Go ahead.

A. Okay. So that was an example from guns. There's also examples that are found in tools. These are a pair of bolt cutters and the manufacturing process, there are parallel lines here, parallel lines that are equally spaced. Again, potential for subclass carryover. Most subclass carryover has to do with parallel lines, just to make that clear. Either evenly spaced or covering the whole surface from one end to the other of a particular work piece. In bolt cutters, the blade of the bolt cutters undergoes a grinding process, okay, where a grinding wheel, for example, will come down and sharpen those cutting surfaces that are in the interior of this tool. Those are extremely individual in nature because of the nature of the grinding wheel and the constant changing of that tool on the working surface and the constant changing of any chips that form between that grinding tool and the working surface, and that grinding tool wearing down and losing some of its sand particles, if you will. Okay?

So even though you have these subclass characteristics, they'll show up and the examiner will notice, okay, evenly spaced parallel lines. Red flag,

can't use them. I have to look at the other characteristics here.

And besides that, any bolt that's cut with this bolt cutter tool, the markings that are upon or seen in the center of that thing that's cut are from the cutting blade. Surrounding that would potentially be some -- the subclass carryover. But that would only be around the bottom, kind of like a skirt.

Q. Okay.

A. And then on top would be the individual markings.

So even all on top of that, an examiner will also inspect items by rotating them at 90-degree intervals. So in the case of those -- those casings with subclass characteristics that I've shown to the Court a couple of slides ago, if you were to turn them 90 degrees, now the oblique lighting is going to pick up different markings that are below those subclass characteristics that may be identifiable. So even though the breechface has subclass characteristics on it, there still might be individual characteristics below them, and they could be seen perhaps by a rotating at 90-degree intervals, and that's another thing that can be placed.

So we talked about class, subclass characteristics. Now we're on the subject of individual characteristics. These are marks or features produced by

the random imperfections or irregularities of tool surfaces. These characteristics can be used to individually associate a tool to a toolmark.

How are individual characteristics produced? These random imperfections or irregularities can be produced by manufacture, the interaction of chips with the manufacturing tool, and the slow wear of that tool over time is -- marks incident to manufacture, and you can also have individual characteristics from wear from use and wear from abuse.

Here are some examples. This is a knife, and there's a zoomed in box here of the actual cutting surface of that knife. You can see in this cutting surface how a grinding tool came in and -- and cut these markings on that cutting surface. You have lines that aren't -- you know, that are thicker than others. Some aren't perfectly parallel with others, either. And you can see here, this is -- any cuts made with this blade will be individual.

In the knife proper, or the area that's not bladed, you can see evenly spaced parallel lines that may be a potential for subclass characteristics. So an evaluation would be done to see if that's a problem or not, and then we'll only rely on markings made with the cutting surface, which any markings made with a knife are made with the cutting surface anyway.

What we're seeing here is the interior of a gun barrel. What I did, I cammed a gun barrel at an angle and then I was able to take a picture of the interior of that barrel through a stereoscope. Here are the lands, the raised portions. Here's the grooves, the low portions. Here's another land, raised portion. This is another groove, low portion. What I wanted to show is that on these lands are perpendicular markings to the direction of travel of the bullet through this barrel. These perpendicular markings are from the reaming operation, and that reaming operation, again, cuts from the side, okay?

THE WITNESS: And if -- if you would like to see an example of a reamer, Your Honor, I have one here.

THE COURT: Okay, sir.

THE WITNESS: It might be a little sharp, sir.

THE COURT: Okay.

THE WITNESS: I'll hold onto that.

THE COURT: All right, Thank you.

THE WITNESS: And it cuts from the side and then it will ultimately leave these reaming marks on the land impressions. Now, these marks are perpendicular to the direction of travel of the bullet leaving extremely individual markings on the bearing surface of any projectile or bullet,

rather, that is fired through this firearm. So those are examples of individual characteristics from manufacture.

There also -- I mentioned that there can be individual characteristics from use and abuse. This particular gun is -- is a little bit older and you can see evidence of some damage within the barrel of this firearm.

Now, going from firearms, tools. Let's talk about individual characteristics from wear, use and abuse. Think about a hammer that you may have --

THE COURT: Let me just interrupt you so if I could follow up with the State.

The issue in this case is a firearm, right?

MR. BAKKEDAHL: Yes.

MR. BURNS: Right.

THE COURT: Not a tool?

MR. BAKKEDAHL: But the science is -- the underlying premise is the same.

THE WITNESS: A firearm is a type of tool.

THE COURT: Okay. All right. Go ahead, sir.

THE WITNESS: So from use, the face of this hammer has been changed from its constant hitting of nails, for example. Little nicks and scratches will appear in random locations on the face of that

hammer giving the face of the hammer a very individual, unique look to it because of those random interactions from use.

Here's those bolt cutters again. Here's some evidence of abuse. Maybe this bolt cutter was used on a particular piece of metal that was too big for it or on a piece of metal that is -- that is very hard. So damage occurs to the blade in a very random fashion from that abuse. And that damage will then leave individual markings on any further cuts that that bolt cutter makes.

So we talked about individual markings, subclass characteristics and class characteristics. Now let's bring that into the examination process. First step is Level 1 analysis. Basically it's an evaluation of the class characteristics. And what I have shown here are two examples of elimination based on class characteristics. In other words, two items will be compared and, first and foremost, their class characteristics will be compared. This bullet is from a .45 auto. This bullet is from a 9mm. In other words, this bullet is a smaller diameter than this one. There is no way possible for this .45 auto bullet to have been fired in the 9mm pistol barrel, okay? Also, you see that this