

Just the Story Behind Bloodstain Pattern Analysis

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

Voiceover [00:00:19] 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 two, Just Science sat down with Erin Sims, forensic lab manager at the Lincoln, Nebraska Police Department, about bloodstain pattern evidence in forensic investigations. Not all crime scenes will have blood stains, but when they are present, analysts can use them to help determine the types of activities or mechanisms that produce them. Erin Sims believes that bloodstain patterns can tell the unknown story behind a crime. Listen along as she discusses the application of bloodstain pattern analysis and how it fits into the larger puzzle of crime scene investigation in this episode of Just Science. This season is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Here is your host, Dr. Mike Planty.

Mike Planty [00:01:21] Hello and welcome to Just Science. I'm your host, Dr. Mike Planty with NIJ's Forensic Technology Center of Excellence, a program of the National Institute of Justice. Here to help us today with our discussion is guest Ms. Erin Sims. Erin has been employed with the Lincoln, Nebraska, Police Department for 38 years. She started her career as a uniformed police officer for nine years, was then a detective sergeant for 16, and was promoted to forensic lab manager of LPD's forensic identification unit in December 2008. Her areas of expertise include latent print examination processes, crime scene processing, and bloodstain pattern analysis, of course, the topic of today. Welcome to the podcast, Erin.

Erin Sims [00:02:00] Well, thank you. Thank you for having me.

Mike Planty [00:02:02] Our topic today focuses on bloodstain pattern analysis. This can be of great value and importance to the crime scene. Before we get into the specific case we're going to discuss, can you just describe to our listeners what bloodstain pattern analysis is and the true value to a crime scene investigation?

Erin Sims [00:02:20] Well, bloodstain pattern analysis is generally defined as a systematic assessment of the size, the shape, the distribution and the appearance of individual bloodstains, as well as bloodstain patterns. And we do this as a means of helping determine the types of activities or the mechanisms that produce those. There's not going to be bloodstain patterns at all of your crime scenes. There's lots of different ways to kill people or injured people, but it can help you in some cases to piece together what happened. And I always like to say you shouldn't just rely on a bloodstain pattern analysis. You really need to look at it as one piece of the totality of the evidence in that case and, you know, back it up by DNA, back it up by wound analysis from your pathologist. So, like I said, it's just one of the small pieces, but it can be really helpful.

Mike Planty [00:03:18] Sure. And so the value when you go to a crime scene, it's really about reconstructing the events, right? And-

Erin Sims [00:03:24] Kind of a verification of statements. You have a lot of witnesses or you have victims or even suspects and just what I usually do is I wait until I'm done with my analysis and then I go in and I read the statements and I see which ones are - follow

along with the evidence and which ones don't and then why and point that out to the investigators that are following up on the case. And it just helps with movement through the crime scene. It can help maybe differentiate between a homicide or a suicide attempt or an accidental. Like I said, you are looking at the patterns, but you're also looking at the totality of the case as well.

Mike Planty [00:04:06] Exactly. It's really talking about how the blood was distributed, whether it was pooling, what was the activity of the actors in the scene that you might be able to detect - to positioning, whether people were moved, whether a certain type of weapon or weapon at all was used, and even things around concealment and cleanup, you are able to identify and detect.

Erin Sims [00:04:27] Yes, yes. All of that. It's a pretty big open field, but it really helps sometimes.

Mike Planty [00:04:33] And I think that's one of the things that kind of, maybe, not necessarily unique to bloodstain pattern analysis, is that what you're doing - you're dealing with not only the internal properties of blood, but then every crime scene is different, right? You have these environmental factors. You have different actors and you might have multiple locations, the primary crime scene is secondary, and all of these things kind of come together and, just like an accident or automobile investigation, in general crime scene investigation, you kind of have to take all this variability and all these factors into account when you're trying to reconstruct and contribute to your analysis.

Erin Sims [00:05:12] Yes, and I would say too to move very slowly and look at all the angles and then make sure your work is peer reviewed by somebody else who is well-trained to kind of make sure that you're not going off on some tangent or something like that.

Mike Planty [00:05:28] That's really interesting. When you talk about the process and how this has evolved, you have a lot of experience as a police officer. So tell us a little bit, how did you get into this area of bloodstain pattern analysis and what kind of drove you down that line?

Erin Sims [00:05:43] Well, basically, when I was a detective, I worked a lot of cases and crime scenes and I would go into some place and come out with more questions than I had answers for and so I was offered by my department to send me to the basic 40-hour class and I kind of got hooked after that first class. And I can tell you, when I came home from that, I'm kind of like, now what and how do I apply this? Because in the basic 40-hour class, all of the experiments that you do are very structured and rigid and crime scenes are not structured and rigid. So what you see in that class, may be a little bit different looking when you actually apply it to a crime scene. So I just started spending my own money then and went to as many classes and as much training as I could and talked to as many of the other people in the discipline and basically kind of reached out for help because I'm in Nebraska, we have a low crime rate, so I don't get a lot of repetition, but I wanted to make sure that I was doing it the right way when it was necessary. Not having a lot of crime is a good thing, and it also allows us to maybe spend a little bit more time at the crime scene than maybe other agencies might have. So I really kind of just jumped into it. I really felt that it helped answer a lot of questions for me and was more likely to point me in the right direction.

Mike Planty [00:07:16] And maybe before we go on to this case, can you talk about some - what are some of the tools - photography, of course, but what are the types of tools does a - would a bloodstain pattern analysts use at the crime scene?

Erin Sims [00:07:29] I would say the camera and a tripod is probably the big one, number one. I like to use sticky measuring tape and put that on the walls and surround my patterns from the floor up to show just where on the wall this event occurred. Also, a lot of close-up photos. I usually don't do any of the math at the scene. I've been kind of doing it long enough that you can kind of visualize it in your head, but I still do stain selection at the scene. Select the ones that are the best shape in that pattern for me to use, to do math, to do the trigonometry, to find the area of origin on that. So there are some things I do at the scene and then a lot more that I do back when I get to my desk and rested. Because a lot of times you'll be at the scene for, you know, 12 hours or so and you might come back the next day and do another 12. So like I said, we have that opportunity to do that because our crime rate is lower but I'm sure some people are going, oh, my goodness, we have to be in and out in an hour, but and then then I would say if your agency does that, then just be really good with your photography. Take everything at 90-degree angles, make sure you're in focus. Because we can reconstruct it from photos if they're taken properly. But it is a little bit more difficult. It's a lot better if you get to go to the crime scene yourself.

Mike Planty [00:08:56] Apparently there is crime in Nebraska because we're going to go through a case right now, and this is a really interesting one. It's a big whodunit. And I think the title of your of your presentation was The Bloodstain Patterns Will Help Tell the Story When the Victim Can't or Won't. And that's really where you can run into certain things, like you said around the testimony of - whether it's a victim or other actors there, you know, and trying to reconcile what has happened. So do you want to introduce us to this one?

Erin Sims [00:09:25] Sure, and I'm going to kind of start at the beginning, which is always the best place to start. But I didn't get called to the crime scene until day four. This particular case was worked by our county sheriffs and we share a crime scene investigation team. So we will go help them. They come in and help us whenever we need manpower. This particular incident happened out in the county, so about 20 miles outside of town on a farm. And it was a - the first time we - they became aware that this man had suffered a gunshot wound, was on Monday at about 2:00 p.m., he actually made a phone call to his own private doctor that was in Lincoln and said, hey, I have a laceration and I need some stitches and I was wondering if I could come in right now. And the doctor was open, so he said, fine. This is a 58-year-old man, and it took about 30 minutes to drive in and get to his doctor's office. So basically, the first thing he told his doctor was that he had received this injury not from a gunshot, but a horse had kicked him, and this pushed him into a hay bale lifter prong. And for city folks who don't know what that is, it's on the front end of a tractor and it's about three feet long and about three inches wide and has a point and you use it to lift up bales and move them around your farm. And so he said that his injury was caused by a horse kicking him into this prong. He took off his shirt and pulled out a wadded up white T-shirt out of the wound, and it was underneath his left armpit about the size of a softball. So quite, quite a large wound. And when the doctor saw this, you know, he said, you know, this is really serious. I'm going to call you an ambulance and we're going to get you to the hospital, and he said, you know, I drove this far, I'll just get my truck and drive up there. So he walked out, he got back in his truck, drove another couple of miles up to the hospital, and then he didn't even go to the emergency room. He just kind of wandered through the hospital for a while and somebody directed him to the emergency room. And he's ambulatory, he looks fine, and he went up to the admissions

desk and told him why he was there, and he looked OK, so they told him to have a seat in the waiting room. Well, this is an emergency room. So he sat in the waiting room for two and a half hours before he was seen and so about 5:30 in the evening is when he finally got in to see the e-room doctor and when he took off his shirt and told him the same story, this doctor goes, we're going to X-ray now. And then when they got the X-rays back, there was a gunshot pellet pattern inside the man's chest. So, that was pointed out to him, and he goes, well, OK, I've been depressed, I've been depressed, and I shot myself. And so, OK, they're going to get him ready now for surgery. And luckily, one of our uniformed officers was doing security at the hospital that same night, and they always carry a little pocket digital camera, and he got called down to the emergency room because of the gunshot wound to the man and he went in, snapped a few photos, luckily, before they got him into surgery and I'll described the wounds for you, because the pictures really do them justice but, there is an entry wound, mid chest, about two inches left of center, so maybe right above your heart and there's some charring, so it's a contact wound, and then an exit wound underneath his left armpit about the size of a softball. And there's also some injury or damage to his bicep of that left arm. And most likely that would put his arm in the position that his elbow is up. So kind of elbow up shoulder length to go through the chest and then peel off the bottom of his bicep. And Officer Holmes said that they would lift his arm up and he could see inside his chest cavity and he could actually see his heart beating and what was left of the left lung was just kind of flapping in the breeze there. So.

Mike Planty [00:13:48] Oh my gosh and this guy has been walking around all day!

Erin Sims [00:13:48] How he was able to drive into town with this type of injury is amazing to begin with. So it also in talking to him, he said, yeah, this happened out on my farm. So they called in the deputies, and the deputies were familiar with him because they had been out to his place on domestiques and shooting calls and just a lot of fighting and drinking going on in his past. So the deputy that arrived, he was familiar with him and he told that deputy the same story of how he shot himself. And he said, well, tell me exactly how you shot yourself. And he said, I put the butt of the shotgun on the ground outside my shed and I put the barrel up into my armpit and I pulled the trigger. OK, so that's not right because of the wound pattern. So wound analysis - the wound pattern - that story is not correct either. So at about that time, they're loading him up. Now they're going to move him to the trauma hospital for surgery there and he kind of added, oh, this happened yesterday. This happened on Sunday between 3:00 and 4:00 p.m. And he said, well, was anybody else there? He said, no, I was by myself all day. And then later he said, well, I guess my son did stop by but I don't remember much about that. He goes, the next thing I remember is walking around my house at seven o'clock and noticing there was a lot of blood just everywhere, and I thought about cleaning it up, but I was kind of dizzy, so I just went back to bed and passed out. He said on Monday, he woke up, he was still dizzy, was in a lot of pain, but he saw that blood and he decided he's going to start cleaning up and he was trying to use a knife - well, he took a shower. He also tried to use a knife to kind of clean up the wound a little bit to see if he could tape it shut, I guess. This is a tough old farmer, so anyway - and so that's about the time he decided that maybe he needed medical attention. So the deputies really wasn't buying any of this, and they had recalled, like I said, discharging firearms and chasing each other around on past calls for service. So he left to go have surgery and they decided to go out and start interviewing the family members. And I should mention the shotgun, it was a 12-gauge, eight shot, so 409 pellets and the wadding all went through his body and he's still upright. So they went to the victim's home and just kind of secured it, locked it down. They got a hold of his ex-wife. She's pretty much said, I haven't seen him for five years. I got divorced when I walked out. He said, you can't take anything with you. If you're going to leave, just leave. So she

grabbed her daughter and they both left, and she said they had been married for 20 years, divorced for five. She said the reason he left was because he had previously suffered two traumatic brain injuries and had been depressed and drank heavily after that and was just - it changed his personality. So she said 13 years earlier he had been electrocuted and fell off a 20-foot pole and then -

Mike Planty [00:17:08] This guy has been through the wringer.

Erin Sims [00:17:07] And then 10 years earlier, he was kicked in the head by a quarter horse, and he was found unconscious by the barn. And so she said, you know, these injuries really changed his personality, caused his disability. He suffers memory problems. He got real depressed and he normally drank about three six packs a day. He got fired from his job. So he's just kind of spiraling. And she said, I just had to get my daughter out of there. But the son had elected to stay with dad. So two people living in the house and they're looking for the son because he wasn't at the house. And while they were talking to the ex-wife, she said, well, he was in the process of moving out because he had kind of seen this coming and dad was like going to be evicted soon anyway. So he had been slowly moving his stuff out and she said, as a matter of fact, he went over there on Sunday and he moved his gun case and his guns out and that was about 3:00 and he got home about, oh, by at least by 7:00 because he was home for dinner. And she said she didn't notice anything in his demeanor. So they hunted him down and he was very cooperative. He let them look at his truck, took his guns, gave up his phone, his clothing he was wearing. And he said, yeah, I went out there at 3:00 on Sunday. I had called him like four times before that, telling him I was coming, and he said this was my last load and I know I left about four because that's when I called my girlfriend when I was pulling out of the driveway and the cell phone records back that up. But he said, when I entered the house at first, I couldn't find him. And then I found him laying in bed and he was kind of mumbling and slurring speech and I thought, wow, he's drunk and I don't like him when he's drunk so I'm just going to get my stuff and get out. And so he went upstairs, he said, and got his guns, got in his gun cabinet, which he had to slide down the steps, but he said, I finally got it out of the house, and he denied seeing any blood in the house at all and left about four o'clock. So then on Tuesday, the Tuesday - they - the deputies spent the first day completely searching all 30 acres of the farm. There's a house, a large shed that has a wood shop inside of it. There's two horse barns, there's six outbuildings. So they spent the entire day combing the farm, basically, and they did interview one of the son's friends who had reported that several months earlier the son had called the friend wanting him to come pick him up at dad's house because he told him he was currently hiding in the bushes on the property and that his dad was mad and drunk and was basically hunting him with a gun and was shooting just into the bushes and into the trees, trying to flush him out. And the friend decided he wasn't going to be any part of that, so he called the county sheriff at that time anonymously, but they figured out who he was and when they arrived, they talked to both the father and the son, and they denied that there was any problem. So there could have been problems. It sounds like there probably was maybe just a little bit of instability. So they went around the neighboring farms. Nobody heard any gunshots. Most of the people that lived around said we really keep a wide berth of that house because he's angry all the time and he doesn't appear to have any friends. Probably his son was his last friend, and his son was moving out of the house. So the deputies went back to the hospital and said, hey, you know, your stories aren't adding up. First of all, you know the wounds not right. Are you sure maybe your son didn't accidentally shoot you and you're not telling us the truth? And he was actually being wheeled into another surgery when this conversation was going on and he said, yeah, my son and I were arguing, I don't even know about what. But then we went out to rabbit hunt in the back area, and he said it was

my fault because I was moving around, and I stepped in front of the shot as the son was tracking a rabbit and fired. So he says the son actually shot him, but it was an accident. And the deputy kind of said, well, how far away were you standing? And he said, oh, about 10 feet. So it's like, well, that one doesn't really add up anyway. And they took him off to surgery and he basically was in the hospital for the next two months, had like eight surgeries total. Kind of left him alone after that because it's kind of like any time you talk to him, you get a new story, so.

Mike Planty [00:21:42] Yeah, we went from an angry horse to suicide to now rabbit hunting accident. So you've gotten - you've gotten three scenarios so far, right?

Erin Sims [00:21:53] And like I said, the deputies were still thinking, you know, angry ex-wife, angry son. It could have been a homicide, too. And that's kind of when I got called in, was to come out and help them. So I went in there on Wednesday, and I was out there for probably about five hours or so and kind of the shed, it's a big metal shed, it's about 30 by 60 feet overall and there's a wood shop that's kind of self-contained inside that about 15 by 30. And when I - that - like I said, the deputies had already been over the entire property. So they hadn't picked up the evidence yet. They still had all the markers out and they gave me a tour of everything and then took me to the wood shop because that's where they had decided that the shooting had actually occurred. And walking up to the door of the wood shop, there is a shotgun hole that has been shot out the wall about, oh, four feet up. And you go into the wood shop and it's your normal wood shop. It's not the cleanest of shops, but it's pretty orderly. In the overall pictures you really don't see any bloodstain. You really

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Mike Planty [00:23:04] It's not a mess, right?

Erin Sims [00:23:06] Yeah, it's not a mess. And you really do have to get in and up close to some of the surfaces to find the blood spatter.

Mike Planty [00:23:12] Yeah, it's your typical garage like you would imagine, where there's a concrete floor or some type of floor, there's paint stains and other stains all over the place. And then now you're talking four days later picking up those bloodstain patterns. Just not obvious, right?

Erin Sims [00:23:25] And this is a wood shop. So this is where he finishes furniture. So you have stains all over that. But there doesn't really appear to be any sign of cleanup either. I mean, it's - the floor is covered with dust. There's a shotgun laying on the floor. There's spent shotgun shells on the floor. There's I think like five of them or six. There's actually five other shots that were taken inside. So something was happening in there to cause someone to start shooting basically the wood shop up. And so I was called in too to do the shooting reconstruction along with the blood spatter. Really won't go into the shots, but the blood spatter, what I found was there was a impact spatter or forward spatter. So forward spatter is what leaves the exit wound and it's traveling in the direction of the force. So the shotgun force is shooting it out the exit wound. And there is a large spatter pattern on the cement floor right in front of the door as you walk in. And it's about two feet wide and about six feet long of large blood spatters. And then on the west wall, which is where the door is, there is another spatter pattern that is basically eight feet high and ten feet in diameter that covers the whole door and wall there. And that's just because of the force of the shotgun has created that large pattern. But in photographs, that's real difficult to see. You really need to get in there, get up close and inspect things and that's why it's important to take close up photos so you can reconstruct it. And I did do some work on the

shotgun because there was actually the small pellets. I could use the shape of this pellet spread to also figure out the angle that the shot was fired from. And I actually did some stringing. It doesn't look pretty in the photos, but basically all of the shots come back to the center of the room. And that's also where all the spent shell casings are on the floor. Someone shot out the window, put several into the ceiling, one into the wall, and then it appears that probably the final shot was the one that went into his chest and everything is undisturbed. So there's no cleanup. And then the next part of the spatter pattern that I start looking for is a trail. And given his wound, you should be bleeding a lot. But I think probably what he did was he pinched his arm down to his side and maybe his hands up over his entry wound on his chest. And he's putting enough pressure on that. And it's winter, too, it's February, so he's probably got a coat or something on. But you can still follow a drip trail out of the woodshed into - there's a dirt floor inside the bigger shed. So that's a little bit harder to follow in dirt, but then you get to snow, and you can follow it through the snow until you get to the sidewalk again and then back up to his back door. So basically it led on into his house.

Mike Planty [00:26:34] So you have established it through the blood spatter analysis with the trajectory of the shotgun placement in the shot that he left in a walking pattern. So, again, reconstructing all of those other stories, right? There was no horse in the barn. Suicide was impossible. But you still haven't ruled out accident, right?

Erin Sims [00:26:53] But the shot was close contact so that barrel of that shotgun was burned around his wound. And then as - when we get further in and talk about the clothing, it also shows the burn mark there. So he either held the shotgun himself or somebody else held the shotgun, but it was tight against his chest when the shot was fired. I made several diagrams to help me visualize things and also to help people who were doing the investigation. And so basically, I have a diagram of the house that just shows all the basic rooms and all of the evidence that the deputies marked. So they marked a lot of blood evidence that was in there. There was heavy blood staining in the bedroom. There was a trail that led in the back door, into the dining room, into the living room, into the bedroom, into the kitchen, and then into a laundry room and a bathroom. So all over on the main floor. No indication of going upstairs or downstairs. It appeared that he lived basically on the main floor, and that's where that blood trail was. Now, one of the questions was, is that how did the son show up to move all the stuff out and not see the blood trail? And the blood trail is hard to find in parts of the house. And if he wasn't paying attention, he could kind of walk right by it, I think. When blood drop hits carpet, it wicks down. It doesn't form a big stain. And if you have a dirty carpet anyway, it just looks maybe like Coca-Cola or something like that. Some other - it could be anything. So it'd be real easy for the untrained eye to actually see this in the way that he left the trail was made because there just wasn't a lot of blood spurting out of him. But if you get into the living room, that's where it becomes kind of interesting. He's got a big blood saturation stain on his chair that faces the TV in the corner and there's also a drip trail that goes to the TV and back to the chair.

Mike Planty [00:28:55] So business as unusual for that guy, right?

Erin Sims [00:28:57] So he spent some time in that chair bleeding out. He also kicked off his boots and took off a shirt there, dropped it on the floor. And the boots are dark, so you have to get down close to those and light them up. But they have spatter all over them and when you lay out the shirt, there is an exit wound out the armpit and a lot of blood. But again, the way it was just laying on the floor is probably kind of normal, you know, for a teenage boy to just walk on by that and not really see anything. When I walked into the bedroom, there is a trail that goes in there and heavy bloodstains on the bed. So

somebody bleeding out did spend a lot of time in the bed. Since that time, though, they had pulled the sheets off and they were in the washing machine. There was a pad that was tossed outside on the stoop and it was heavily bloodstained. But even the mattress was still heavily bloodstained. There was a white t-shirt on the floor and when we spread that out, it had the contact gunshot wound to the chest and then the exit wound out the armpit of that so - and just more blood stains on his pillow. I don't know if he maybe used that pillow to, you know, stuff under his arm and put some pressure on it. And he had additional spatters on his - the front of his jeans that were laying there and all of the heavy blood staining was on the left front. And then there were some white patterns. And so if you have blood on your hands, you might wipe the thighs - wipe them off on the thighs. So that's what his jeans kind of look like there. Another interesting part of it was the kitchen, because somebody had spent a lot of time mopping up blood because there was bloody mop marks that covered all the linoleum floor and then they put the mop into the sink and let it sit there so there was bloody water there. But then somebody - there's another drip trail on top of the mop marks. So if someone else had been there to clean up, they didn't do a very good job and they also didn't make sure that their victim was dead. But it kind of looks like just from one of the stories he gave, he kind of said, you know, I saw all the blood and I thought about cleaning it up, but he didn't start cleaning up till Monday. So maybe he did do the mopping himself and put the sheets in the washer. There's just a lot of kind of strange things that kind of tended to start me on the side of a suicide or an accidental gunshot.

Mike Planty [00:31:28] Because the concealment, it's not really concealment, it's more about like just trying to clean up and you see a - on a floor. It is just like you're mopping, but he's just dripping over it and he probably doesn't recognize it really on the rug, like you said, because it's not really detectable, especially the condition of the house. Back to one other point you made. I just want to highlight it. He's talked about the saturation stains and that is specific because that means the person was there for some time, right?

Erin Sims [00:31:53] Yes, for some time. So there is a saturation stain on his TV chair and it's right where his armpit wound would be. So it bled out on to the arm of the chair there. And then the bed, the bed was very heavily bloodstained, so he probably did spend a lot of time there. And he may have thought, I'm just going to go curl in bed and die, I don't know, but -

Mike Planty [00:32:20] It was a surprise that he woke up the next morning yeah and drove himself to the doctors. It's incredible actually when you see these photos here.

Erin Sims [00:32:26] It should be mentioned, too, that there's three phones. There's one out in the shed, there's one in the kitchen, there's one in his bedroom by his bed, and none of them have bloodstains on them. So all of this movement that he's doing, there was never a thought of him, you know, like I'm under duress or I need an ambulance. And maybe loss of blood, you know, kind of - he's already got a traumatic brain injury and maybe loss of blood, as you know, his decision making is not real good at the time. But there's a lot of movement after the fact. There's a lot of stuff going on that - it kind of led me to believe if he had been the victim of homicide attempt, that maybe they would - well, maybe they should have, stuck around a little bit longer to see where he was going when he walked out of the shed.

Mike Planty [00:33:17] And maybe even his urgency would be different, right? Instead of just thinking about medical care the next day, possibly. Maybe seeking it the same day,

you know, but who knows, right? There's a lot of alcohol in the house and evidence of previous gunplay, right?

Erin Sims [00:33:34] Right. And we found his blood-stained underwear in the hamper. Like I said, the blood-stained sheets were in the laundry. He had taken a shower and mopped in the bathroom, but then bled all over again in the bathroom. He just couldn't get the bleeding to stop so that's when he finally figured he needed to have some stitches. So my final version of my diagrams is - I think it's pretty cool looking - it shows all of the blood trails through the house, all of the saturation stains on the furniture. It shows where the mop marks were. So it just gives you an idea. And the mopping would have all happened after the son had been over. If he had shot himself, I think it was just before the son got there and maybe he wanted his son to find him. The deputies were still kind of working under the theory that the son had shot him, and I wasn't, you know, going to interfere with that. And they followed that trail for a while. But there was a lot of shooting evidence in the house. It looked like they used to go out on the roof and shoot off the roof towards the road. So we found shell casings up there. One of the things I asked the deputies to do was to go to the hospital because they didn't want him to die and not get some measurements of how long his arm was. Is it physically possible for him to reach the trigger of the shotgun? So I can say anything I want to say about bloodstain patterns. But I want to know if it's physically possible. So if the shotgun had been at his chest and aimed at his heart and held straight out in front of him, he couldn't have reached the trigger with the shotgun that was used. But if you move your arm to the side, his arm was long enough then. So he would have one hand a hold of the barrel and put it on his chest to hold it in place. And then the other hand, reach out to the side and pull the trigger. And that could account for the direction of the wound through the body and also for the elbow being up at the time. And I told this to the deputies, and I said, or someone came up to him and put the gun into his chest and he turned and then the shot was fired. I said, but you know what comes afterwards? There's no finishing him off. There's all of this other activity. So did I really answer the question with the analysis?

Mike Planty [00:36:01] So one thing you can look at is, like you said, the blood dripping trail. It's pretty plausible, right? There's not a lot of struggling activity within the house that you might see.

Erin Sims [00:36:11] Well, even the blood trail, the blood trail from the shed itself is a slow-moving trail. And you can tell that by the shape of those drops, too, even though they're hitting different types of surfaces, the snow versus the cement versus the dirt. But it's just a slow-moving trail. It's - nobody's running. They're not being chased. They're not running from an altercation. They're not running from another shot. They're just -

Mike Planty [00:36:39] There no evidence of somebody tackling or assaulting them and pushing them on the ground or anything, right?

Erin Sims [00:36:43] There's no disturbance in the dust on the floor. There's no disturbance of the spatter on the floor. And the spatter is right in front of the door. So, you know, if anybody was going to go down and have a wrestling match on the floor -

Mike Planty [00:36:57] That would have shown up, yeah.

Erin Sims [00:36:58] Yeah, there just wasn't any of that. It was just after the shot everything - it just looked like everything stopped and then it was slow motion from there.

Mike Planty [00:37:05] So where is the - is the farmer still alive? Where are we with this story?

Erin Sims [00:37:10] Well, yeah, some of the questions, like I said, he was in the hospital for about 60 days. Well, longer than that. He was shot in February. He returned home in June. Unfortunately, his workshop where his - the shooting happened, that burned down unknown cause the following year and then in 2009 is when he had - he finally was evicted out of his house and had to move on. It is officially classified at this time as a suicide. They had polygraphed the son. Didn't have any triggers there. Didn't really have any information of anyone else going out there. When they went and talked to the daughter, she said, I haven't seen him in years and his brothers didn't like him. I can really see a situation where he was really depressed, and a lot of really bad things were happening to him. His son was leaving him. He had gotten fired. He was losing his house. I really lean towards suicide. Which - for a lot of reasons outside of the blood spatter. One of my questions that I had still was did it occur on Sunday or Monday. Because that changes the timetable too. The son wouldn't have been there. The cell phone information wouldn't have been there if he shot himself on Monday. So that is possible. Could he have lived overnight? Twenty-four hours with that massive shotgun wound to his chest. But there's clotting and pressure and there's all kinds of things that were working in his favor. So I think we figured out where it happened. I think we ticked off, you know, it wasn't in the horse corral. It wasn't outside the woodshed. It wasn't you know, he didn't get it kicked by a horse. He didn't get shot hunting rabbits. So I think we answered a lot of questions, so.

Mike Planty [00:38:58] Eliminated a lot of those - yeah that's absolutely right. And it's the investigators pulling together all the other information, along with your bloodstain pattern analysis.

Erin Sims [00:39:09] He may not be purposely telling us lies either. I mean, some of the stories that he told, bits of pieces of these actually happened in his life and he has brain injury and now he has a new injury and so he may have passed out or blacked out. Even if he was moving around, he may have lost part of that memory at that time frame. So that's what happened. But he's a tough guy. He is a tough guy and lived through that.

Mike Planty [00:39:36] Isn't it incredible? Yeah, there - so looking forward, you know, this captures a lot of what pattern analysis can do for a crime scene, right? Again, who was there? What were they doing? What type of activity? What happened at the primary scene versus secondary scene? What is your thoughts on how this field has developed? You know given your experience over the last, well I guess, 30 plus years and some of the future - and some of the research areas and thoughts about where this field could be going

Erin Sims [00:40:07] Back when I took my first basic 40-hour course, which was way back in 1998, I think? That basically was the class you could find. I mean, it was what the experts who had done research and had worked crime scenes had put together. And they had it all formalized. And it's pretty close to what they do today. But since that time, there has been so many smart people, much smarter than me with Ph.D.'s in physics and mathematics that have been doing research at universities and we've really benefited from this. So there are additional advanced training courses out there now and the International Bloodstain Pattern Analyst Meeting Conference is once a year and that's a weeklong, and experts from the medical field, from researchers. Just so much has advanced since I first took that 40-hour class and like I said, when I took the 40-hour class, I was just left with more questions than answers and that's - I think a person really has to apply themselves and follow the education and the training. Hopefully you can find a peer that can mentor

you. You know, send your casework to and check your work, basically. You know, I started as a lowly cop so when I came on that was my goal - was just to be a police officer and do good things. And I had no idea I would have maybe paid attention more in science classes at college if I knew anything about what I was going into now because I'm playing catch up so.

Mike Planty [00:41:50] Yeah and can you say a little bit about - because you were taking the certification course, right? Or the testing. There are standards being developed, of course, behind all of this. And so can you say a little bit about that and know that might be impacting the field?

Erin Sims [00:42:04] Yeah, the International Association of Identification offers certifications on various forensic fields and bloodstain pattern analysis is one. To even apply to take that test, you have to have two hundred and forty hours of training. A hundred of those have to be specific to bloodstain pattern analysis. But that is a lot more training than the basic 40. They also require three years of work experience. So if an attorney or just a student took the 40-hour class, they couldn't hang up a shingle and say, I'm an expert. You really need to get into a law enforcement agency, I think, because those are the people that are getting sent out to work the crime scenes. And that's the experience you need. You need to get into the crime scene and look around and in three dimensions, you know, you kind of feel what happened when you apply your training. You do have to have a bachelor's degree to - and there - I think there's maybe some other requirements. I can tell you that at three years I did not feel like I could pass the test. I was a detective for ten years before I tried and passed. And also I'm on the certification board now, so I assist with making the test now. And it is a very difficult test. It's a three-part test and you have six hours to take it. We currently, I think, have 52 certified bloodstain pattern analysts worldwide. Not a lot. There are a lot more crime scene investigators certified across the globe, but it's an interesting field. I'm fascinated by it and read any book and any article. The OSAC Committee's - Organization of Scientific Area Committees for Forensic Science - they have - are publishing standards now for bloodstain pattern analysts. And I would suggest if you want to see what we're requiring, go in there and look at those standards. Look at the standards for report writing and the standards for a training course, and we also have a bloodstain pattern bibliography that they put together, 2019, that's got over 1300 research articles and books listed there, so. There are suggested topics for research needs on the OSAC website too. So if you're a student and you're looking for something to do some research on, go check there.

Mike Planty [00:44:41] It's rapidly developing a lot of interest from the scientific community on improving our knowledge around this space. So a really - a lot of positive movement in the right direction.

Erin Sims [00:44:52] Well, I was going to say some people find - are queasy with blood and I want to tell you, as a young officer, I had never seen a dead body before I got hired. I had never been to a funeral. You know, it was all completely new to me. But I think maybe that's - maybe the way I coped with it was I wanted to know how it happened and I wanted the answers, and so once I flipped that switch, then I was just full bore. I want to learn as much as I can. This is part of my job, so.

Mike Planty [00:45:22] Yeah, and really, you know, to really understand what happened, like you said, and to serve justice. So, I mean, I think that's the ultimate goal is a fair outcome here. This has been a really, really interesting discussion. And I want to thank our

guest today, Erin Simms, for sitting down with Just Science today. Thank you very much, Erin.

Erin Sims [00:45:40] Oh, you're welcome.

Mike Planty [00:45:41] 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 of forensic science, visit forensicCOE.org. I'm Mike Planty, it's been another episode Just Science.

Voiceover [00:45:57] Next week Just Science interviews Heather Connor, the latent print unit technical leader in Mesa Police Department's Forensic Services, about the investigation of a grisly murder in Mesa, Arizona. 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.