

Just Advanced Capabilities in Firearm and Toolmark Analysis

Introduction [00:00:05] Now this is recording, RTI International Center for Forensic Science presents Just Science.

Voiceover [00:00:18] Welcome to Just Science, a podcast for justice professionals and anyone interested in learning more about forensic science, innovative technology, current research, and actionable strategies to improve the criminal justice system. In episode one of our Firearms Research season, Just Science sat down with Nicole Jones, the director of the Forensic Science Translation and Implementation Program in the Center for Forensic Sciences, and John Grassel, a program manager for RTI's Center for Forensic Sciences and co-director of the Forensic Technology Center of Excellence, also known as the FTCoE, to discuss toolmark analysis and advanced capabilities in firearms. The FTCoE serves as the bridge for the forensic community to support adopting innovative technological solutions. 3D imaging technology for firearms and toolmark examination is an example of an emerging technology the FTCoE evaluates. Listen along as these experts discuss the FTCoE's dissemination efforts on firearm evidence collection and analysis and their upcoming Firearms and Toolmark Research Forum happening January 11th through the 14th, 2022, in this episode of Just Science. This episode of Just Science is funded in part by the National Institute of Justice's Forensic Technology Center of Excellence and RTI's Applied Justice Research Division. Here's your host, Peyton Attaway.

Peyton Attaway [00:01:36] Hello, everyone, and welcome to Just Science. I'm your host, Peyton Attaway, with the Applied Justice Research division at RTI International. Our topic today is advanced capabilities in firearm and toolmark analysis. Here to help us navigate this conversation are our guests, Nicole Jones and John Grassel. Welcome to the podcast.

Nicole Jones [00:01:55] Thanks, Peyton. We're really excited to be here today.

Peyton Attaway [00:01:57] Nicole, according to your bio, you have extensive experience leading projects to implement evidence-based practices and methodologies to advance the reliability, reproducibility, and accuracy in the application of forensic science. Can you tell the listeners a little bit more about your past experience in the forensics field and what led you to your current role in CFS?

Nicole Jones [00:02:17] So I joined RTI in 2003 and initially worked with the National Laboratory Certification Program. Before coming to RTI, I had been doing work at an organization in Charleston, South Carolina, implementing LC-MS/MS for the detection of low levels of explosives, and that was a technology that was of interest to the National Laboratory Certification Program, specifically for hair testing. In 2011, RTI was awarded the Forensic Technology Center of Excellence, and I was responsible for evaluating CFS-supported U.S. Department of Justice grant activities, including technology evaluation, technology assistance, and tech transfer. So in that role, I served as a liaison between the state, local, and federal law enforcement agencies, NIJ, and then the research community. I also served as a task leader and liaison for the NIJ Forensic Science Technology Working Group, the NIJ Forensic Laboratory Needs Technology Working Group, and the FBI Technology Working Group for our 3D Toolmark Technologies. So I developed validation protocols for implementing new instrumentation and technologies for use in forensic laboratories, and two of my favorite focus areas have been the improvement of death investigation through both data modernization as well as the implementation of

imaging technologies - basically, virtual autopsy, which is pretty cool - as well as the implementation of new advanced technologies for firearm and toolmark examination.

Peyton Attaway [00:03:36] Great. Thank you so much, Nicole. And John, according to your bio, you lead cutting-edge technology-driven efforts to support basic and applied research serving the criminal justice and forensic science communities. Can you tell our listeners a little bit more about your past experience in the forensics field and what led you to your current role in CFS?

John Grassel [00:03:55] I am fairly new to RTI. I came here in April of this year from the Rhode Island State Police. When I was in the Rhode Island State Police, I led our forensic services unit in addition to responding to and analyzing crime scenes throughout the state. We performed fingerprint and footwear examinations, bloodstain pattern analysis and video analysis, and we also performed shooting reconstruction of critical events, especially those involving police officers. So with that, I hold certifications as a Forensic Mapping Specialist and a Public Safety Laser Technician, which basically involves 3D documentation of crime scenes, as well as a Certified Footwear Examiner and a Senior Crime Scene Analyst with the International Association for Identification. So with regards to firearms, we certified the operability of seized firearms, which in Rhode Island is a requirement for cases to proceed through the court system. And we also perform chemical testing for gunshot residue, both to determine the passage of a projectile and for a distance determination, which is basically the distance from the muzzle of a weapon to the target. In addition to that, we performed cartridge case ejection pattern testing and serial number restoration in which we tried to examine and process weapons with obliterated serial numbers to attempt to bring these numbers back to life. With RTI, one of the big draws for me was the Forensic Technology Center of Excellence that's widely regarded in the field as a great provider of training, but also of reference resources and cutting-edge studies. So that had a huge attraction for me to come to RTI.

Peyton Attaway [00:05:45] And we're so glad that you're here. Nicole, before we get started, could you tell us a little bit more about RTI's Center for Forensic Sciences and the work that you all do?

Nicole Jones [00:05:54] So the RTI Center for Forensic Sciences focuses on continuous quality improvement to enhance the current state of forensic science and its application. So we use a multidisciplinary approach to support advancements in forensic science that allows us the insight and ability to craft individualized results. So through our collaborations with members of the forensic science community, including scientists that investigate crimes, deaths, and other threats to public safety and public health, we have the unique and distinct advantage of developing innovative technologies and actionable data to solve challenges faced by government agencies, forensic laboratories, and criminal justice practitioners. And we have a wide range of projects that span all the forensic science disciplines, as well as technologies used by law enforcement.

Peyton Attaway [00:06:35] Can you all give us the high-level overview of your work together, focusing on firearm and toolmark analysis?

Nicole Jones [00:06:41] Yeah. So the FTCoE is tasked by NIJ to act as a bridging organization within the forensic community to support the adoption of technology solutions. So the FTCoE helps NIJ evaluate how well a solution addresses the intended functional requirements, I guess I would say. And so the determination can range from market analysis to real functionality testing for mature solutions, and then ultimately, the FTCoE

works with NIJ to facilitate the introduction of the solution into practice. With regard to the translation and implementation of 3D imaging technologies for firearm and toolmark examination, that's really just one example of emerging technology that FTCoE has facilitated. So NIJ began funding research in 3D imaging technologies for firearms examination in 2009, and the FTCoE began efforts to facilitate the adoption of this technology in 2015. So some of these activities include convening a Forensic Optical Topography Working Group of firearm examiners, researchers, and instrument manufacturers from the United States and beyond. The working group included members from other agencies - so that included NIJ, the National Institute for Standards and Technology, the FBI, the Bureau of Alcohol, Tobacco, and Firearms; state and local agencies - some of the ones in particular were the Contra Costa County Office of the Sheriff, Illinois State Police, the Joliet Forensic Science Laboratory; and then also universities - South Dakota State University, Iowa State University; and then international agencies - the Netherlands Forensic Institute is one that's probably at the cutting-edge for imaging technologies with firearms, as well as the Belgium National Institute for Criminalistics and Criminology; and then we also met with many of the manufacturers of these instruments - Alicona, Zeiss, Leica Microsystems, and FTI. So this working group sought to establish the applicability and validity of optical topography to forensic investigations by examining optical topography instruments, methods, data systems, and analysis from a practical perspective for ballistic and toolmark identification, including requirements for systems that are needed to be deployed by crime laboratories. So the working group also worked to produce publications and training materials, and those can be accessed by the entire forensic community, and they provide guidance to practitioners on applications and recommendations for further research and development and capacity assistance. And all of those resources can be found on the FTCoE website, and that's ForensicCOE.org. So the working group also reviewed current and past efforts to implement optical topography in crime laboratories, including the application of confocal microscopy. And then we published a final report summarizing the working group discussions. Following that working group meeting, we also conducted a practical review of examination methods at the FBI laboratory, and that was conducted by a subgroup to establish consensus on the application of optical topography for ballistics identification with respect to examiner practices, instrument requirements, training, and analysis. An additional review was held at Contra Costa County Office of the Sheriff to discuss some of the challenges that they experienced with implementation and the firearm research they participated in at their laboratory. As another follow-up from that meeting and in partnership with the working group, the FTCoE conducted a landscape study of forensic optical topography. So the landscape study included a comparison of all the available instruments, including those more commonly used in industries other than forensics, so specifically the medical field, but also included a discussion of the barriers to implementation, practical and technical considerations for adopters, and it provides an overview of all the applicable international standards and technology developments. So the FTCoE is currently working on an update to this report, that report was published back in 2016 and the new report will be published in early 2022. And then currently, John and I are working together to plan the Firearms and Toolmark Policy and Practice Forum. So this is a four-day symposium that will take place January 11th through the 14th of 2022. And then there'll also be a four-part webinar series in December and January leading up to that event.

John Grassel [00:10:41] So I could go into some more detail on the Firearm and Toolmark Policy and Practice Forum. It's an all-virtual event ranging from approximately 1 PM to about 4:30 PM Eastern Time, and it's broken into four days and each day has a key topic. So day one will be talking about research; day two, emerging technologies; day

three is intelligence; and day four is with legal aspects. Each of those days will have a keynote speaker and a series of panel speakers, and then each of those panels will commence with a live question and answer period. And then on the final day, after the legal aspects is done, we will have a big open discussion as, basically next steps forward - where is the field going from here? So we're very excited about that. We have a wide range of dynamic speakers lined up and as I mentioned, that's a pretty good range of topics where sometimes in this field, we- we find that we're in a little bubble. And so this kind of takes us out of the bubble where we could see the intersection of many different facets of our discipline. One of the topics that will be discussed at the Firearm and Toolmark Policy and Practice Forum is a recent black box study which was conducted by the FBI in cooperation with AMES Laboratory, and that black box study on firearm and toolmarks centered on accuracy, repeatability, and reproducibility. The purpose of that was basically to address the recent National Academy of Science and PCAST reports, as well as some recent court challenges to firearms and firearm comparisons. Within that just accuracy refers to basically errors and that will talk about false positives and false negative conclusions. When the study mentions repeatability, that focuses on if an examiner looks at a specimen, makes a conclusion, and then sometime at a later point, looks at the same item again, do they come up with that same conclusion? And then the last thing that that black box study looks at is reproducibility, which is - is the opinion of one examiner the same as the opinion of another examiner which will look at the same sample. There will be a forthcoming study on that, and like I said, it will be further brought up at the Firearm and Toolmark Policy and Practice Forum.

Peyton Attaway [00:13:18] Thanks, John. That sounds like a great event. We're really looking forward to hearing more from that and all of the good work that comes from it. So do you guys have any data or information that shows the impact of your work currently?

Nicole Jones [00:13:31] One of the things that I wanted to mention, Peyton, around that subject is in 2018, the FBI established the Technical Working Group for 3D Toolmark Technologies - we commonly referred to it as the TWG-3D2T. It was set up with administrative support from the FTCoE, and all of that is coming out of the- the work that I previously described that we've been doing with the transition of NIJ-funded research in this area. So the TWG-3D2T was established to support and promote the advancement of forensic application of 3D optical topography instruments. So the objectives of the TWG-3D2T are really to define the scope and practice areas of the discipline of forensic firearm and toolmarks specifically to 3D measurement technology and its application to the discipline; recommend standard practices, protocols, reports, limitations, and terminology; also recommend standards for data interpretation and wording of conclusions; recommend education, training, and continuing education requirements; promote the dissemination of research and development priorities for the community; collect and distribute discipline-specific information on scientific foundations in this area. Also, they are seeking international recognition and harmonization of appropriate TWG-3D2T working products so that this technology is being implemented the same, not just across our nation, but across the world. And then we're also looking to establish relevant toolmark population statistics for firearms and toolmarks. So all of these different things that we're working on are really to promote the adoption of this technology, and we're working with several state and local agencies on that right now. So really learning from some of the early adopters and the challenges they faced so that we can help other agencies avoid those pitfalls.

Peyton Attaway [00:15:15] And what are some challenges that you guys see with an advanced firearm and toolmark analysis?

Nicole Jones [00:15:20] So I think there are several, and I can talk to some, and I know John has some that he is going to talk to. So I think the first one that I would mention is the lack of statistics for traditional comparison microscopy. So like John mentioned earlier, in the 2009 National Academy of Science report, it was documented that the process for analyzing tool marks on cartridge cases and bullets is inherently subjective since a firearm examiner makes the final determination of a match, not a computer. And historically, the firearms examiner's opinions have been based on the AFTE Theory of Identification as opposed to being based on metrology or statistical formulas. However, research looking at ways to incorporate more objective measurements into firearms examination continues to evolve, especially with these new 3D imaging technologies. The last decade has seen innovative progress in the development of algorithms, measurement instruments, data, and methods to facilitate objective analysis of firearm and toolmark comparisons, as well as the development of 3D technologies has provided repeatable data and feature-based correlation methodology that's been vital for the development of area and feature based correlation algorithms. And then I think another challenge has been with the implementation of 3D imaging and virtual comparison microscopy - it's expensive. There's a lot of training that needs to happen, and many forensic laboratories around the United States and internationally have begun to purchase or investigate virtual comparison microscopy and its utility in firearm and toolmark analysis, but the validation of VCM for use in casework is a mandatory task for all laboratories, and validation can be very time-consuming and very expensive. And due to the novel technology, there exists limited guidance on how to conduct this important step for implementation. So that's, again, one of the things that the TWG-3D2T working group is working on. And then another aspect of virtual comparison microscopy is the quality of the 3D measurements being generated by the 3D optical instruments. This requires special training on the statistical process controls and routine checks to verify instrument performance. However, due to current constraints and the file types used by NIBIN, there's a lack of interoperability - that's one of the things that NIST has really been working on and trying to get everybody to switch over to the XP3 format so then all these instruments are interoperable, and then hopefully at some point NIBIN will also be interoperable. And then I think the last limitation or challenge that I would mention is just the recent limitations on testimony. So due to subtle manufacturing differences, every firearm produces different microscopic characteristics when it's fired, and these characteristics can change over time based on how the firearm is used and maintained. So firearm identification is the process of analyzing the bullet and cartridge case that's left at the scene to determine if they came from a specific firearm. So the characteristics are identified as class and subclass arising from the manufacturing process and individually from both environment, like how well somebody is cleaning their gun, as well as post-manufacturing processing. So the class characteristics are measurable features that are specific to the rifling specifications of the barrel from which the bullet was fired, and some of those marks the manufacturers intend to have imprinted just to brand, basically, their firearm. And then the class characteristics include like the caliber, the number of land and grooves, the direction of the twist and all that. And then subclass characteristics are those that are associated with the manufacturing process but are unintentional and may carry over across several batches. And so these individual characteristics are factors such as imperfections, corrosion or damage to the barrel, and those affect the rifling pattern contained in the barrel of the firearm. And so the uniqueness of these characteristics on the cartridge casing attribute to the firearm and its firing make it possible for the use of this information and the brass collected at the crime scene to either connect a firearm to the scene or eliminate the firearm from consideration. And all of that's important because recently there have been some court decisions that have limited the examiner's testimony to just class characteristics instead of those subclass characteristics. So in some cases, the examiners have been limited to just be able to say yes, a 9mm gun

fired this cartridge casing, which really isn't enough to establish a connection. And so that's- that's kind of been a challenge getting around that. And, you know, it's hopeful that with the implementation of some of these 3D technologies, that will face less and less challenges in court.

Peyton Attaway [00:19:43] That's so interesting, Nicole. I feel like that can really have direct impacts on people's, you know, the case outcomes and people's lives. So it's great to hear that you guys are doing work in that area to improve that response. John, do you have anything to add about challenges that you see with advanced firearm and toolmark analysis?

John Grassel [00:20:02] Sure. And this may not be, and it's probably not limited to just firearm and toolmark analysis, but we see it in many of the forensic disciplines where there is a need for consistency, both in standards and in testimony. For example, with firearms and toolmarks with regards to standards, we have the Association of Firearm and Tool Mark Examiners, or AFTE - they have a range of conclusions. But then there is also the American Academy of Forensic Sciences Standards Board, which is commonly known as ASB, which publishes standards for OSAC, and they have six published standards as well related to firearm and toolmarks, which range from, say, firearm and toolmark 3D measurement systems and measurement quality control to safe handling of firearms and ammunition, and then even down to minimum educational requirements for firearm and toolmark examiners, trainees. But none of these are set in stone requirements that agencies have to follow - that, of course, leads to a lack of consistency. And then with regards to testimony, a lot of it is agency dependent - how they wish to testify and what their court will allow them to, or what their prosecutor will allow them to. So on the federal side, the Department of Justice has a uniform language for testimony and reports. But again, that's just for federal testimony, and it doesn't necessarily trickle down to the state or local level. And then one of the other areas would be accreditation. There is, again, not a hard and fast requirement that a lab or agency would need to be accredited, although it's obviously highly recommended and sought after, but it's not a requirement in order to perform a firearm or toolmark analysis.

Peyton Attaway [00:21:58] And what are some next steps for your project work together in this area?

John Grassel [00:22:02] So one of the emerging areas that is gaining some, some traction would be gun crime intelligence. In fact, in my own state, I was happy to- to see that a task force was recently stood up to specifically address this particular issue, and gun crime intelligence - it's basically, it's all about driving the process forward with good quality evidence. So that'll start at a crime scene. When the investigators go to the crime scene, they examine it - obviously, they're not leaving cartridge casings or bullets, you know, left at the scene. They're collecting them. But it then becomes a matter of what do we do with that evidence? Is it properly handled from the time it's collected at the scene? And then does it sit in storage or is it then analyzed right away? Because what we have seen is that a lot of the gun crime violence is linked between jurisdictions or a same gun may be used in similar instances. So that takes us to an examination in a timely manner of the casings and the bullets or the weapon that is seized at a scene - a good collaboration with your local ATF Office, of rapid entry of these cartridge casings into the National Integrated Ballistic Information Network, which is NIBIN. And then once you have entered that evidence, you've analyzed it, then taking it to the next step, which is an intelligence analyst, which can help investigators link multiple scenes - bring in, say, crime scene video or surveillance video, and try to link all these scenes together with the ultimate goal of

comprehensive but actionable intelligence to investigators to try to solve crimes in a rapid manner so that it doesn't perpetuate the- what seems to be an ever-growing cycle of gun crime violence.

Peyton Attaway [00:24:07] And Nicole, do you have any emerging areas that you're seeing in the field that are exciting to you or anything that you would like to add to John's remarks?

Nicole Jones [00:24:15] So yeah, Peyton, there is some really exciting new research that's coming out. One, in particular, was an award to Houston Forensic Science Center that was just announced about a month ago. And so the project's entitled Advancing the Understanding of 3D Imaging for Firearms Identification. They are going to study whether using a 3D microscope can allow for enhanced visualization of poor-quality markings and allow for more conclusive determinations of same source versus different source. So with multiple manufacturers releasing microscopes capable of acquiring 3D images of bullets and cartridge casings, the data and image from these instruments will need to be interchangeable. Like we mentioned earlier, you know, trying to make sure that everybody is using the same, the same data format. So forensic laboratories will individually decide what instruments they wish to purchase. But inter-lab comparisons may need to take place so this study will test the compatibility of data generated by different vendors of 3D microscopes, and firearms examiners will look at these images of fired bullets and cartridge cases created by different brands of 3D microscopes to determine if the quality and appearance of the images is good enough to perform accurate comparisons. So we're really excited to see the results of that study. And then another one that I'd like to mention is RPDFT. And so RPDFT has been a project that started in 2018 as a collaboration between NIST, the FBI, the Netherlands Forensic Institute, and they started the development of RPDFT, which is a system that consists of a user interface, a reference database of firearms and tool marks, both impressed and striated. It has data processing modules, a quantitative similarity metric, a statistical weight of evidence calculation protocols as well. So in the past three years, this reference database infrastructure has been developed to index test fires generated by the FBI, and they're being indexed based on their class characteristics, like I described earlier. So this reference database consists of ground truth known match and known non-match comparisons, and is designed to be filtered according to match and relevant case characteristics of the evidence being analyzed. So NIST and NFI's objective toolmark analysis algorithms and statistical protocols have also been integrated into the database. These allow for objective and quantitative one-to-one comparisons of firearm toolmarks, which are then used in conjunction with the relevant reference population to calculate its statistical weight of evidence and provide a statistical statement of certainty. So the database also provides reference data for continued innovation of correlation algorithms. However, the primary goal is to provide firearms and toolmark examiners the ability to support their testimony with objective similarity values and statistically sound quantitative expressions for the weight of evidence. So RPDFT is a national framework - it's maintained by the FBI with the help of NIST and the TWG-3D2T that I've mentioned several times, and they all work together to maintain and update the reference data and the statistical distributions as needed. Vendor correlation algorithms will also be used in RPDFT to build vendor-specific statistical distributions. And so to participate in this, commercial vendors will be required to conform to the OSAC standards with respect to hardware and software and reference geometric standards, and bullets and cartridge case replicas will be used to conform the minimum specifications. So this will drive innovation and help the commercial market remain open and competitive. So we're really excited about RPDFT. Again, I think this will one, you know, address the challenge of the lack of statistics and then two, also help with

some of the limitations in testimony that we've been experiencing recently in firearms and toolmarks examination. So John, I know you probably have some other ones that you're really excited about and want to share as well.

John Grassel [00:28:06] Sure, I wanted to highlight, there's a- some agencies that have started to use a technology called ShotSpotter and use it in collaboration with some rapid entry of casings that are located at crime scenes into the NIBIN system. So ShotSpotter enables police officers, law enforcement to basically converge at a scene where the technology detects gunfire and then if they were to collect the cartridge casings from that scene and enter them into that National Integrated Ballistics Information Network in a very timely manner, they've been shown to- to see some success in that as well.

Nicole Jones [00:28:47] Yeah, I know I was reading an article recently and I also saw a presentation by the chief in Cincinnati, and he was going through how their jurisdiction had implemented ShotSpotter and NIBIN together, and at one point I think they had seen like a 60-percent reduction in crime violence with guns just because they were going to these scenes where ShotSpotter had alerted them to. And even though it may be that they didn't arrest anybody or find a crime occurring, they were able to still gather the cartridge casings and enter them into NIBIN and then link multiple crimes together just by showing up and doing that. So it's really exciting. I know ShotSpotter, there has been some controversy about it. Some people have reported that it's maybe bringing law enforcement into communities of color disproportionately. But I think that there are some good aspects to it if it's implemented properly. So I do think that's an exciting one, John. I'm glad that you brought it up.

Peyton Attaway [00:29:45] Can you both speak a little bit to gun crime intelligence and some innovative strategies that you've seen in the field?

John Grassel [00:29:51] So with gun crime intelligence, one of the- the hurdles, so to speak, that labs are trying to overcome is the long time that it takes to, once evidence is collected, to a report is finished and delivered to law enforcement. And so it leads to a disconnect, right? So in forensic science, we are always trying to get the correct thing, and you still want to do that, but sometimes that long report writing time takes away from what is termed actionable intelligence. So it may be months before a report is produced, and that's not helping investigators on the ground.

Nicole Jones [00:30:35] I know one of the really cool things that Phoenix has implemented is that they have a- I think it's a three-phase triage process. And so depending on the severity of the crime and depending on if it's going to go to court, they'll send some of the evidence directly to the police department that's across from the crime laboratory. And they've actually put NIBIN units at the police department, and so law enforcement can go ahead and upload the cartridge cases immediately into NIBIN so that they can start gathering some of that actionable intelligence and then send the evidence over to the crime lab for processing for additional investigative purposes, but also for when it goes to court. And so that really lets them meet that 48-hour turnaround time that ATF is really looking for for the minimum required operating standards for NIBIN. So I think that's been really, really exciting to see their approach on that. And then another thing that I've really been interested in, and John can probably expand on it even more than I can, but Miami-Dade a few years ago - and I can't remember the actual dates and John may know this better than I do - they incorporated a crime analyst into the forensic laboratory, and she has just been incredible. I mean, the way that she is able to comb through social media and kind of find the social circles that some of these suspects or even victims kind

of hang out in and then being able to connect the dots on different things, being able to also map that to figure out which gangs are operating in which areas and which guns are falling in which areas to figure out which guns are running in which gang circles. So it's been really interesting how all of that maps out. And John, I don't know if you have any more to say about the Miami approach.

John Grassel [00:32:21] Yeah, absolutely. And that- what that crime analyst or the other crime analysts throughout the country have also done is they've taken firearms out of, say, a silo, and they've incorporated it with all of the other general intelligence evidence that you could collect from a crime scene and made it part of a big piece of a pie rather than just a slice hanging it off on the side - if we want to use a food analogy because, you know, that's always good to think about - but so they brought it all together and incorporate it, like I said, with some video evidence, or there may be some other physical evidence, and let's try to tie that all in - license plates. Anything else that could be an intelligence factor and then get that out to law enforcement investigators in, again, a timely manner that- that can be actionable. So they need to be comprehensive. They still need to be as competent as humanly possible, but they need to get that message out there in a quick manner in order to prevent further crime from happening.

Peyton Attaway [00:33:29] We're running near the end of our time together. Are there any final thoughts that you'd like to share with our listeners?

Nicole Jones [00:33:34] Definitely check out the FTCOE website. Again, it's ForensicCOE.org, and there you can find out information about upcoming webinars that we have specific to firearm and toolmark examination, and definitely tune in for the Firearm and Toolmark Policy and Practice Forum. Again, the dates for that are January 11th through the 14th, and I think we have a really exciting agenda and some great panel discussions to look forward to there.

John Grassel [00:33:59] Some of the highlights for the Firearm and Toolmark Policy Practice Forum. We have some great keynote speakers to include Erich Smith, so Erich will be talking about the previously mentioned FBI black box study, and Thomas Chittum, who is the acting deputy director of the ATF. And then into the weeds a little more, we have a couple presentations - we have Miami Dade and Philadelphia, Delaware Valley intelligence analysts sections going to speak to us. We also have a great topic on evidence screening to facilitate the multidisciplinary processing of guns for firearms, DNA, and latent print examinations. And then our last day, which is focused on legal aspects, will have speakers that will talk about challenges to firearm and toolmark admissibility, the current state of the law post-PCAST report, and a review of validation studies - what has come before. And those are all great topics if you're a firearm examiner or a legal person or crime lab director or anyone interested in the field - that should keep you up to date on some current trends, some new legal aspects that you may not have heard about.

Peyton Attaway [00:35:16] I'd like to thank you both, Nicole Jones and John Grassel, for sitting down with Just Science to discuss advanced capabilities in firearm and toolmark analysis. Thank you so much, Nicole and John.

Nicole Jones [00:35:28] Thank, Peyton. It was great to be here.

John Grassel [00:35:29] Thank you very much, Peyton.

Peyton Attaway [00:35:30] I'd also like to thank you, the listener, for tuning in today. If you enjoyed today's conversation, be sure to like and follow Just Science on your podcast platform of choice. For more information on today's topic and resources in the field, visit ForensicCOE.org. I'm Peyton Attaway, and this has been another episode of Just Science.

Voiceover [00:35:50] Next week, Just Science continues the conversation on firearms with RTI's Dr. Josh Hendrix to discuss school safety in the age of mass shootings. Opinions or points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.