

## Just the Analysis of Impressions and Patterns

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

**Voiceover** [00:00:17] 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 four of our Strengthening the Forensic Workforce Season, Just Science sat down with Assistant Professor Jessica Zarate and fifth year student Kristen Szabelski at Madonna University in Michigan, as well as Dr. Christine Picard, an Associate Professor and Director of the Forensic and Investigative Sciences Program at Indiana University, Purdue University, Indianapolis to discuss their hands on impression and pattern education programs. People will immediately think of fingerprints or bloodstain patterns when mentioning impression and pattern forensics. However, the section is quite diverse and includes the analysis of additional types of evidence such as footwear impressions, firearm toolmarks and questioned documents. Listen along as Dr. Picard, Professor Zarate and Kristen Szabelsky discuss the importance of research and experiences in impression and pattern education programs from their different perspectives. This episode is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Here's your host, Gabby DiEmma.

**Gabby DiEmma** [00:01:25] Hello and welcome to Just Science. I'm your host, Gabby DiEmma, with the Forensic Technology Center of Excellence, a program of the National Institute of Justice. This season, Just Science will discuss forensic science programs and NIJ funded research at universities accredited by the Forensic Science Education Programs Accreditation Commission or FEPAC. Here to guide us in our discussion is Jessica Zarate, an Assistant Professor at Madonna University and her student and Administrative Research Assistant, Kristen Szabelski, and Dr. Christine Picard, an Associate Professor and Director of the Forensic and Investigative Sciences Program at Indiana University, Purdue University, Indianapolis. Jessica, Christine, and Kristen, welcome to the podcast. It's great to have you.

**Jessica Zarate** [00:02:10] Thank you for having us.

**Gabby DiEmma** [00:02:12] Jessica, can you tell us a little more about your professional background and current role at Madonna University?

**Jessica Zarate** [00:02:18] I teach forensics coursework to include discipline specific content in the area of impression and pattern evidence, I'm a National Institute of Justice funded researcher and have collaborated on research grants with the Forensics Research Outdoor Station, also known as FROST, and their Outdoor Forensics Taxonomy Research Facility at Northern Michigan University, the Michigan State Police Forensic Science Division, Oakland County Sheriff's Department Forensic Science Laboratory and the Wayne County Medical Examiner's Office. My research is primarily focused within the impression discipline publishing on a fluorogenic method for lifting, enhancing, preserving blood and other proteinaceous impression evidence, the recovery of blood impressions from difficult substrates, including from human skin, defining methods to create consistent and reproducible fingerprint impressions, and most recently, the recovery of blood impressions in semen smears from decedent skin during the early stages of decomposition.

**Gabby DiEmma** [00:03:08] And Kristen?

**Kristen Szabelski** [00:03:09] Hi, I'm Kristen Szabelski. I'm a student administrative assistant for the National Institute of Justice Grant. I also lab assist for Professor Zarati for her impressions and trace evidence and introduction to forensic courses at Madonna University. Upon my academic involvement, I am also a student athlete on the women's golf team.

**Gabby DiEmma** [00:03:25] Awesome, and Christine?

**Christine Picard** [00:03:27] Well, currently I'm the director of the Forensic Science Program here at IUPUI and what brought me to this position has been just a love of forensic entomology, which is my research focus. So the insects that show up at various crime scenes. And so my role within the forensic science program here as the director as well as an instructor, I teach the forensic biology coursework for our graduate students, and I also teach additional classes to some of our undergraduates that include some professional preparation classes for our students. So my background and some of the NIJ funded research that has sort of gotten me here so far has revolved around these insects. I've worked with the chemists to look at different volatile organic compounds, and I've worked with biologists to look at the genomic structure of some of these insects that we work with.

**Gabby DiEmma** [00:04:19] Very cool and later in this discussion, I would love to hear a lot more about this research. Before we get started, I'd really like to know what made you decide to pursue a career in academia and more specifically, a career addressing forensic science questions?

**Christine Picard** [00:04:34] I, like most people I think, you know have this love of the forensic science and the forensic realm. So that definitely piqued my interest early on. And I look to see where that intersected with some of my other interests, which included, weirdly, insects. I am fascinated by them as well as genetics, and that's how I eventually converged on what is now my career. But I didn't take a straight path there. For a while I was actually a chemist and I worked for a small pharmaceutical company. But what drove me directly into academia was the idea that I couldn't ask and answer questions when I was working in industry. Industry has a bottom line. Academia, now I get to ask and plan experiments and try to answer questions that are constantly in my head and it's the greatest job in the world.

**Gabby DiEmma** [00:05:26] Excellent, and Jessica?

**Jessica Zarate** [00:05:28] I didn't originally plan to work in academia. I began my professional career as a police officer. While working as an officer, I invented the ZAR-PRO fluorescent blood lifters and was awarded a Midwest Forensics Research Center, MFRC grant to conduct additional research with ZAR-PRO. The MFRC grant was conducting collaboration at that time with Michigan State Police North Field Forensics Laboratory, and we eventually began renting lab space at Madonna University to facilitate the grant work. Upon completion of the grant, I was asked to teach the Forensic Science Program at Madonna University as an adjunct in which I was able to continue working in the lab space I acquired via the research grant, and I started mentoring students in their own research endeavors. With that being said, that was 13 years ago. I'm still teaching the forensic science program and I'm still working my own research and I'm very excited.

**Gabby DiEmma** [00:06:14] Excellent. And Kristen, you're still a student, and I'd be interested in hearing what made you pursue and what's keeping you there. Why are you sticking with this this career path?

**Kristen Szabelski** [00:06:22] Well, Madonna is not far from where I live, so it was one of the first schools I looked at during my college search. I had always had a love for science and true crime and when I discovered Madonna had an accredited forensics program, it immediately became my top choice and upon meeting Dr. Barta, who's the advisor for the forensics program, she talked about all the great opportunities students have while attending the school and even greater possibilities after graduation and that definitely held true. I've had a lot of great experiences here at Madonna, and it definitely didn't disappoint.

**Gabby DiEmma** [00:06:51] So before we dive into today's discussion, I'd like to start with a basic definition of impression and pattern evidence. Now, I know a lot of people in our audience might immediately think of fingerprints or blood pattern analysis, but impression and pattern evidence or IPE encompasses many important forensic subdisciplines. Would one or both or all of you be willing to provide a brief explanation of what is impression and pattern evidence?

**Jessica Zarate** [00:07:19] Impression and pattern evidence is just that. It's any evidence that is found leaving a pattern of any type. That could be fingerprints, it could be footwear impressions, it could be bloody denim from blue jeans on a wall. It's really trying to analyze a pattern and see what left it. Fingerprints and footwear are the most common, but there's a number of things that could leave patterns at the scene.

**Gabby DiEmma** [00:07:39] And so I know both of your universities have great FEPAC accredited forensic science programs, and I'd be interested in hearing a lot more about them. Starting with Jessica and Kristen, so you guys are at Madonna University. Tell us more about the forensic science program there.

**Jessica Zarate** [00:07:56] As stated on our program website, our Bachelors of Forensic Science degree provides students with a strong experiential foundation across the sciences and a refined knowledge of its application within the criminal justice system. Students within our program also obtain a minor in chemistry or biology or both chemistry and biology. And I would just say, like for more information on our program, listeners can visit our program website, a little plug for our university, or even contact our program director, Dr. Jodie Lynn Barta. She'd be happy to answer some questions and we're always excited to take any questions of interest into our program.

**Gabby DiEmma** [00:08:27] And Kristen, as a student in that program, what is your perspective on Madonna University?

**Kristen Szabelski** [00:08:33] Well, I believe getting an education through a FEPAC accredited university is a great thing to have on a resume. Not all forensic programs are accredited, so it makes our program stand out all the more. In addition, the students really get a great hands-on experience in classes and get to learn a little bit about everything in the forensic discipline. The school also participates in a lot of outside activities, which gives students a better idea of what they want to do post-graduation and even make connections with people for future job opportunities.

**Gabby DiEmma** [00:08:58] Awesome. And Christine, tell us about IUPUI and their forensic program.

**Christine Picard** [00:09:02] At IUPUI, our FEPAC accredited program includes two concentrations. So we have a forensic biology concentration and a forensic chemistry concentration. So students will get their Bachelor's of Science in Forensic and Investigative Sciences, and it is a Purdue degree, Purdue University, that's the side that we're on with our IUPUI. So students in our programs will often dual major in either forensic biology and biology or forensic chemistry and chemistry, and that is because we have a pretty robust science degree that makes up our forensic science degree. And in fact, to get your dual degrees, it's often just one or two extra classes that you end up having to take to get that second degree. Our program is focused on a lot of hands-on activities that include forensic microscopy labs, forensic biology labs, forensic chemistry labs with the most real experiences we can give them. So in our forensic biology lab, they are working with real biological samples and analyzing and generating DNA profiles on a genetic analyzer, a 3500 that's present in the lab for the students to use. On the chemistry side, we have ATF and DEA licenses, so students are working on the real chemicals, the real drugs, very small amounts, in order to get that genuine experience. And our forensic microscopy lab has three different types of microscopes that the students use and each student has their own microscope. So they get to spend 3 to 4 hours at a time during the lab periods looking through the microscope to look at trace evidence and patterns and whatnot. So we put a real emphasis on the hands on learning our students get.

**Gabby DiEmma** [00:10:45] Yeah so both of your programs sound like they have good general education. You get in depth into the topics and then you get that hands on learning that you really need to be a forensic scientist. So in your opinion, what are some of the advantages of FEPAC accreditation both for your university and for your students?

**Jessica Zarate** [00:11:04] Like you said, our FEPAC accredited undergraduate program is the only undergraduate program in the state of Michigan. So we get a really great selection of students. Our accreditation demonstrates the excellence of our program at Madonna University, meeting a high standard of employers under Department of Justice endeavors to improve forensic science through partnership between the National Commission of Forensic Science and the National Institute of Standards and Technology. This recognition demonstrates achievements of our students throughout completion of their degrees and makes them more employable within forensic science profession upon graduation. Students' success upon graduation is evident in the training that we give them here at the university.

**Christine Picard** [00:11:39] FEPAC accreditation sets out really great standards that allow employers, especially, to be able to evaluate students that are graduating from that program. So from our perspective at the university, it's a great roadmap for us to ensure that the students are getting proper instruction for that industry. For the students, I think it's that seal of approval. I ask often incoming freshmen like, why did you decide to come here? And FEPAC is always number one in a lot of their answers. Sometimes it's geography, but certainly students and parents are doing their research on which programs are really scientifically focused, which is what FEPAC allows us to do. And so I think that's the main advantage, is to put everybody who graduates from these programs on a level playing field, at least at a minimum, and to be employable.

**Gabby DiEmma** [00:12:29] You all mentioned that the programs involve a lot of hands-on learning. You have all mentioned research plays a major role in your programs and is a major role in your specific careers. So I'd be interested in hearing more about any NIJ

funding you've received to help do this forensic research and tell us more about the research you and your students are doing.

**Christine Picard** [00:12:52] Sure! You know, research is such an integral part of the learning experience. I think just getting that experience asking questions, like I said before, testing hypotheses, forge new paths to understand something that we've been working with for a long time, which includes a lot of forensic science, is really important to the growth of forensic science, to the growth of the students as lifelong learners, and of course, to my own growth, which I just really, really enjoy. So in our case, some of the research that we were interested in had to do on the forensic entomology side. So it's the insects, of course, that come in shortly after death and they can be useful to establish a time since that person's been - at least a minimum time since that person has been dead. And so they're very useful after a certain amount of decomposition has occurred. However, they're natural systems, right? There are huge populations of these insects out there that have a lot of variation. And I always make the comparison to line up ten, ten year old boys and you're going to see a lot of height variation there because there's just natural variation in the population. Believe it or not, the same thing happens with maggots. Even though maggots may be all the same age, so to speak, they may differ in length. But because we use the reverse, because we use the length of the maggot in order to estimate the age, that variation increases uncertainty around some of the estimates or makes some of the estimates larger, which may not be all that useful. So some of the first funded research that I had, we artificially selected for really, really fast growing maggots and really, really slow growing maggots. And then we sequenced their genomes so that we could look for these different molecular markers or genetic markers that are associated with the faster or the slow. And so, practically speaking, if you had a situation with a case, then maybe you could genotype the maggot or those several maggots and get a slightly more precise estimate around that time since death. So that's an example of some of the research questions that we're asking and trying to get at answers. And it's been many, many years, and I still don't actually have the real answer, but we do keep getting closer and closer because that's science, right? You answer one question and then you've got four more and you have to go answer those four questions and you just continue to build in that direction.

**Gabby DiEmma** [00:15:23] And the issue of determining time since death or postmortem interval or PMI is near and dear to my heart because I did some human decomposition research and it's been an ongoing problem just trying to figure out how do we determine this. There are so many variables and we're conducting all of this research to try to figure out what is the leading factor, how can we simulate this to accurately predict? And it's really interesting, I didn't think about the genotypes affecting the growth factors of insects. So that's really cool. And Jessica, I know that you also, you mentioned the FROST facility. I forget what it stands for, but tell us more about research there and other research that you're doing at Madonna University.

**Jessica Zarate** [00:16:08] As I previously mentioned, I've been working on NIJ research. I got I got my first research grant in 2009 while I was still a police officer. So the research grant was awarded to my police department, which is kind of unusual, to work on ZAR-PRO, which wasn't quite name ZAR-PRO yet, it was still - I had the product but we were still looking at the application of it. This grant was awarded through the Midwest Forensics Research Center in the Ames Laboratory at Iowa State University. We basically we got to work with ZAR-PRO and looking at various substrates. I don't remember how many we looked at, but it was a lot, and the recovery of blood impressions specifically from those various substrates. And in 2013, the Madonna University Research Forensic Science

Research Facility was awarded another NIJ grant to develop DNA friendly, fluorogenic methods for detecting, enhancing, and preserved blood and proteinaceous impressions. And in this study, we compared the use of ZAR-PRO and other chemical enhancement reagents that we developed at the University for the recovery of blood and semen impressions from various substrates. We also worked on extraction of DNA post enhancement from the ZAR-PRO lifters and from those and from the enhanced in-situ staining methods. And most recently, our NIJ grant, which we're still working on, was awarded 2019 to assess methods to enhance and preserve proteinaceous impressions from the skin of decedents during the early stages of decomposition, and this is the work that we've been doing with FROST, which is the Forensics Research Outdoor Station on the campus of Northern Michigan University in Marquette, Michigan. If you don't know where that is, it's up at the - almost in Canada, the upper peninsula of Michigan. And there we put blood impressions and semen smears on the skin of human decedents and we recover them with ZAR-PRO and we dye stain in-situ with Hungarian Red and Amido Black, comparing the viability of all those methods, which is pretty exciting. We've got to do - or see a lot of maggots. Christine, you'd like that. Some of which we're eating through our impressions from under the skin, right? So that was interesting. Or leaving footprints on our impressions of contamination, you know, but they're little walking around on the bodies and stuff. We did dye a few maggots, which Kristen thought was pretty exciting. So we got to look at the fluorescent maggots because they ate the dyes from the body. I think we have a really interesting photo of maggots under stained skin that we're going to showcase at the next IAI Conference. It's a pretty interesting photo. But yeah, it's fun. It's always fun when you're doing research, in my opinion.

**Gabby DiEmma** [00:18:30] And you mentioned the IAI Conference, so the International Association for Identification. And I know that you had a couple students that presented there this year and they actually won for the student research category. So tell me more about that.

**Jessica Zarate** [00:18:46] I'm going to let Kristen talk about that since she was one of our winning students.

**Kristen Szabelski** [00:18:50] Yes, it was super exciting. Me and one of my classmates, Sarah Holton, her and I attended the IAI Conference in Nashville over the summer and we presented the work that we did up at FROST and we actually took first in the poster contest. So it was super exciting to see all of our hard work pay off.

**Gabby DiEmma** [00:19:05] Awesome. Congratulations. It's always fun to present your research and then to have that recognition. It's great. So besides research, how, or has NIJ funding allowed your program to grow or played a role in shaping it?

**Christine Picard** [00:19:20] One of the best ways you can demonstrate to your administration that there's a need for more resources sort of put forth towards this area is by getting funding. And our forensic science researchers here have been very successful at getting NIJ funding. And because of that, our administration is taking note that, hey, forensic science research is exciting. A lot of students actually really gravitate towards it and also it's fundable. And so it's allowing us to grow our program in the sense of being able to bring in more faculty who do research and that provides more opportunities for our students. It provides additional instructors to teach some specialty classes for our students. So I think all in all, obtaining funding for your research has been integral to the growth of our forensic science program here.

**Gabby DiEmma** [00:20:18] Excellent. And how about at Madonna University?

**Kristen Szabelski** [00:20:21] Yes, NIJ funded research has allowed us to evolve undergraduate student research as innovative studies in the pattern of impression discipline. During campus tours with incoming forensic science students, I find that the students are very excited about the opportunities for undergraduate research within our program, which obviously helps with recruitment. We have a research hallway that has posters from all of our students and faculty, and usually when I give the tours, if they come see me, we bring them to that hallway and say hey look at what you can do here. And just them looking at the research and the stuff that we're doing at the institute, it's just a really exciting thing and it's exciting for the students to be involved in research.

**Gabby DiEmma** [00:20:57] And Kristen, as one of those students, how - was that a major draw? You mentioned that it was partially location as well as the FEPAC accreditation was a major draw, but did research and the amount of research that the university does, was that a major draw to bring you to that university?

**Kristen Szabelski** [00:21:14] Absolutely. It has been one of the best things to be a part of this research. I think I have learned so much more being able to work on this, and it really helped me decide what I want to get into after graduation. You're in all these different classes and you're like, well, maybe I want to go to chemistry, maybe I want to go biology. But after Professor Zarate took me in and allowed me to work on this grant, it really showed me that I want to work with impressions and trace evidence after graduation and all the things that we got to work on, having so much fun, and obviously I've met a lot of new people that have been joining our program, so it's great to have those extra friends as well. But I definitely think my skills have developed greatly by working on this grant and it's been an amazing experience and I wouldn't have changed it for anything.

**Gabby DiEmma** [00:22:00] And I wanted to follow up on something that you said, that your professors take you in. There's this degree of mentorship that helps you get to graduation and find what you really want to do in the career of forensic science. So I'd be interested in hearing more about the mentorship structure at your universities. Also, are there any internships in addition to all that student research and hands on learning that you do?

**Christine Picard** [00:22:27] Our university, in terms of mentorship, certainly we have professors will mentor undergraduates. We have graduate students in our labs, masters and PhDs. So they will also mentor some of the undergraduates on the research side. And if we're just talking about on the program side, we have a pretty active forensic science club that we encourage all of the freshmen to join. It's a great way to get to know other students in the program, but also you'll get that informal mentorship from the more senior students, and we lean on that quite a bit. And it's been really, really helpful for a lot of our students to get that access to students who've been through the program, who know what to anticipate with certain classes, and who can give tips and advice on some resources on campus. In terms of internships, our university doesn't have a formal process, so to speak, but we do have an internship class, which is a class that you can register for if you get an internship, and that way it shows up on your transcripts. But our relationships with many of the local and statewide forensic science labs means that they are constantly coming to us, hey, we have these internships. Tell your students because they really like our students. And so they are always asking for some of our students for some of these opportunities.

**Gabby DiEmma** [00:23:47] And Jessica?

**Jessica Zarate** [00:23:48] I'm going to let Kristen answer the question on mentorship.

**Kristen Szabelski** [00:23:51] Well, there are also lab assistant positions open, where the students help the professors set up labs and assist other students during class time. And this just allows students to work behind the scenes with the professor and do prep work that would not be otherwise done in class. And I just feel like that makes those students that much better at the subject. In addition, there's a senior seminar class that's required for graduation, and this is where students just do a research project overseen by a faculty member and the subject matter, and this was incredibly helpful in learning how to effectively conduct research and improve your writing skills.

**Jessica Zarate** [00:24:22] So as far as like hands on learning and internship opportunities, all of our forensic science labs, of course utilize hands on learning. And the students have a number of opportunities to conduct research while completing their forensic science degree. As faculty members in all areas of our forensic science programs offer student research opportunities. Student internships are also available. We have students intern at the Michigan State Police Lab System, Oakland County Sheriff's Department Forensics Lab, along with other public and private laboratories. In addition, this is something that we do as well is I founded a run a cold case investigative research team, which was the first of its kind in the state of Michigan, which we partner with local and state police to conduct comprehensive case reviews on open unsolved cold cases. In recognition of the benefits of this cold case team, the Michigan State Police is now considering the work of our students on the Cold Case team as an internship with their agency as well. So they work with me, but they're working on MSP cases, so they get that as an internship opportunity as well. So we have a number of really unique opportunities here at Madonna for them to get involved and really make a difference in the field, even before graduation.

**Gabby DiEmma** [00:25:24] You all mentioned these close relationships with your local, state and federal agencies. Do you find that this makes your students more likely to pursue graduate studies? Does it help them get hired more quickly because they already have experience with these agencies and they know what your students are capable of?

**Christine Picard** [00:25:42] These research experiences that the students get are invaluable, I think, at the very least, to getting them to the conferences, to meeting and networking. I think that's really, really important, whether it's local, regional or national conferences. I think that's a invaluable experience for the students. But also when they get to the interview stage, they have a leg up I think because they've been doing so much of the work in the lab and they've gotten really good at it. If they also had opportunities to be teaching assistants, there's no better learning of a subject matter when you have to teach it to someone else. And so those experiences, I think, are really, really good for the students.

**Gabby DiEmma** [00:26:24] So you mentioned professional conferences and we talked a little bit already about the International Association for Identification or IAI conference, but what other professional conferences do you and your students regularly attend?

**Christine Picard** [00:26:39] You know one that our students pre-pandemic used to always - the Forensic Science Club always organized a trip to the American Academy of Forensic Sciences Conference. I mean, they love that conference. There's so many opportunities to hear just the most fascinating stuff at these conferences. So that was definitely a big one, but it's gotten rather expensive. It's always in pretty expensive cities, so it's just been more

difficult to accomplish that. We're telling our students about the Midwest Association of Forensic Science. It usually tends to be within driving distance. It's not as expensive as AAFS and it's also a really great opportunity to network with scientists, forensic scientists that are regional, which has been always really, really good. Outside of that, because my research spans a few different areas, sometimes research students will go to entomology meetings. So go to the insect meeting to talk about forensics, to the insect scientist. Or there can be other types of scientific meetings on the chemistry side that our students may go to, like the American Chemical Society. And often these big national conferences will have symposia or special sections that are dedicated to the forensic science research that's being done within that subdiscipline. So we are always open to any students going to any conferences that they want to go to, because I think getting the word out and getting the experience is really useful.

**Jessica Zarate** [00:28:01] I'm a member of the International Association for Identification and I regularly attend that annual conference along with the American Academy of Forensic Science Conference and also the Midwestern Association of Forensic Sciences Conference. It's usually local. It's not as costly, like Christine said, it's just within driving distance. And we also have the Michigan Academy of Science Arts and Letters, which is within our state, which is even better. So we can usually get students there. Yeah, there's all kinds of exciting conference opportunities. The more students we can bring to them, the better. I wish there was more funding to bring students to these conferences. Even the \$200 student fee for the IAI is really expensive for students that are not yet working, right? Any opportunity we have to get them at conferences and involved is great.

**Gabby DiEmma** [00:28:43] And so Kristen, what was your experience at IAI. You've mentioned it a little bit before with the award you won for your poster presentation. In your opinion, what are the benefits of students attending these conferences?

**Jessica Zarate** [00:28:57] So it was my first campus that I attended. So it was super cool to go to. They had all these, I guess, seminars that you could go and sit in and listen to so you could just room hop and listen to whatever you wanted to listen to. And even law enforcement, police officers, they will do like a case study. We sat in on one of those where she took us through a whole event that happened and those are just super cool to listen in on. And then after all that, we went and did our presentation. So that was really cool. Just meeting all those different people and they're coming up to us like, I work for so-and-so agency, here's my card and this is how I got to the job that I currently have. It's always interesting, like what steps they took, where they went to school, just so you can get that kind of experience of like what you want to do and what avenues you could possibly take. So you don't necessarily need that dream forensics job right out of the bag. Like not a lot of people take that route. So it just brought a lot of comfort to me to hear other people's stories and their experiences and it was great. I would love to go back if I ever have another opportunity to.

**Gabby DiEmma** [00:30:02] You know, I attended the regional meeting, NEAFS, or the Northeastern Association of Forensic Scientists, as well as EAS, the Eastern Analytical Symposium. So definitely check out any regional meetings that you can go to. To learn and network is so important. So for Christine and Jessica, what have your students been up to post-graduation? Have many found work in forensic science as a career? Are they in publicly funded laboratories? Are they now conducting their own research? Tell us a little bit more about that.

**Christine Picard** [00:30:35] Our students are at all of the above. So we have students that are in certainly local labs here in Indianapolis, State Police Lab. We have students that are in national or federal labs across the country. Our program draws in from a large number of states, so we tend to have students from all over the country that are coming here so they do fan back out. And it's a really great network that we're creating and they always come back with jobs. Hey, can you post this to your students? We have a job opening coming up. So we've had to create a specific site for our students that's like, here's where we're going to post all of these job openings that are coming our way. In terms of research, we definitely had some students that have gone on to do Ph.D. level research who started off as undergraduate forensic science students. Actually, most of them are in publicly funded labs. So they still, even as a Ph.D. level scientist, still want to be a forensic scientist. And I actually like that idea and hope that they come back to academia because they're going to learn a whole bunch during that process of working in a forensic science lab and then being able to apply a lot of what they've learned in a research context.

**Jessica Zarate** [00:31:49] My response is very similar to Christine's. We have students all over local, state, federal labs, private labs. I'm unaware of if we have any former students that have been awarded NIJ grants, but we have a number of students that work on research projects in the achievement of their advanced degrees, whether it be master's degree or Ph.D. Students are very successful.

**Gabby DiEmma** [00:32:08] So we are nearing the end of our time together. So before we wrap up, is there anything coming up that you would like to tell us about or any final thoughts you would like to share with our listeners?

**Jessica Zarate** [00:32:18] As I said, we work with Michigan State Police and local agencies on cold case investigations. But I'm also a member of the Michigan Mortuary Response Team and the Vice President of Missing in Michigan Association. And the Missing in Michigan Association was founded by Lieutenant Sarah Krebs of the Michigan State Police with the mission to provide support for law enforcement and the families of missing persons, in partnership with NamUs is which is the National Missing Persons and Unidentified Remains System, local law enforcement agencies and Department of State Police and the FBI, the Federal Bureau of Investigation to name a few of these collaboration partners. This year's Missing in Michigan event will be hosted on May 25th at Madonna University and we'll have law enforcement training, a private session for the family members of missing persons and a public session to help raise awareness for the missing. In Michigan alone, right now we have over 3800 missing people with 874 of them being children. So that's also another thing that our students work on and if anyone is in Madonna area on the 25th come and join us.

**Christine Picard** [00:33:15] I have two parting thoughts. The first is follow your passion, like find that one thing that you really love and you'll be amazed at how many opportunities that opens up for you. So I do hope that more people get into forensic science research. Coming from the perspective of trying to find Ph.D. level instructors it's actually a very small number of them out there, and it would be great to increase the number of folks that are doing forensic science research. So I'm hopeful that some students maybe get motivated by that. The second thing I just want to talk about, I think we do that is all about the student experience, we offer these special workshops that we give to our students. Every semester they get three different options. They get to take these for credit, and they're taught by folks working in the forensic science labs. We have that opportunity here because we're urban and all of the labs are actually in Indianapolis. And so we'll have people come in and talk about specialty topics. We do document examination, we do blood

spatter, hazardous crime scenes, we do ballistics, all of these topics that don't fit well within the curriculum, given how FEPAC requires a rigorous science curriculum, but we want to expose our students to all the different disciplines that exist out there. One example for sure that one of our students took a special workshop on ballistics and is now a firearms examiner with a forensic lab. And that completely changed what their original plan was going to be. So we want to make sure that we're exposing students to all the different areas of forensic science as well, and as well as some possible research avenues that might exist within those.

**Gabby DiEmma** [00:34:53] Excellent. Yeah. There are so many different disciplines that you can pursue in forensic science, so it's great to have that exposure before you get out into the workforce. Jessica, Kristen, Christine, it has been great having you on the podcast, and I'd like to thank you for taking the time out of your day to chat with me about these important topics.

**Jessica Zarate** [00:35:12] Thank you for having us.

**Gabby DiEmma** [00:35:13] If you enjoyed today's episode, be sure to like and follow Just Science on your platform of choice. For more information on today's topic and resources in the forensics field, visit [ForensicCOE.org](http://ForensicCOE.org). I'm Gabby DiEmma and this has been another episode of Just Science.

**Voiceover** [00:35:31] Next week, Just Science sits down with Dr. Robin Cotton from the Boston University School of Medicine and Dr. Daniele Podini from the George Washington University to discuss forensic biology and DNA programs. 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.