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ISHI INTERNATIONAL SYMPOSIUM ON HUMAN IDENTIFICATION

DENVER, CO | SEPTEMBER 18-21, 2023

May 2023

The ISHI Report

News from the World of DNA Forensics

Start Reading

What's inside:

Introduction

Letter from our Editorial Board

Your Public Persona and You: Navigating Social Media as a Forensic Scientist

Untangling the Past: The Use of DNA Technologies in a Highly Commingled World War II Era Case

Can Improv Really Help Forensic Scientists?

Forensic Scientist of Note: Natalia Yael Sandberg Lacasa

The Other NGS: Preparing the Next Generation of Forensic Scientists for the Workforce

Spotting Trends in Forensic DNA

IDseek®: The Next Revolution in Forensic MPS

NamUs: A Programmatic Update

Genetic Privacy and Forensic Investigative Genetic Genealogy: Today and Tomorrow

An Update from the Organization of Scientific Area Committees (OSAC) for Forensic Science

Meet The 2023 ISHI Student Ambassadors

Innocence After Guilt: The Role of Post-Conviction DNA Testing

2023 Calendar of Events



The ISHI Report

Letter from the Editor

Greetings from Madison and welcome to the May edition of the ISHI Report. This issue is filled with contributions from many familiar names in the forensic science community. Read on to learn more about several topics that will be explored in depth during the workshops at ISHI.

Jo-Anne Bright from the New Zealand Institute of Forensic Science and Research (ESR) reflects on what's been learned ten years on from the introduction on STRmix™. Exciting new features have been incorporated into the system based on feedback from users and advances in the underlying science. These include two related products which, when combined with STRmix™, complete a full workflow from analysis to interpretation and database matching. If you can't get enough of probabilistic genotyping, consider signing up for the Advanced Reporting of Likelihood Ratios workshop at ISHI taught by Jo and colleagues.

Communicating clearly is a valuable skill no matter what your career. Presenting scientific concepts and results is especially important for those called to testify in court. Former forensic scientist Julie Burrill will be co-presenting a workshop at ISHI designed to help forensic professionals learn a practical method based on improvisational skills to convey scientific information to disparate audiences. She shares how the Alda method can help forensic scientists effectively communicate to a non-scientific audience.

Professor Pamela Marshall from Duquesne University previews what attendees will learn during "The Other NGS, Next Generation Scientists" workshop at ISHI. The pandemic has changed many things, including how young scientists prefer to learn new skills, interact with supervisors and receive feedback. This workshop taught by a diverse team of forensic professionals will offer actionable suggestions to help those in management recruit and retain the next generation of forensic scientists.

We're pleased to introduce Natalia Yael Sandberg Lacasa, head and co-founder of the "Registro Nacional de Huellas Genéticas" of the Direccion Nacional de Policía Científica (DNPC) of Uruguay. Natalia describes how she decided to dedicate her career to the field of forensic science and shares some of the challenges unique to her region. Learn more about ongoing efforts to advance forensic science in Latin America by attending the GCLAITH Meeting she is chairing at ISHI.

New strides in DNA technologies have made it possible for Suni Edson and colleagues to identify remains of services members lost during conflicts in WWII from common graves in Cabanatuan, Philippines. The identifications were made more challenging due to the compromised state of the samples, preservation methods and commingled bones. In this article Edson et. al, detail their efforts to overcome the odds to successfully identify remains.

Our colleague at Promega, AnnaKay Kruger offers helpful perspective in her piece, "Your Public Persona and You- Navigating Social Media as a Forensic Scientist". Her practical advice is useful to all who are engaged with social media and offers a valuable reminder that what you post on the web can come back to haunt you.

We are excited to announce a new 6 part video series, *Innocence After Guilt- The Role of Post-Conviction DNA Testing*. This series examines post-conviction DNA testing to learn more about the factors that contribute to wrongful convictions, the years-long process of re-examining a case, the people involved and the roles that they play, and the key learnings that will hopefully lead to fewer wrongful convictions in the future.

Finally, we offer a note of thanks to all the aspiring forensic scientists who applied to be student ambassadors at this year's 34th International Symposium on Human Identification. We were impressed with your engagement and heartfelt love for the field and wish we could have chosen you all. Follow www.ishinews.com and this publication to learn about the four students chosen as ISHI Student Ambassadors.

Best wishes and high hopes for sunny days ahead.

The Editorial Board

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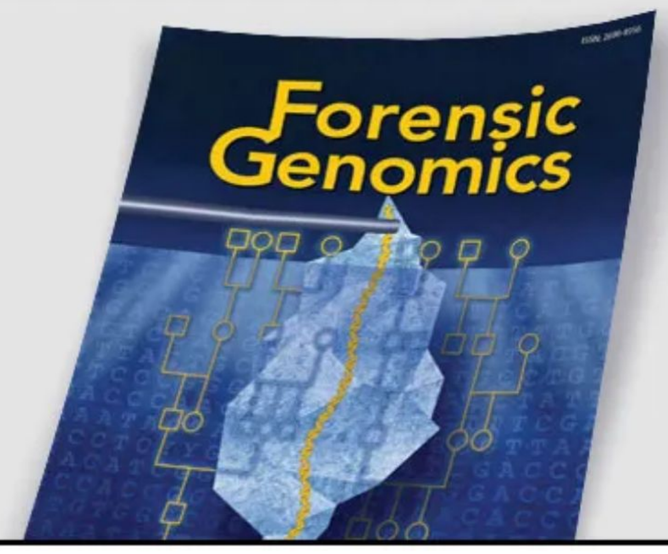



Your Public Persona and You

Navigating Social Media as a Forensic Scientist

AnnaKay Kruger, Promega

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Sometimes, social media can seem like a virtual utopia where we all have the freedom to express ourselves as we wish. At other times, social media feels like a lawless wasteland where no one is truly safe from the judgment and opinions of others. The reality probably lies somewhere in between, but the perils of using social media are numerous. Our behavior online can have implications offline in ways that we may not foresee, for both our personal and our professional lives. This is especially true when your personal life—your experiences, opinions and convictions—can be used to discredit you and call into question your ability to do your job. In this respect, there are few who stand to lose more from their use of social media than those in the criminal justice system, particularly forensic scientists.

The Duty of a Forensic Scientist

In a criminal case, forensic science stands as a bastion of objective truth between two highly motivated parties: the prosecution and the defense. A forensic scientist is called to serve the court by speaking for the evidence.

"As a forensic scientist, what you're doing is essentially you're giving a voice to items of physical evidence that can't speak for themselves," said John Collins, founder of the leadership coaching organization Critical Victories and former forensic laboratory system director for the state of Michigan. "You can't put a bullet on the witness stand, and the bullet testifies and says I was fired. It's the forensic scientist who has to give a voice to that evidence."

As such, it's critical that a forensic scientist can give voice in a way that is unbiased. Bias in a court case refers to the degree to which a person may favor one narrative or outcome over the other based solely on their personal opinions, beliefs or past experiences, and not on the evidence presented.

"We're human beings. We all have biases and prejudices, and that never really goes away," said Collins. "A bias is oftentimes a form of motivation. The prosecution is motivated to incriminate the defendant. The defense's motivation is to get an acquittal or a light sentence. So, then the question becomes, what's the motivation of a forensic scientist?"

Though the existence of true objectivity in science has been hotly debated for decades, an important part of becoming a forensic scientist is learning how to regulate your own biases so that they can be separated entirely from your work.

"There is a feeling, I think, that prosecutors have and that investigators have, that they're doing good work and they're getting justice for victims. And it's easy to fall into that mindset when you're working in that system so closely with those stakeholders," said Tiffany Roy, forensic DNA expert and president of the forensic consulting agency ForensicAid. "However, a forensic scientist is an advocate for the science, and that means protecting the science. Protecting it from the prosecutor, protecting it from the defense attorney. Those people have ethical obligations that are very different from the scientist, and they might want to use your evidence or aspects of it as part of their narrative."

Whether the evidence could be used in support of the narrative put forth by the prosecution or by the defense should be of no consideration to the forensic scientist. Everyone involved in a criminal trial—the prosecution, the defense and the court—should be able to trust in the authority, expertise and objectivity of the forensic scientist.



The Consequences of Bias in Forensic Science

If a forensic scientist were perceived by a jury to be biased, this could have consequences not only for the criminal case at hand, but for the scientist themselves and the forensic lab to which that scientist belongs.

Chair of the Department of Forensic Science at the University of New Haven and former Connecticut State Police Detective Peter Valentin said: "I think, in the worst-case scenario, the jury completely disregards what otherwise would have been a valid interpretation of what the evidence had to say. Even in the presence of extraordinarily probative evidence, if the jury for whatever reason doesn't believe that the analyst that's testifying is objective, they are free to disregard that testimony and, as a result, disregard what that evidence had to say."

While casting aside key evidence obviously has dire implications in the context of a trial, attorneys can cite that situation going forward to discredit and undermine any future testimony from that scientist.

"If the forensic scientist is perceived to be biased, obviously it calls into question the accuracy of the results that are being reported. It has downstream effects too, because then it creates anxiety about the capability of that scientist to be helpful in future cases. What you get is a trust problem," said Collins.

Further, aside from tarnishing their own reputation, a scientist accused of allowing personal biases to affect their work in turn reflects poorly on their lab, potentially impacting the testimony of all the other analysts working there.

"An issue of bias in a particular analyst can very easily be turned into a systemic issue of poor training, poor supervision, and that would certainly affect the testimony of other analysts within the same laboratory," said Valentin.

The Hazards of Social Media

As countless people have discovered in their use of social media, anything you post publicly can be distributed and interpreted freely, sometimes exposing you to a degree of scrutiny you may not have anticipated. Even if you take something off social media after the fact, there's no guarantee that it won't resurface later. Someone like a forensic scientist, for whom personal biases can become a real liability, needs to think carefully about how the things that they post could be used to cast their expert testimony into doubt.

"You have to remember that whenever you're an expert, whatever your expertise is in, you are an authority. Expertise gives you authority in a particular subject matter, and then you use that authority to exert some kind of influence," said Collins. "The problem with social media is that if it is misused, or if you lose your sense of self-control in your engagement with social media, that can impact whether you are seen and trusted as an authority."

Even things that seem innocuous—something as simple as a comment on someone else's post, or a like—can be twisted to paint you in an unfavorable light.

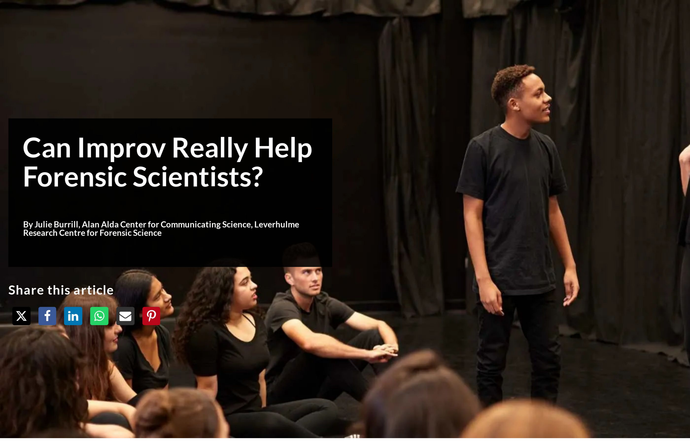
"For those of us who are in the criminal justice realm, we have to be extraordinarily careful about not only our intentions when we post things on social media, but also about the way that somebody can twist what we've said. We need to consider how somebody could think about us or draw opinions about us based on something we posted," said Valentin.

Though it may not always feel fair that your personal life and professional success as a forensic scientist are so intertwined, it comes with the territory.

"You're not just a scientist, but you're a scientist that provides information to do one of the most important public functions, and there's value to that," Valentin said. "In exchange for that really important role that you have, there are some obligations, and one is not to compromise yourself."

That said, it's not necessary to abandon social media entirely—but if you're going to use it, it's a good idea to lay down some ground rules for yourself as far as protecting your public persona on the internet, whether that's avoiding expressing personal opinions about controversial topics, carefully vetting the photos you post for sensitive content or otherwise.

"I know lawyers have this joke: 'Dance like no one is watching and e-mail like it's going to be read aloud in a deposition,'" said Roy. "I really believe that, for forensic scientists, they need to keep in mind that we are part of the justice process and anything that they put out into the public sphere is going to reflect on them."



Can Improv Really Help Forensic Scientists?

By Julie Burrill, Alan Alda Center for Communicating Science, Leverhulme Research Centre for Forensic Science

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The coupling of improv theater and scientific reporting may not seem an obvious choice at first glance, but Forensic Science can learn a lot.

Alan Alda (best known for television show M*A*S*H*) hosted a PBS show for many years, "Scientific American Frontiers," that highlighted groundbreaking scientific research. As host, Alda traveled to the labs and research sites of scores of scientists to talk to them about their work and its significance - to them and the world. Throughout the show, Alda found that some scientists had a hard time breaking out of "lecture mode" and into an authentic conversation in front of the camera. He found himself relying on his improvisational theater training - a method that focuses on deep listening and building interpersonal connections - to help them share their work in conversational ways that non-scientists could understand. That experience got Alda thinking.

"I really wanted to understand this [research] myself. And that forced them to drop the lecture and really concentrate on me...Why can't we train scientists to have that relationship with the people they're communicating with?...Why can't we train scientists, while we are training them to be scientists, train them to be good communicators?"

In 2009 he helped to found the Alan Alda Center for Communicating Science, whose mission is to use the fundamental tenets of improvisational theater, coupled with the practices of good communication theory based on social science research, to develop a new type of communication training. Subsequently, this unique blend became known as The Alda Method©.

When the Leverhulme Research Centre for Forensic Science at the University of Dundee in Scotland recognized "Communication" as one of the central research areas in Forensic Science in need of "positive disruption," a potential partnership was born. They too were asking how we can train forensic scientists as communicators, and how to use best practice to do so. Bringing science communication research to forensics was the natural next step.

Forensic science exists to be communicated. We are all taught at some point early in our training that the word "forensic" comes from the Latin word "forensis" meaning "in the public, or open court." The results must be shared openly with the public or the court; the reason forensic science exists is to serve a legal function. More than many scientific disciplines, forensics has a mandate to be translated for people who are not necessarily scientific experts.

In addition, the structure of the adversarial legal system can make the presentation of scientific evidence more like putting on a show than we, as scientists, like to admit, even to ourselves. Although few criminal cases proceed to trial and even fewer use forensic expert testimony, the process of testifying can bear an uncomfortable resemblance to performing and has certainly been known to induce something akin to stage fright.

Enter, improv theater.

The Alda Method© is not used to turn scientists into actors or stand-up comedians. The forensic science communication training is not about developing a script or teaching you to tell jokes or play a character. Instead, the method guides you to isolate and practice specific skills that research indicates make people more comfortable with and successful at communicating science. The principles of improv readily map onto those of effective science communication.

For example, a core principle of improv, called "Yes, And ..." stipulates that partners must accept each other's reality and build off it to move forward together. You need to understand where the other person is coming from and accept it, even if you do not agree with it. From there, you can find ways to build connections, trust, and start a real conversation.

A good science communication conversation works the same way. As we practice in this communication training, this does not mean agreeing with factual inaccuracies. Instead, the forensic science curriculum aims to help recreate an experience like a cross-examination as a joint conversational build. Instead of an interrogatory gauntlet to survive, the questions are framed as an opportunity to practice meeting your conversational partner where they are, genuinely connecting with them, and contributing to the greater goal of creating something for the audience (e.g. the jury).

Most forensic scientists do not receive extensive communication training. Typically, we may have a moot court exercise at the end of an undergrad or master's course and then again during our initial on-the-job training. These are usually practice testimony and we get feedback from more senior scientists or attorneys. These can be highly valuable, but are usually infrequent. They rarely include research into how people understand and process novel scientific information, what juries understand, or which models of communication demonstrably make for a successful scientific exchange.

This workshop curriculum on Courtroom Communication for forensic scientists was developed by a team combining our respective experience in forensic science and the Alda Method© science communication training. Dr. Julie Burrill has a background in forensic DNA and criminal trial consulting, while partner Josh Rice has years of experience in theater, improv, Alda Method© facilitation and curriculum design. We have deliberately incorporated a moot court exercise familiar to forensic scientists, as well as broken down forensic science communication into basic skills to practice. The program uses exercises for forensic scientists to learn to be adaptable, empathic communicators who share their evidence with the jury using a cognitive framework and vocabulary that will resonate.

The Courtroom Communication program reframes the act of testifying as an opportunity for conversation that will help the jury understand the evidence. To do this, forensic scientists engage with social science research about why and how communication works, develop strategies that will help achieve specific goals, and practice different tactics with peers. We focus on what active listening really looks like, how to build analogies for complex or quantitative concepts, and ways to create connections with the jury. We train forensic scientists to center the experience of the jury and thus reorient their testimony through the lens of "what the jury needs to hear" rather than "what the expert wants to say."

There are a lot of challenges to good communication baked into the formalized, interrogatory structure of courtroom testimony, but these can be mitigated with the exercise of good science communication practice.

The Alda Center has a history of helping scientists in a huge range of disciplines to reframe their scientific stories, consider their audience, and become more effective communicators. While scientists in all areas should have the opportunity to improve their communication skills, it is critical in forensic science. The data, their interpretation and the contextual meaning must all be communicated throughout the investigative and judicial process - to other scientists, to law enforcement, to social workers, to attorneys, to judges and finally to juries. Decisions that deeply impact peoples' lives are made at each of these steps. It is incumbent upon the forensic scientists to provide a thorough, accurate, and comprehensible interpretation of scientific data at various stages of the process.

As forensic scientists, we like to consider ourselves neutral in the judicial process. Regardless of who presents our testimony, we are not advocating for either prosecution or defense, but for the science. This training gives scientists the tools to do that more successfully. We are looking forward to sharing this workshop with you at the upcoming ISHI in September 2023.

Would you like to learn more? Consider attending the *Courtroom Comms: Testifying about Forensic Science with Communication Best Practices Workshop.* In order to keep the workshop interactive for participants, the class size will be limited to 24 participants. Julie and Josh will be holding two sessions of the workshop - one on Sunday and another on Monday. Learn more on our website.

For more information on this program and other Alda Method© curricula, please visit: www.aldacenter.org/

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Forensic Scientist of Note

Natalia Yael Sandberg Lacasa

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Throughout my life, my curiosity and passion for science, and unknowingly, criminology, have led me to pursue a career in forensic genetics. I believe that passion is the only way to approach science, and I have dedicated myself to continuous and rigorous training in the field, overcoming any obstacles that come with starting something new.

I grew up watching Investigation Discovery series, dreaming of being able to solve criminal cases someday. The path didn't seem easy, and undoubtedly it wasn't, but nothing prevented me from achieving my goals because, in addition to my passion for what I do, I am characterized as obstinate and tenacious. The high demands and aspiration for excellence are a way of life for me, not allowing for lack of rigor in the workplace, which enables obtaining results that contribute to justice in an irrevocable and reliable way.

Becoming a mother changed my priorities, but not my goals, which I have been able to sustain with sacrifice despite my reduced free time. Currently, my days are divided between my partner, work in the laboratory, and my ten-year-old son Lucas, with whom I share a love of sports, chocolate, and anchovies. I take great pleasure in accompanying and supporting him in his soccer life as it is the sport he has decided to invest his recreational time in.

Although I am not a morning person, I have managed to incorporate physical exercise into my morning routine, which helps me to relax and balance my energy for the rest of the day.

In my leisure time, I love sharing long walks along the coast of Montevideo (capital of my country) with my partner, talking about life, concerns, and projects. Spending time with my loved ones is essential for me to stay centered. I enjoy a close-knit family with my mother and my three siblings, whom I deeply love.

I decided to study forensic genetics when I was 17, which involved a great risk as I was about to embark on a university career and then try to enter the Scientific Police, the only place in the country dedicated to that subject. This was taken with bewilderment and at the same time with enthusiasm by those around me since it meant something original and innovative.

During my years as a student, I worked in sales, which offered me the possibility to exploit my relationship skills and ascend to become in charge of a world-renowned brand. That place provided me with tools for managing personnel that still benefit me today. Eventually, the day came when I had to choose between my true passion, science, and my other hobby, sales since I couldn't maintain both jobs.

Since I joined the *Dirección Nacional de Policía Científica*, more than 18 years have passed, and although I was very young, I always had strong support from my different superiors, trusting my ability without hesitating to provide me with academic growth opportunities.



My beginnings in Forensic Science were as an analyst in the Biological Laboratory, and I still remember the excitement and satisfaction that analyzing forensic cases generated in me. Parallel to my work in the laboratory, I obtained my degree and later specialized continuously in the forensic area. Over the years, I became interested in the analysis and interpretation of criminal minds, which led me to Neurophysiology and eventually completing a Master's degree in Neurobiology. This, as a single mother and already at that time as the head of a laboratory, meant many hours of practice, study, and research for three years, culminating in work of which I am proud.

In order to expand my job market, I worked and studied in the field of medical genetics for several years. I am aware that for my age, I have come a long way in the field of criminology. I have been fortunate enough to learn from various international courses offered by the National Police and the University.

In Uruguay, forensic genetics is only developed in the police field, and I have had the privilege of attending its growth and actively participating in its development. Although my entry was in 2005, in 2011, my then-boss and I left the Evidence Laboratory to focus entirely on the creation of a Criminal Genetic Bank for the country. Until that date, although the Biological Laboratory was very efficient in terms of analysis and obtaining genetic profiles, there was a large percentage of cases without resolution due to a lack of suspects.

This meant the greatest motivation to create that Criminal Genetic Bank and thus help justice solve those inconclusive forensic cases. The road was difficult, but we finally managed to vote for the Law for the creation of that bank and thus under-take the new stage of creating what would later be called the "National Registry of Genetic Footprints" Laboratory, which I have been leading since 2016. I enjoy the position and feel natural in it. I have managed to form a solid team of work integrated by other women scientists with whom we administer and manage the country's criminal database.

I am proud to have participated since the birth of this project, which I can say has helped justice in resolving more than 50% of the cases that were inconclusive. Our success rate is comparable to that of the first world, and growth has been exponential.

In mid-2020, I faced one of the biggest personal and professional challenges I've ever had. One day, like any other, I was at home watching forensic case programs, as I usually do, until I came across an interview with Argentinian parents whose teenage daughter had been murdered. The young woman had been suffocated, stabbed, and buried on a tourist beach on the coast of my country during her vacation with her godparents. After this interview I was deeply shocked and decided that same day I would do something for that family.

From that particular forensic case, there was a single male genetic profile loaded on CODIS software by the Biological of the *Dirección Nacional de Policía Científica*. It had been obtained from a bloodstain found at the crime scene, and whose confrontation with our database had not yielded positive results, being a "Cold Case" from 2014. I began to create investigation strategies that initially involved searching for kinship with any male already in the database and thus achieving the culprit. This frustrating process culminated in May 2022 when, after two and a half years, I managed to identify the perpetrator and thus be able to provide some peace to those parents. This fills me with pride and satisfaction given that the investigation process was long, complex, and silent, but finally, I managed to impose myself on the police hierarchies to gain trust in my work in the absence of precedents of this type and without statistics to support my primary hypotheses. On a personal level, the resolution of this case meant not only being awarded by my Unit and the highest hierarchies of the *Ministerio del Interior*, but also being featured in the press of my country and Argentina for a long time. This has been extremely comforting because of the recognition I have been receiving from people expressing their affection and gratitude. All of this means motivation to develop a project that focuses on long-term case work and is also enhanced by the visibility and interest it brought to the press and authorities.

I believe that working in the police force involves a high degree of social responsibility that not only should we involve ourselves in a cold and objective manner given our scientist character, but we must be aware that behind the families left behind, there is great pain and an urgent plea for justice. Personally, I am a very sensitive person and tragic events affect me deeply, to the point where I cannot just do my job, clock in and go home. I've always felt the need and the obligation of doing more for other people and have embodied this throughout my years leading the lab. Currently I am working on a project called "Search for Missing Persons through their Relatives." This was well thought out and came to fruition just before the COVID-19 pandemic began. Since the beginning of this project, many people have been identified and those families were finally able to give some closure to the uncertainty and anguish caused by the absence of their loved ones.

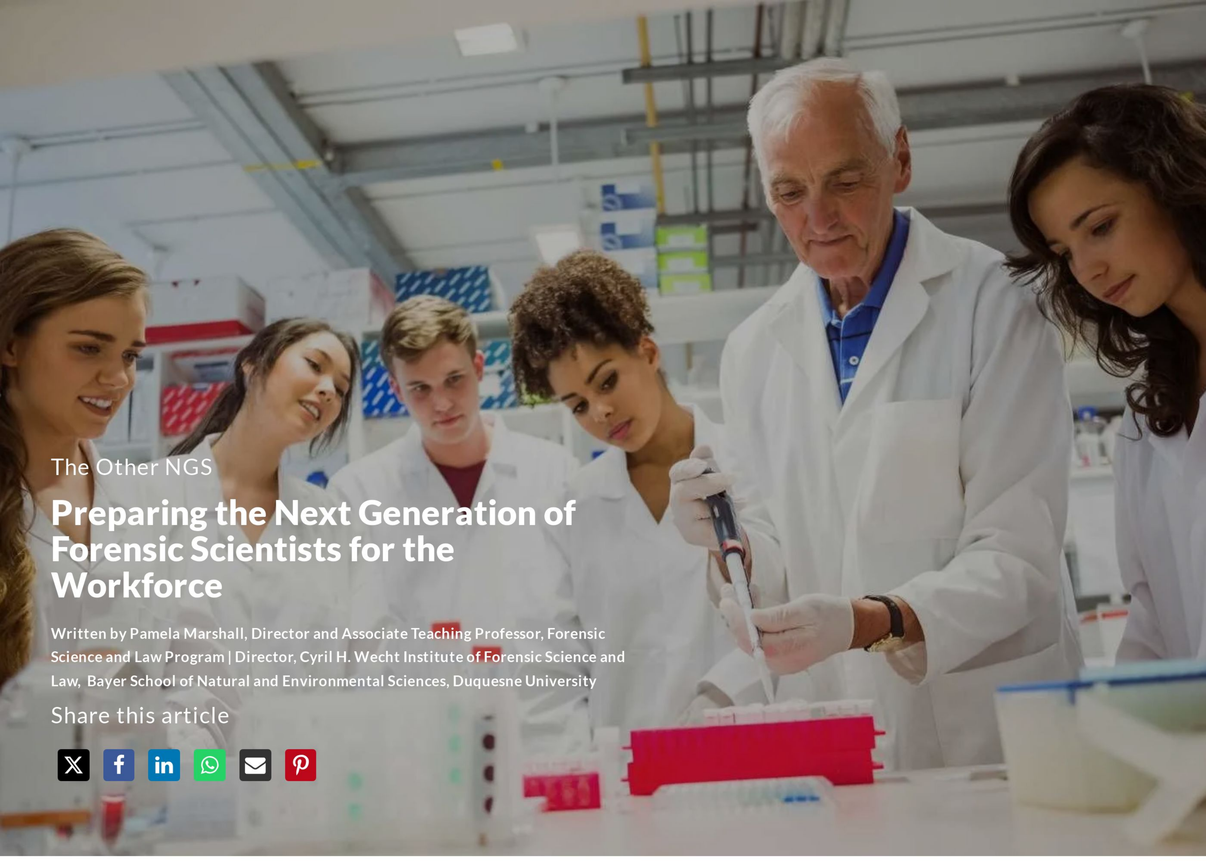
When I started on the path of forensic genetics, I always knew and set out to go far. That has been my driving force. Doors continue to open in unexpected ways, but clearly, it is due to effort, perseverance, and persistence. I will always act in accordance with the values that were instilled in me as a child and that define me as a human being: perfectionist, persevering, responsible, just, strong-willed, and very straightforward. These attributes have brought me quite a few problems throughout my life, but the benefits are greater, so I will continue on the same path.

Post-pandemic, society's view of scientists has changed, as has their appreciation and respect. In the field of genetics, it is not necessary to clarify its value, but it is noteworthy that justice and the police, in my particular case, constantly support training in the area.

It is not insignificant that investigations are now often led and consulted by a scientist, and that those of us who specialize in genetics have become referents. That is where the importance of constant training lies, being able to draw on the knowledge of peers and recognize weaknesses in the search for solutions, the generation of strategies, networks, always aiming to maintain the trust that has been placed in us over these years.

In my particular case, given the role I occupy, I am always interested in pursuing the truth by assisting justice with scientific and consistent tools. That is my ultimate goal, our north, and my passion, without losing a sense of humanity, sensitivity, empathy, and common sense, keeping in mind that the samples we work with are not just codes or numbers; they are people and families.

It was a surprise and a great honor for me to have been chosen to chair the GCLAITH this year. It has always been a pleasure to attend the different annual academic events and has given me the opportunity to exchange with a large number of referents and colleagues. This year, as chair of the event, I set out to address and provide a space for discussion of the different problems that developing countries face, seeking to enable first-tier countries to collaborate with their experiences to enrich exchanges and growth throughout the region. At the same time, I will seek to ensure that we all continue to innovate, grow, and update ourselves as much as possible in this race for knowledge in the forensic field.



The Other NGS

Preparing the Next Generation of Forensic Scientists for the Workforce

Written by Pamela Marshall, Director and Associate Teaching Professor, Forensic Science and Law Program | Director, Cyril H. Wecht Institute of Forensic Science and Law, Bayer School of Natural and Environmental Sciences, Duquesne University

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I absolutely cannot wait for ISHI 34 in Denver, Colorado! ISHI is one of the best conferences and I always look forward to attending the presentations, learning new things, and networking.

These past three years have been a challenge for all of us – how to navigate a pandemic and the social distancing, remote work, and mental health situations that came with it. Pair this with our routine tasks in the forensic setting and it has made for one of the most challenging times in our lives.

In fact, the COVID pandemic impacted all of us in different ways. In academia, student mental health moved to the forefront of education. Educators in forensic science programs struggled to find ways to deliver content and hands-on laboratory experiences in a remote format, with internships dissolving at most laboratory agencies, and other challenges (like maintaining high and rigorous standards for accreditation), all while supporting our student's well-being. These students are now graduating and preparing for the workforce; many of them are prepared academically but may not be ready to face the workplace and the day-to-day trauma that is encountered in a crime lab.

This is the focus that my colleagues and I will be presenting in our one-day workshop titled, The Other NGS: Next Generation Scientists and How to Prepare Them for the Workforce, on Monday, September 18th. As your facilitators, we will discuss best practices in the training of new hires and the onboarding process, and share ways to develop a more resilient workforce. Participants will engage in an interactive workshop to network and bring their own challenges and questions to the peer group. Our goal is to elevate your awareness of the unique challenges with new graduates, while also presenting strategies and solutions for helping new hires cope with their complex roles in the forensic science setting.

As an academician and program director for nine years, I have had the opportunity to get to know this next generation firsthand. I have learned of unique and complex challenges facing students today, even more so in light of the pandemic. And as a former forensic science practitioner, I know exactly what laboratories expect in their new hires.

This interactive workshop is designed for individuals who are responsible for hiring and training new employees, offering them an understanding of these challenges along with tools that they can implement in their own operations, starting with the interview process.

The reality is that the new graduates are smart! It's not about the science – if it was, we would have it easy. The struggle comes with overcoming a fear of being wrong, the fear of making a mistake, building confidence, critical thinking, and dealing with pressure, on the job and in the courtroom. Our workshop will provide well-being resources and strategies that can be incorporated into your own laboratory.

Let's face it, hiring is a time-consuming process and training is costly. We want to help you develop strategies to find the right fit while also recognizing that onboarding is a difficult journey. Finding the right balance of constructive criticism, positive feedback, evaluation, and the try/fail/repeat method that is science, all while navigating the mental toughness of a new hire, can be an exhausting process. But in the end, when it works, and you have someone who considers their role to be a career investment and not just a job, who looks to their next testimony with confidence and not fright, who looks at mistakes as opportunities to learn, you'll have your reward. And you can say that you have better prepared your workforce for the difficult days on the job.

We look forward to seeing you at ISHI 34 and we hope you join us for this thought-provoking and strategy-building workshop!

Workshop Team:

John M. Collins, Executive Leadership Coach

Julie Conover Sikorsky, M.S., Manager, Forensic Biology Unit, Palm Beach County Sheriff's Office

Dr. Ray Wickenheiser, Director, NYSP Crime Laboratory System

Learn more about the workshop and register on our website (www.ishinews.com).

View the ISHI 34 Agenda

Spotting Trends in Forensic DNA

Dr. Jo-Anne Bright, New Zealand Institute of Environmental Science and Research (ESR)

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Advances in forensic technology continue to expand the availability and reliability of objective forensic information within the criminal justice system. The success of forensic testing and DNA database systems in aiding criminal investigations has often led to increased evidence submissions. With more submissions and the introduction of new technologies, we are continuing to see growth within the field. In the U.S. alone, the Bureau of Labor Statistics projects the number of jobs for forensic science technicians to rise by more than 11% by 2031.

With that in mind, this article discusses several of the many forensic tools and techniques that continue to change the way forensic laboratories work. Prominent examples include:

- Next Generation Sequencing (NGS), a massively parallel sequencing technology used to determine the order of nucleotides in entire genomes or targeted regions of DNA or RNA;
- Forensic Investigative Genetic Genealogy (FIGG), which combines genealogical research with advanced DNA testing to provide potential links to unknown profiles;
- Activity level propositions, where analysts use Bayesian statistics to help address questions relating to transfer and persistence of DNA that might be of more relevance to the courts;
- Miniaturization, which includes shrinking laboratory equipment, and making the techniques faster (such as Rapid DNA technology), portable, and more efficient; and
- Artificial Intelligence, which has primarily been used in digital forensics, but is increasingly being used in other forensic applications including the designation of alleles and stutter within DNA profiles, and the assignment of the number of contributors to mixtures.

There are, of course, many more exciting areas of forensic DNA research, including lineage markers, proteomics, microbiomics, epigenetics, and non-human DNA applications. The emergence of these new technologies, coupled with continued support and development of probabilistic genotyping (PG) software for the interpretation of autosomal short tandem repeat (STR) profiles, has led our STRmix team to work with researchers and practitioners to enable the use of emerging technologies in casework. STRmix™ alone is now being used by over 100 organizations globally, with many more validating the software.

The emergence of so many new technologies onto the scene requires us to consider a range of issues relating to the current state of each technology. Given that, let me attempt to provide some food for thought.

Looking at Rapid DNA devices, STR profiles developed from such devices have been significantly more variable than standard laboratory methods to date. In 2018, the FBI established the Rapid DNA Taskforce which is working closely with developers of Rapid DNA technology to ensure profiles obtained from evidence collected at crime scenes are of suitable quality for CODIS entry. Inevitably, some of these profiles will be mixtures and appropriate PG solutions will be necessary. We have been working closely with end users and look forward to seeing the advances made with the updated kits and devices.

Existing PG software solutions assign likelihood ratios that address who might have contributed DNA to the sample (sub-source propositions). Quite often, however, the issue of interest to the court is not whose DNA is present, but rather how was that DNA transferred to an exhibit (for example, was it secondary transfer?) or how long might it have been there. These are activity level propositions.

Some analysts in Europe and Australia are already reporting activity level propositions in selected cases. Published research into the mechanisms of DNA transfer, persistence, prevalence, and recovery (collectively called DNA-TPPR) is increasing. These studies are particularly important since they can inform the probabilities necessary for the assignment of likelihood ratios at the activity level.

The wider use of PG software has led to the development and growing adoption of other tools designed to complete the full workflow from analysis to interpretation and database matching. Examples from the STRmix team alone include the data analysis software FaSTR™ DNA and DBLR™, a tool for the calculation of likelihood ratios for mixtures and single source profiles given any set of propositions including kinship scenarios.

FaSTR™ DNA is the STRmix team's first foray into the use of artificial neural networks, which optionally can be used to assist trained analysts with the objective labelling of peaks within a profile probabilistically as artefactual or real. These probabilities subsequently can be used within STRmix™, meaning that not only alleles and stutters will be considered within the profile interpretation, but also artefacts including pull-up and baseline.

In addition to autosomal STRs, these tools now incorporate a growing NGS analysis capability, including within the investigative functions of DBLR™. DBLR™ can accept NGS sequence-based inputs and, when used in conjunction with STRmix™ software enables forensic laboratories to visualize the value of DNA mixture evidence, undertake mixture-to-mixture comparisons, conduct complex pedigree analyses, and achieve superfast database searches.

Looking to the future, the STRmix team anticipates more of the forensic community will evaluate the usefulness of NGS technology. We are actively engaging with the forensic community to gauge what this future looks like with regard to PG. Developers of this technology assert that it provides a depth of information beyond the capacity of traditional forensic DNA technologies. A key question, though, will be how it is used in combination with our legacy databases. Globally, existing databases used for criminal investigations contain tens of millions of STR profiles from known individuals. CODIS alone contains over 20 million offender and arrestee profiles. For this reason, we predict STR loci will be the workhorse of forensic laboratories for the near future.

One of the limitations of STR technology analyzed on capillary electrophoresis (CE) instrumentation is the relatively small number of loci available within the one multiplexed reaction. NGS technology does not suffer from this limitation. With STRs, additional loci can be squeezed into a multiplex horizontally by decreasing their length (using mini STRs, for example). Loci may also be added "vertically" by adding more dyes to the multiplex. This latter approach is a recent innovation from Promega with their Spectrum instrument and new PowerPlex™ 35GY System, encompassing both autosomal and Y-STR loci within the one multiplexed reaction using eight dyes.

Technology utilizing single nucleotide polymorphism loci (SNP) is now being embraced by laboratories routinely analyzing samples from small, degraded samples such as bone samples. Panels are being designed with tens or hundreds of thousands of SNP loci. These loci are much smaller than traditional STRs and are, therefore, less prone to degradation. Many of the advantages attributed to NGS technology relate to SNP loci.

By multiplexing thousands of SNP loci, increased discrimination power can be achieved, aiding investigation efforts such as facial reconstructions of human remains, the differentiation of identical twins, and the identification of previously unidentified remains using FIGG. Given the small sample sizes required, SNPs on NGS platforms are more sensitive and discriminatory compared with STRs analyzed on CE technology. They may produce additional information, such as identity-specific, ancestry, and phenotypic data.

The investment in NGS technology is significant, which may constrain the adoption of the technology for many laboratories in the immediate future. Reporting nomenclature for NGS-generated STRs will still need to be standardized, laboratory staff will still need comprehensive training, and proficiency testing programs will still be required. NGS technology produces significantly more data than traditional DNA typing using CE technology so it is likely laboratory information management systems will need significant configuration to account for this.

For laboratories that look to implement NGS technology for routine casework with a PG solution for interpretation of mixed DNA profiles, admissibility considerations will arise. There will inevitably be significant Daubert and Frye hearings and challenges to both profile generation and its interpretation. The forensic community will need to ensure that it is in a position to demonstrate that the evidence generated with NGS is based on scientifically valid reasoning which can properly be applied to the facts at issue.

The field of forensic biology is constantly evolving, and there are many new and exciting changes coming in the future. New techniques come with new challenges, and these challenges present exciting opportunities for research and collaboration in order to establish robust interpretation methods for emerging forensic DNA evidence. We look to the future with much interest, intrigued to see what else is around the corner.

Dr. Jo-Anne Bright is Senior Science Leader at the New Zealand Institute of Environmental Science and Research (ESR) and one of the developers of STRmix™. For more information, visit https://www.strmix.com/.

Advertorial

IDseek®: The Next Revolution in Forensic MPS

Written by: Pieter van Oers and Katelyn Richards, NimaGen

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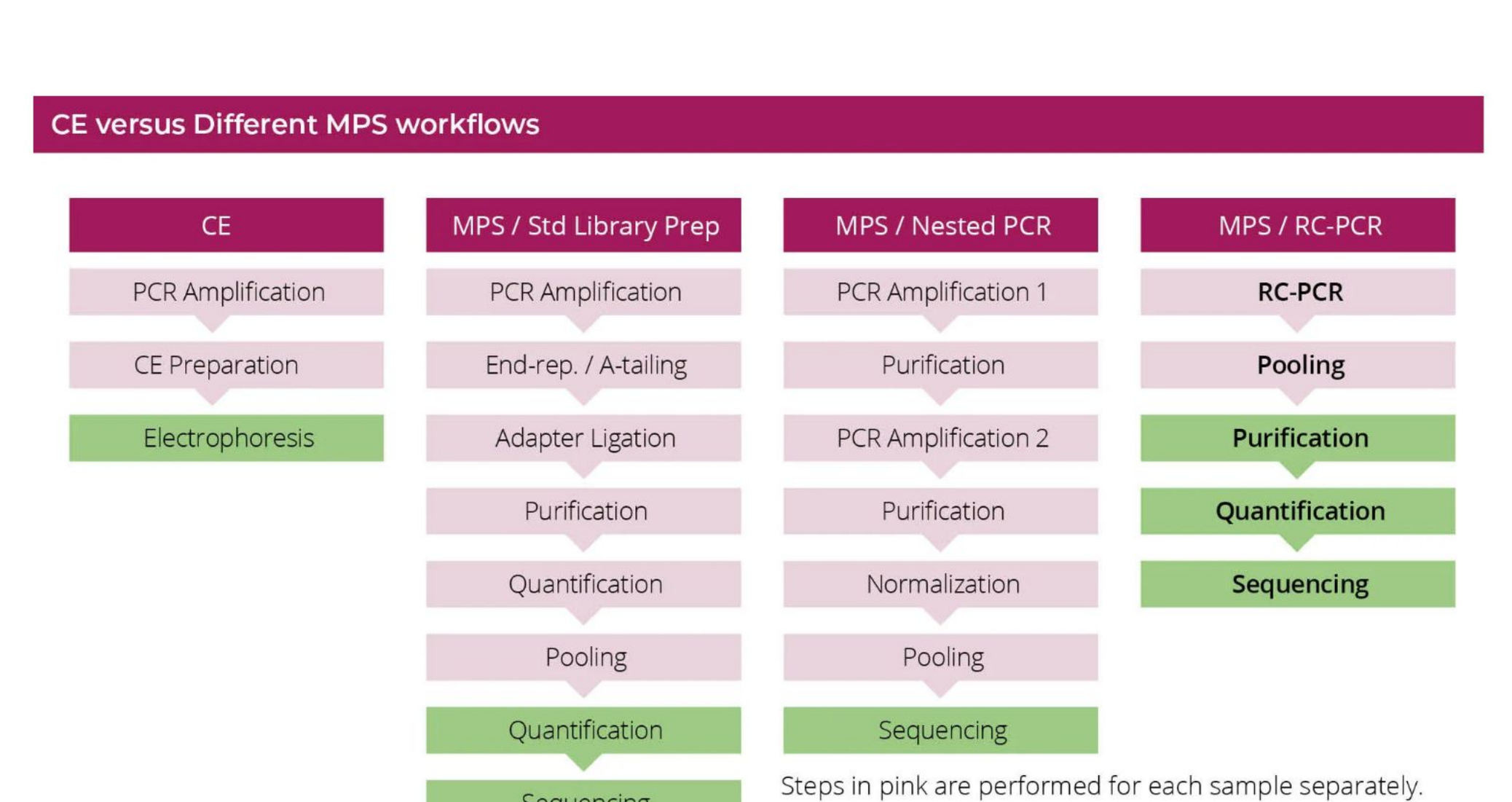
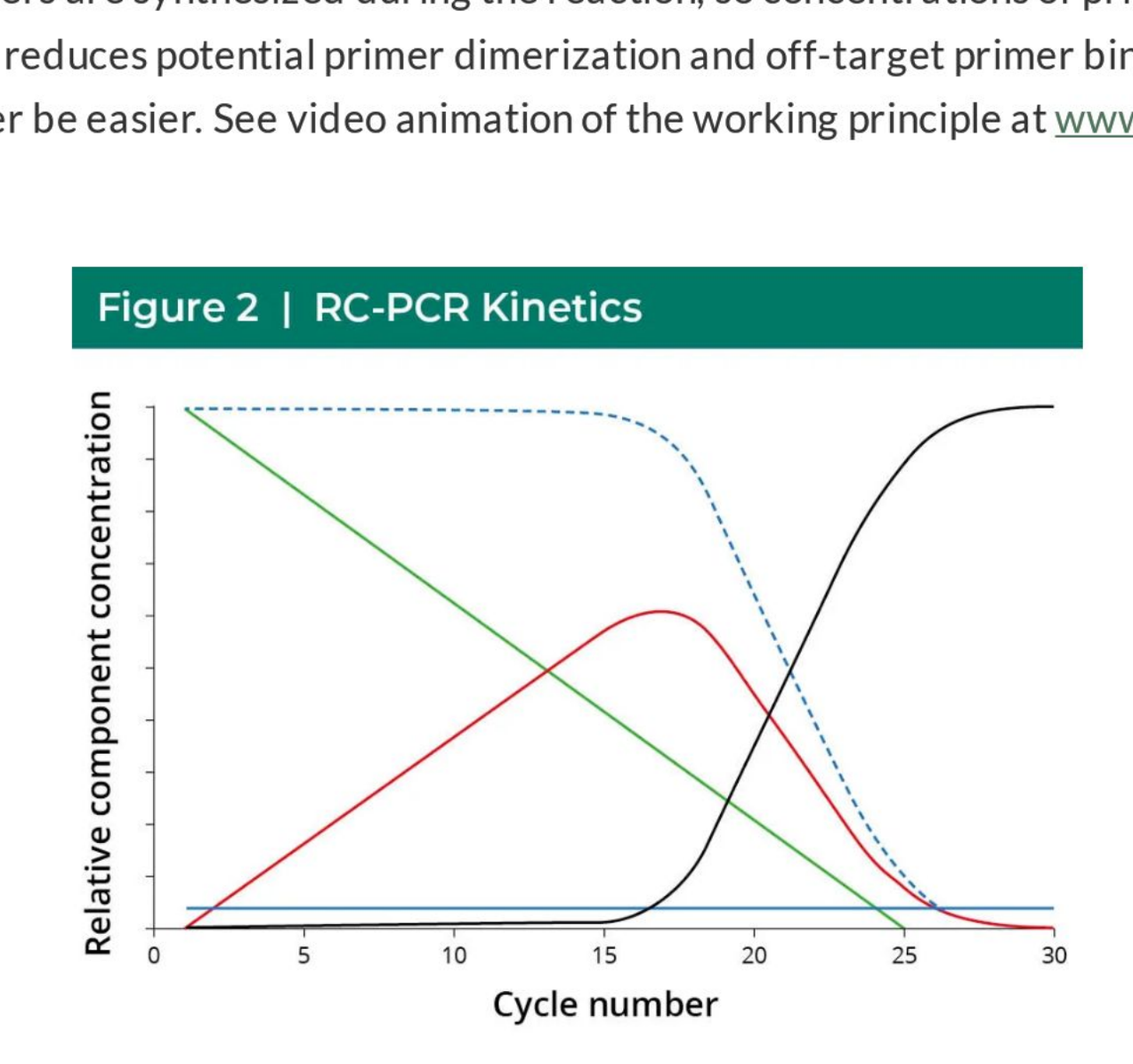
The Power of MPS in Forensic DNA Analysis

After more than thirty years of DNA analysis in forensics using classical methods such as PCR followed by Fragment Analysis by capillary electrophoresis (CE), new technologies based on Massive Parallel Sequencing (MPS) are now changing this field. In addition to unravelling complicated mixed DNA traces, it can also reveal far more information and be used with lower quality and highly degraded samples. Existing MPS library preparation methods are complicated, typically involving multiple hands-on steps, error-prone workflows, increased risk for amplicon contamination and sample swapping. With the introduction of the novel and innovative Reverse Complement PCR (RC-PCR) technology, NimaGen opens doors for the forensic community to make the transition from classic CE to MPS in the safest and simplest way possible, without compromise.



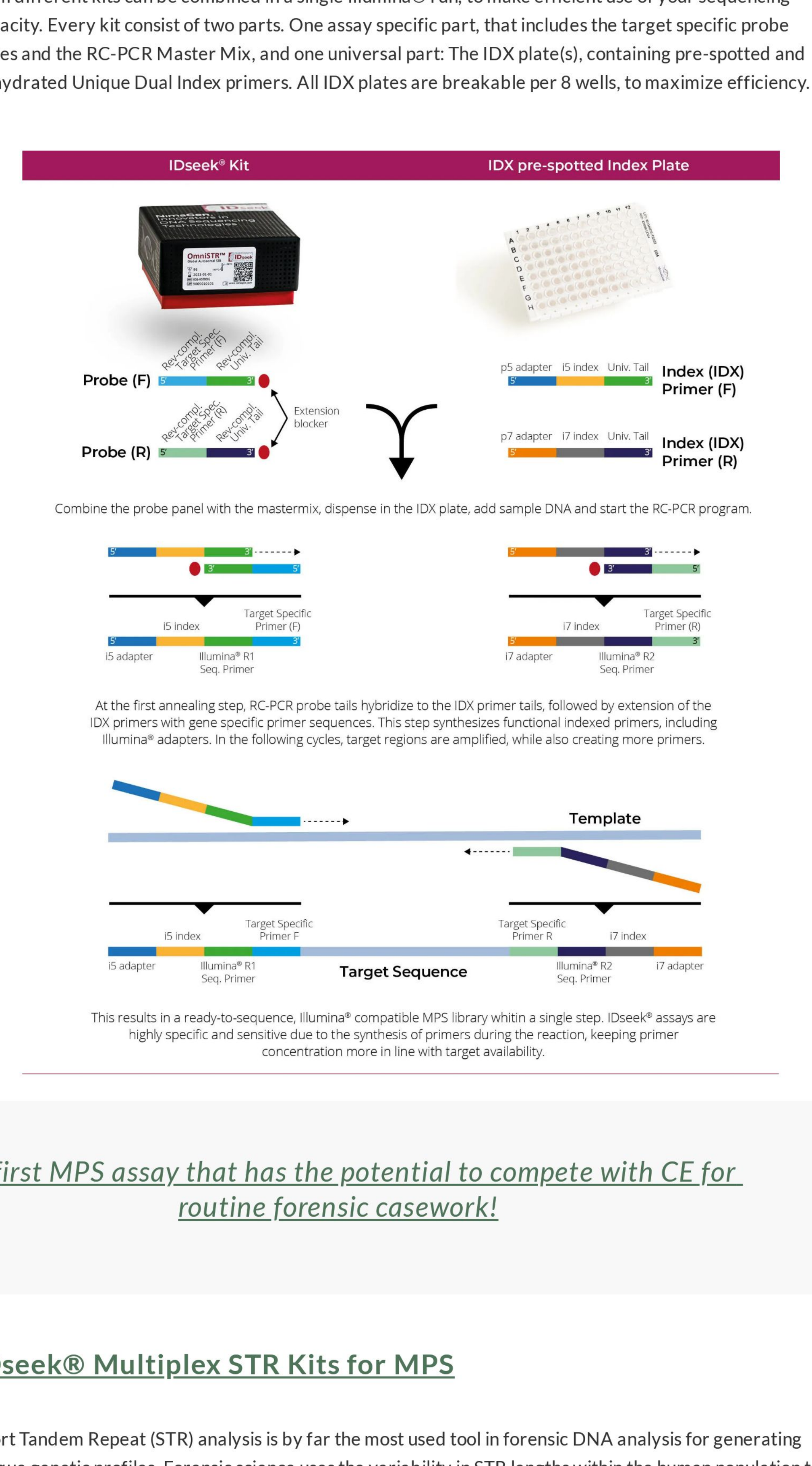
Reverse Complement PCR (RC-PCR) Technology

DNA Sequencing methods typically involve multiple steps, whether it is classical Sanger Sequencing or MPS. RC-PCR from NimaGen is a breakthrough technology providing MPS library prep in a single, closed-tube workflow, with extremely low handling. Multiplex targeted amplification, adapter addition and Indexing all occur simultaneously in a single, closed tube reaction: simply add your DNA to the pre-dispensed index tubes and run the PCR reaction in your thermal cycler. As a direct consequence of the Unique Dual Indexing in the very first step of the library prep ("Early Indexing"), and the single-step amplification, the risk of sample swapping, PCR contamination and pipetting errors are drastically minimized. Additionally, the reaction kinetics of RC-PCR results in high sensitivity and specificity, due to the fact specific primers are synthesized during the reaction, so concentrations of primers and amplicons are more in line. This reduces potential primer dimerization and off-target primer binding. MPS targeted library prep will never be easier. See video animation of the working principle at www.rcpcr.com.



IDseek® MPS library prep: How does it work?

NimaGen offers a range of forensic MPS library prep kits that all work with the same principle. Libraries from different kits can be combined in a single Illumina® run, to make efficient use of your sequencing capacity. Every kit consist of two parts. One assay specific part, that includes the target specific probe mixes and the RC-PCR Master Mix, and one universal part: The IDX plate(s), containing pre-spotted and dehydrated Unique Dual Index primers. All IDX plates are breakable per 8 wells, to maximize efficiency.



The first MPS assay that has the potential to compete with CE for routine forensic casework!

IDseek® Multiplex STR Kits for MPS

Short Tandem Repeat (STR) analysis is by far the most used tool in forensic DNA analysis for generating unique genetic profiles. Forensic science uses the variability in STR lengths within the human population to enable scientists to distinguish between different DNA samples and run them against databases to obtain a match. In the classic analyzing method, DNA fragments are separated and detected using capillary electrophoresis (CE) in order to determine allele length. MPS technologies add significant benefits over CE analysis, such as not being limited by the number of available fluorescent channels or primer design restrictions due to amplicon size or length constraints. Taken together, these benefits allow MPS to overcome a number of complicating factors:

- Allowing the recovery of fuller profiles from challenging samples due to reduced amplicon sizes
- Providing the full base sequence in and around the repeat motifs, further increasing the discriminative power of STR markers.
- Higher multiplexes for more STRs to be detected simultaneously avoiding the need for separate secondary workflows.
- Differentiation of genetic profiles from complex mixtures, commonly associated with crime scenes.

All amplicons in NimaGen's STR multiplex kits are designed to meet the shortest possible fragment lengths and are compatible with Illumina® MiSeq™ systems, with 2 x 10 bp Unique Dual Index reads. This combination of state-of-the art features with the possibility for automated data analysis without human intervention makes this kit the ideal solution for the transition from CE to MPS.

IDseek®OmniSTR™ Global Autosomal STR Profiling

The OmniSTR™ Kit is a single reaction, multiplex library prep kit for autosomal STR profiling, including all the US and European expanded core loci, plus SE33, D4S2408, D6S1043, D9S1122, D17S1301, D20S482, PentaD, PentaE and DYS391. All targets have been designed for short amplicons, while maintaining the most informative sites in the flanking regions. Forensic STR profiling by MPS tend to be applied in specialty cases due to high hands-on time investments. The unmatched simplicity, robustness, sensitivity and safety of IDseek® now facilitates a routine MPS application, hardly exceeding hands-on time of CE.

Amplicons IDseek® OmniSTR

Marker	Length (HG38)	US - EU	Marker	Length (HG38)	US - EU
AMEL-X	105	• •	D3S1358	124	• •
AMEL-Y	111	• •	D4S2408	124	
CSF1PO	147	• •	D5S818	144	•
D10S1248	119	• •	D6S1043	117	
D12S391	139	• •	D7S820	185	•
D13S317	144	•	D8S1179	130	• •
D16S539	226	• •	D9S1122	116	
D17S1301	134		DYS391	158	
D18S51	167	• •	FGA	165	• •
D19S433	128	• •	PentaD	175	
D1S1656	157	• •	PentaE	81	
D20S482	119		SE33	287	•
D21S11	209	• •	TH01	83	• •
D22S1045	124	• •	TPOX	88	•
D2S1338	200	• •	VWA	165	•
D2S441	134	• •			

IDseek® mYSTR™ Y-Chromosomal STR Profiling

The mYSTR™ kit is a single reaction, multiplex library prep kit for Y-Chromosomal STR profiling, amplifying 27 Y-chromosomal STR markers plus Amelogenin in a single multiplex. All targets have been designed for short amplicons, while maintaining the most informative sites in the flanking regions. Forensic STR profiling by MPS tend to be applied in specialty cases due to high hands-on time investments. The unmatched simplicity, robustness, sensitivity and safety of IDseek® now facilitates a routine MPS application, hardly exceeding hands-on time of CE.

Amplicons IDseek® mYSTR™

Marker	Length (HG38)	Marker	Length (HG38)
AMEL-X	106	DYS448	243
AMEL-Y	112	DYS456	149
DYS19	212	DYS458	166
DYS385A	261	DYS460/461	272
DYS385B	249	DYS481	140
DYS387S1A	231	DYS505	173
DYS387S1B	244	DYS522	303
DYS389-I	153	DYS533	220
DYS389-II	127	DYS549	135
DYS390	174	DYS570	125
DYS391	159	DYS576	129
DYS392	121	DYS627	262
DYS393	183	DYS635	154
DYS437	205	DYS643	144
DYS438	136	Y-Gata-H4	200
DYS439	220		

IDseek® Mitochondrial DNA HVR and Full Genome

The use of MPS for the analysis of Mitochondrial DNA (mtDNA) adds great benefits for Forensic Scientists, especially for samples like hairs, teeth and bones, coming from crime scenes or disasters, or ancient DNA samples. Also, for the analysis of any samples that contain very low quantities or highly degraded nuclear DNA, mtDNA analysis can add extra power in creating genetic profiles. Since every human cell contains up to 2000 mitochondria, and the mtDNA is more stable than nuclear DNA, the higher sensitivity of mtDNA analysis can add additional tools to the standard autosomal or Y-chromosomal genetic profiling. With the introduction of the IDseek® mtDNA sequencing assays, the High Variable Region (HVR) or the entire mtDNA genomes can be easily sequenced, providing additional information, like haplotypes and heteroplasmy. Like every IDseek® assay, the workflow is extremely straightforward and safe. In contrast to the STR and SNP assays, the mtDNA kits have two probe pools per sample, separating overlapping fragments in order to obtain full length sequences after alignments. The IDseek® Mitochondrial DNA HVR Sequencing kit is based on two (2) multiplex reactions of 5 amplicons each. The amplicon lenghts are 150 – 230 bp. The IDseek® Mitochondrial DNA Full Genome Sequencing is based on two (2) multiplex reactions of 50 amplicons each. The amplicon lenghts are 150 – 250 bp.

IDseek® OmniSNP™ Identity Informative SNP Typing

New technologies have increased the spectrum of sample types that can be subjected to DNA analysis. While several human ID markers are offering amplification of short amplicons, several forensic samples (e.g., human remains and touch evidence) do not always contain sufficient quantity and quality of DNA to be typed with current methodologies. As a result, challenging samples with high DNA fragmentation may not contain sufficient intact templates for successful PCR amplification. Several studies have reported that DNA fragments in highly degraded samples are very short down to approximately 50 bases in length. Only a limited number of DNA markers, if any, may be detected with such short fragments. Several methods to improve DNA recovery from compromised samples have been developed but had limited or no success. Two advances now may make it possible to analyze highly degraded DNA: Reverse Complement PCR (RC-PCR) and MPS. With the design of the OmniSNP™ panel, fragments as short as approximately 50–100 nucleotides in length are targeted, increasing the success of typing targets from highly degraded DNA samples.

IDseek® comprises a complete range of STR, SNP and mtDNA based Massively Parallel Sequencing (MPS) solutions for Forensic DNA analysis. Come learn more about the Next Revolution in Forensic MPS here!

"The RC-PCR system may be an effective alternative to the current Forensic genetic methods used to analyze highly degraded DNA."

-Magdalena M Bus et.al., BioTechniques 71: 00–00 10.2144/btn-2021-0031

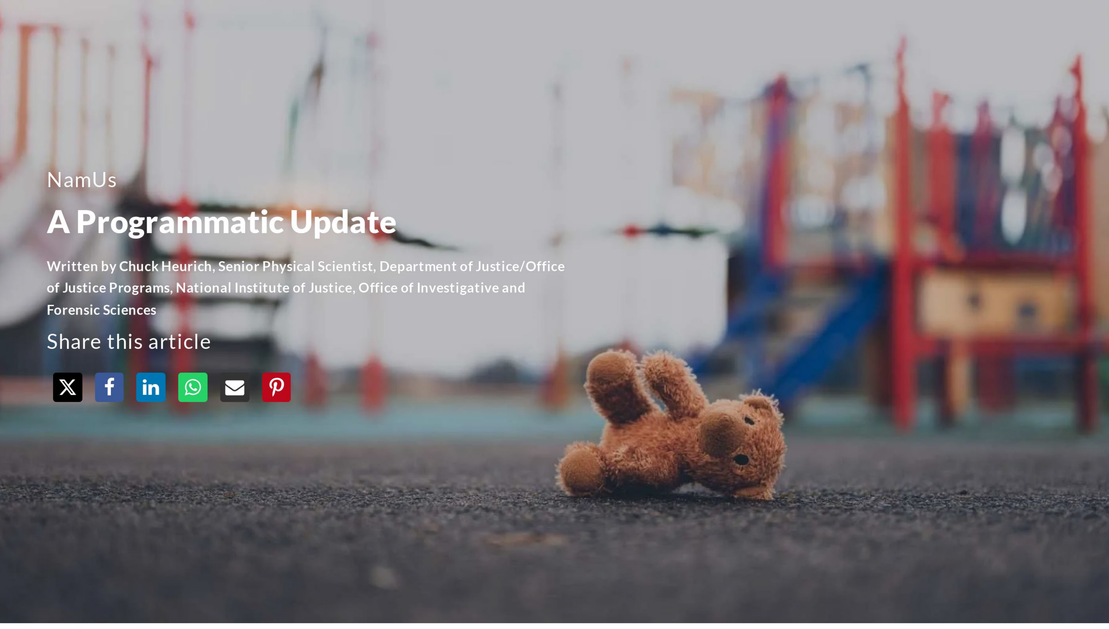
Reverse Complement PCR Features and Benefits:

Cost-efficient workflow

- Breakable index plates ensures optimal usage, minimizing waste
- One closed-tube, single reaction workflow with simultaneous indexing and target amplification reduces labor time
- Single tube sample pooling for library clean-up significantly reduces usage of required magnetic beads and consumables
- Well-balanced read distributions maximizes sequencing instrument flow cell capacity

Confidence in test results

- Closed-tube RC-PCR workflow significantly reduces hands-on time and pipetting error, minimizing risk of sample contamination minimizing risk of sample contamination
- Sample tracking dye in pre-spotted UDI plates ensures accuracy
- Unique RC-PCR kinetics promote high-target specificity and coverage uniformity (optimized read depth balance) from low DNA input



NamUs

A Programmatic Update

Written by Chuck Heurich, Senior Physical Scientist, Department of Justice/Office of Justice Programs, National Institute of Justice, Office of Investigative and Forensic Sciences

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The National Missing and Unidentified Persons System (NamUs), a program from the National Institute of Justice (NIJ), part of the Office of Justice Programs, U.S. Department of Justice, has been helping to resolve long-term missing, unidentified, and unclaimed persons cases since 2007. It connects criminal justice agencies, forensic scientists, and families nationwide with information and resources to resolve these cases.

NamUs *does not* represent the true scope of missing and unidentified persons in the United States. NIJ designed NamUs to support state, tribal, and local case investigations, not as an authoritative source on the extent or nature of missing persons or the unidentified remains problem. In addition, the use of the NamUs program by law enforcement, medical examiners, and coroners is largely voluntary. Even when state, tribal, and local authorities have mandated the use of NamUs, it's challenging for authorities to enforce compliance.

NamUs is not a law enforcement operation. The responsibility to report and enter data sits with the public, law enforcement, medical examiners, and coroners. The authority to verify, investigate, and discuss specific cases rests with the professional users. As of May 8, 2023, the NamUs database had over 23,000 active missing persons cases, 14,000 unidentified persons cases, and 15,000 unclaimed persons cases.

NamUs offers a wide range of services, including an online database of missing person information; forensic services, such as dental record matching and fingerprint and DNA analysis; investigative support; and public and professional user training. All these services are free of charge.

In April 2021, Research Triangle Institute International (RTI), under a contract from NIJ, took over the management of the NamUs program from the University of North Texas Health Science Center, which had managed NamUs under a cooperative agreement. RTI continues to provide the services that NamUs stakeholders have become accustomed to, such as case support through regional program specialists. These specialists ensure that the information in each NamUs record as complete as possible by assisting with user registration, case entry, collection and submission of biometric records and samples, and other tasks. A Complete record can better help investigators resolve cases. RTI also continues to provide analytical case support, including searching criminal justice, government, and proprietary commercial databases for indications of life, and locating contact information for family members to facilitate DNA collections and next-of-kin notifications.

NamUs will also continue to provide advanced forensic services in forensic anthropology, odontology, fingerprinting, and traditional DNA testing. NamUs uses an overlapping services strategy (OSS) to ensure the program has case management, investigation support, and forensic service providers ready to accommodate fluctuations in caseloads as the need arises. With the OSS strategy, NamUs will manage service providers across multiple organizations and states to prevent a single service provider from becoming a bottleneck for any one discipline.

Last year, NIJ created a sample tracking system that streamlined all forensic services and analytical requests submitted to NamUs. The Total Requirement for Unified Sample Tracking (TRUST) System has helped process more than 2,700 forensic and analytical service requests. Approximately 37% and 34% of these requests were for traditional DNA services and fingerprint services, respectively.

In March 2023, RTI completed agreements with the BODE Technology Group and the Minnesota Bureau of Criminal Apprehension Crime Laboratory to resume traditional DNA services. For calendar year 2023, NamUs will be able to analyze 25 human remains cases and 400 family reference samples and enter them into CODIS. This isn't nearly enough to meet the demand.

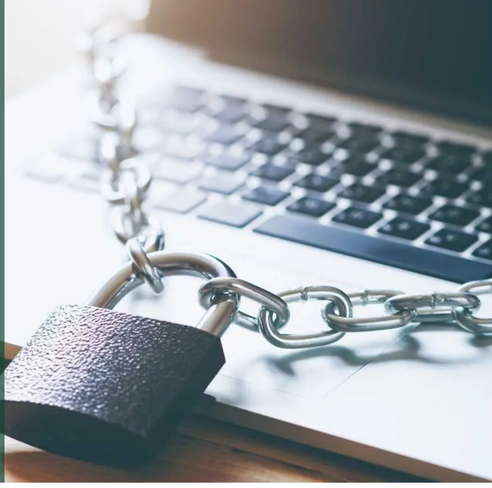
The success of using forensic genetic genealogy to resolve missing and unidentified persons cases has had a significant impact on NamUs' resources. Forty-eight percent of forensic genetic genealogy cases that were submitted from October 1, 2022, through September 30, 2023, resulted in a database hit or confirmed identification. In comparison, the percentage of identifications or exclusions using fingerprint (10%) and odontology (19%) matches were much lower. However, fingerprint and odontology services require far fewer resources and have shorter turnaround times than forensic genetic genealogy services. Additionally, before investigators can even consider cases for forensic genetic genealogy testing, they must have exhausted all possible leads, including fingerprint or dental exclusions, as appropriate.

NamUs continues to collaborate with the FBI's Latent Print Unit to search all fingerprint images from unidentified decedents through the national Next Generation Identification system. On March 15, 2023, these efforts resulted in the 500th fingerprint identification since 2017. The oldest identified case dated back to 1971.

NamUs has been tasked, in federal legislation, with continuing to help resolve missing and unidentified persons cases. Each piece of legislation signed into law creates additional mandates for and burdens on available resources. Recent legislation includes tribal initiatives (Savanna's Act and the Not Invisible Act), missing migrant initiatives (The Missing Persons and Unidentified Remains Act), and The Help Find the Missing Act ("Billy's Law").

As NamUs continues to become more widely recognized and used, NIJ hopes the program will continue to grow and offer more services to help law enforcement, medical examiners, and coroners resolve cases.

NIJ and RTI also continue to look at how to improve the databases. As these improvements roll out, NamUs will communicate with our professional and public stakeholders at conferences and trainings to ensure that their needs are being met.



Genetic Privacy and Forensic Investigative Genetic Genealogy

Today and Tomorrow

Written by Clarice Jacobson, Baylor College of Medicine

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It has been nearly 40 years since DNA evidence became available to forensic investigators, and more than 800 cases have been solved with the help of forensic investigative genetic genealogy (FIGG) over the past 5 years. What have we learned, what are the risks and protections to consider, and what can we expect for the future?

The panel discussion at ISHI 34, moderated by Dr. Amy McGuire, will engage in deep and inquisitive discussion about genetic privacy and explore how to strike a balance between laws and policies that protect individuals and the benefits of technology and public safety. Panelists Drs. Bruce Budowle, David Gurney, Ray Wickenheiser, and Christi Guerrini will provide an overview of investigative and forensic procedures, highlight the key ethical considerations with a specific focus on informed consent, discuss legislation aimed at protecting citizens' genetic privacy, and share findings from a recent survey on public acceptability of various applications of IGG and its potential oversight.

Current Procedures

Investigative and forensic procedures are constantly evolving with advancements in technology and scientific research. Dr. Ray Wickenheiser will delve into some of the factors and scenarios for involving biological materials and DNA in investigations and how the circumstances of their deposition, discard, and collection, may differentiate how they should be considered.

There are several types of samples directly related to the suspect. For example, a discarded sample left by a perpetrator when committing a crime, such as semen left on the person of sexual assault homicide victim. A second category of discarded sample typically employed in criminal case investigations is that of an item discarded by a person of interest, such as water bottle utilized by the suspect in that sexual assault homicide. That discarded water bottle may be collected by law enforcement to gather a reference sample which would be compared against the DNA found at the crime scene. The third scenario is a third-party sample taken from a person known to be innocent of the crime, however, may be a family member of a suspect, whose DNA may assist in genealogical research used to help solve the sexual assault homicide case.

There are also samples that are extraneous to the suspect that may be useful to the investigation process. For example, staff databases are created with DNA obtained by individuals handling forensic samples, to examine crime scene profiles in case contamination has occurred so staff are not erroneously entered into the database as potential suspect profiles. Elimination samples are very similar, except they are taken from individuals connected to the victim of the crime whose DNA may be present in the crime scene sample, such as a spouse or significant other, so their DNA profile is not thought to be that of the suspect and erroneously entered into the forensic database.

In this panel, Dr. Wickenheiser will delve into each of these scenarios and considerations regarding proportionality to solve the crime and maintain public safety, while protecting public trust and privacy rights. Dr. Budowle will also explore how informed consent requirements differ among the different scenarios.

Informed Consent

With technological advances in molecular biology, data mining, and access to metadata in the forensic genomics arena, there are enhanced benefits and risks to consider. One way to convey these benefits and risks is through informed consent. Informed consent is based on fundamental ethical principles that already are accepted when conducting biomedical and behavioral research involving human subjects. If appropriately addressed, informed consent can allow individuals to make decisions voluntarily with autonomy, dignity and respect, while enabling the use of samples for intended proper use(s).

In this panel, Dr. Bruce Budowle will review areas in which informed consent may need to be revisited and/or developed further. This includes reference samples from family members in missing persons or unidentified human remains cases, targeted analysis of an individual(s) during forensic investigative genetic genealogy cases, donors that populate the reference databases used to develop investigative leads, donors who provide their samples for validation studies, population studies and entry into databases that would be applied to forensic statistical calculations, family members who contribute samples or obtain genetic information from a molecular autopsy, and medical and other acquired samples that could be accessed for identification purposes.

Dr. Budowle will address how going forward the informed consent process should be more comprehensive, and risk assessments should be applied to consider the information that should be contained within a form or other means to communicate and assess comprehension of a potential participant.

FIGG Laws

In the United States, there is currently no comprehensive federal law specifically regulating genetic privacy and IGG. In 2019 the Department of Justice issued an interim policy saying that "forensic genetic genealogy" should generally be used only for violent crimes such as murder and rape, as well as to identify human remains. It is unclear if a final policy will be issued. Currently, FIGG laws are regulated at the State level, with vast differences among the States. For example, Maryland and Montana require law enforcement agencies to obtain a warrant or court order before using familial DNA searching in criminal investigations. Other States, such as Florida and Texas, have no specific regulations regarding FIGG.

In recent months, State legislators have put forward new laws aimed at protecting citizens' genetic privacy. Some of these laws regulate FIGG directly, while others have indirect—and presumably unintentional—effects on FIGG. Some of the laws that directly regulate FIGG create onerous requirements that do not protect genetic privacy, while leaving sensitive areas well-known to FIGG practitioners unregulated. And many of the laws that indirectly affect FIGG effectively ban the method.

Dr. David Gurney will address each of these concerns further and the need for legislators to confer with experts in FIGG to craft effective and targeted legislation around genetic privacy and FIGG.

Public Sentiment

Public opinion around FIGG is complex, reflecting a balance between the potential benefits and risks of the technology. Past studies have demonstrated that individuals are concerned about genetic privacy, yet they are willing to share their genetic data to support activities that they believe are important, such as medical research. However, all of these studies pre-date FIGG, and none probed the public's attitudes towards law enforcement participation in genealogy databases.

In 2020, our research team obtained funding from the National Human Genome Research Institute to conduct a 4-year study of public preferences related to FIGG for the purpose of informing practice and policy. During this panel, Prof. Christi Guerrini will present findings from a survey our research team is in the process of fielding with 1000 respondents who comprise a representative sample of the U.S. general population. This survey includes direct elicitation items to understand public acceptability of various applications of FIGG and its potential oversight. The survey also includes two experiments intended to understand level of concern with law enforcement use of various kinds of personal information about non-suspects as well as relative preferences for various features of FIGG practice associated with trade-offs between individual interests in privacy and societal interests in public safety and justice. This work builds on our team's 2018 survey to understand acceptability of FIGG to identify perpetrators and unidentified human remains.

In conclusion, in today's digital age, its clear investigative genetic genealogy is here to stay. But, there is also a clear need to discuss and understand the benefits and risks involved. We must engage in dialogue to navigate the minefield of ethical and policy issues to ensure this exciting technology is being used in a way that upholds our ideals.

To learn more about this year's ISHI conference, visit our website below.

Join the Conversation at ISHI 34

An Update from the Organization of Scientific Area Committees (OSAC) for Forensic Science

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New Validation Standard Added to the OSAC Registry

OSAC recently added the following published DNA standard to the Registry:

ANSI/ASB Standard 038, *Standard for Internal Validation of Forensic DNA Analysis Methods*, 2020, 1st Ed. Added to the OSAC Registry on May 2, 2023, this Academy Standards Board published standard details the general requirements for performing an internal validation of all forensic DNA analysis methods within a forensic DNA laboratory.

The OSAC Registry now contains 145 forensic science standards, with **18 specific to biology/DNA!**

Has your organization implemented any of the DNA or other discipline-specific standards on the OSAC Registry? Complete the **OSAC Registry Implementation Declaration Form** (found on the Registry Implementation webpage) and submit it to mark.stolorow@nist.gov to let us know!

Your Input Needed: Assessing Research Needs and Standards in the Forensic Human Biology Community

OSAC's Human Forensic Biology Subcommittee's Research Task Group is seeking input regarding current research needs, standards and training for the forensic biology community. This survey will aid the OSAC Human Biology Task Group in:

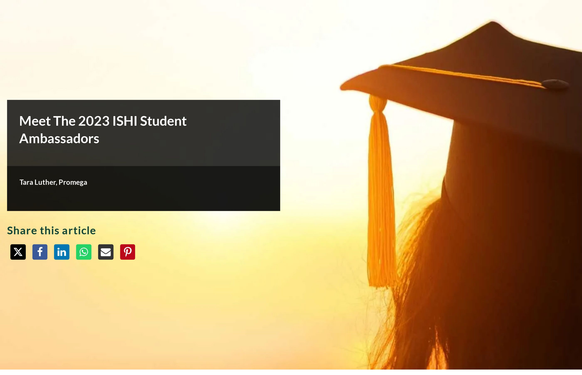
- Identifying the most practitioner-relevant research needs in the forensic biology community
- Generating new standards or training documents based on practitioner feedback
- Understanding and identifying future training needs

For more information and to access the survey, visit https://go.fiu.edu/OSACSurvey.

Help Strengthen Forensic Science through Standards!

Do you want to participate in the standards development process and make an impact on the forensic science community? Visit the OSAC website to learn about OSAC's activities and get involved! If you are interested in becoming a member of OSAC, please complete and submit an application form to be eligible and considered for positions opening in October.

Additionally, our friends at the Academy Standards Board (ASB) of the American Academy of Forensic Science (AAFS) will be accepting applications later this summer for new members. ASB is an ANSI-accredited Standards Development Organization (SDO). ASB has 14 consensus bodies, including DNA, each with 7 to 25 members selected by the Board of Directors of the ASB. For more information on the ASB visit, www.aafs.org/academy-standards-board. To get the ASB Newsletter and receive notification of the annual call for members, send a request to asb@aafs.org.



Meet The 2023 ISHI Student Ambassadors

Tara Luther, Promega

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We know that it takes a special kind of person to choose forensic science as a career, and this year, we'd like to recognize a few of the students who are making a difference in the field. We're excited to introduce this year's ISHI Ambassadors! These students are all pursuing degrees in the field of forensics. They will be participating in this year's 34th International Symposium on Human Identification in Denver, Colorado. Follow Beighley, Julia, Cassie, and Kayli on social media as they share highlights from the ISHI workshops, presentations, and poster sessions. We'll also hear about the fun moments in between the scientific sessions including the networking events. We look forward to seeing the meeting through their eyes, and learning more about their research and career aspirations.



Beighley Ayers

Masters in Forensic Science, Biology Track at Towson University

My early fascination with forensic science started around middle school, inspired by television and documentaries broadcasting strong women in STEM using evidence as puzzle pieces to solve crimes. I knew forensic science was for me after taking an introductory course newly offered at my high school. I enjoyed taking on the tedious challenge of examining evidence and analyzing data to help evaluate the circumstance of the case. Even without an abundance of recognition, I found forensics to be self-fulling and a confidence-booster. Once I realized forensic science was offered in college and a pursuable career path, I entered my journey of becoming a forensic DNA analyst. As my first year of graduate school at Towson University comes to a close, I am one step closer to graduating with a Master of Science in Forensic Science in the biology track. With an in-depth education from Towson, I am eager to find a position as a forensic biologist working at a crime laboratory after graduating in May 2024.

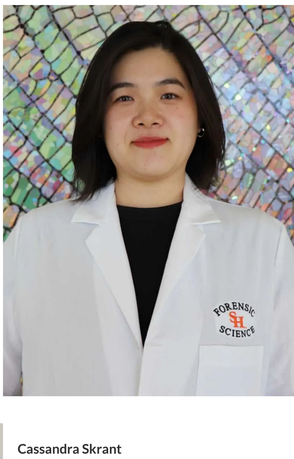
Body fluids are important pieces of evidence that help determine the circumstance of a case. The identity of body fluids is an important step that is typically conducted via routine forensic serology testing. However, serology testing has drawbacks such as lack of confirmatory tests for saliva and vaginal fluid, and the excess sequential testing to evaluate numerous body fluids that leads to sample loss and degradation. An alternative way to distinguish body fluids from one another is through DNA methylation patterns and PCR-high resolution melt (HRM). Benefits of the PCR-HRM technique are in-tube methodology, being time efficient, analyzing differences based on a single nucleotide, and the ability to test of multiple body fluids in a single run. To process body fluids with this technique, samples are bisulfite treated to keep cytosines from being converted to uracil, and this methylation pattern is unique to tissues and cell type. By analyzing the melting curve, body fluids can be differentiated from each other individually and within mixtures. In my research, I will present data for the differentiation of body fluids, blood, semen, saliva, and vaginal fluid, using BCA54-M and DDX4-U-L primers. Therefore, the goal of my research is to provide an alternative method to differentiate body fluids that will uphold the integrity of the sample, overcome routine serology drawbacks, and propose a method for laboratories to incorporate into everyday use.

Follow Beighley on Instagram **and** Facebook**, or connect with her on** LinkedIn**.**

Fun fact: I am really good at baking banana bread and muffins.

Julia Wang

PhD in Forensic Science, Sam Houston State University



My curiosity for natural sciences first led me to study human biology and cell biology for my undergraduate and master's degrees. My passion for research was nourished during this time by being able to pose my own research questions and watching scientists of various backgrounds push the boundaries of scientific discovery. After studying and working for a few years in animal and clinical research, I recognized that I wanted to pursue an applied science where the fruits of the labor could be seen within my lifetime.

Without realizing it, I had crossed paths with forensic science multiple times in my life – as a child seeing the rise and fall of a local crime lab, as an undergraduate and graduate student studying cell biology, and now as an adult searching for a science in which to develop her career. Forensic science felt like a natural fit. Now I am proud to say that I research topics that I am passionate about while applying a curiosity for cell and molecular biology that has driven me for the majority of my life

My current research focuses on improving the analysis methods of sexual assault evidence. My post-graduation plans are to continue in bridging the space between state of the art research and crime labs especially in reducing the turnaround time in sexual assault evidence testing and reducing the sexual assault backlog. I want victims of sexual assault to be able to receive justice and closure as quickly as possible.

Follow Julia on Instagram **and** Facebook**, or connect with her on** LinkedIn**.**

Fun fact: I was Grand Champion of the Fifth Annual World Chinese Youth Art Festival in Chinese Dance.



Cassandra Skrant

Forensic Science Program, Towson University

Multiple events in my life led me to forensic science. As a high school student I cultivated a passion for biology, which I decided to develop at The Ohio State University as a biology major. During my undergraduate years, I discovered that I have a particular interest in biochemistry, genetics, and microbiology. To explore this passion, I started undergraduate research with Dr. Albert. The research I conducted in her laboratory taught me so much, and I could not get enough. I felt comfortable in the lab and knew I wanted to stay there for the rest of my life. Although I was certain of my place in a laboratory, I was still questioning my place in the research world until I enrolled in a few forensic courses. During these courses I realized I loved forensic science and decided to continue my education at Towson University. All of these events led me to forensic science, but the main aspect that has kept me in forensic science, despite the realization that it is an exacting career with little recognition, is the idea that the work I am performing is helping provide relief to victims and loved ones. Since providing relief to victims and their loved ones is very important to me, my dream is to be a forensic DNA analyst who helps solve cases that do not receive as much attention as they should. This includes cold cases and backlogged sexual assault cases where the victims and families have not received the attention and justice they deserve.

Along with learning from others at the conference, I also plan on sharing my research project on discriminating monozygotic twins via pyrosequencing. This research project's overall goal is to provide crime laboratories with a method for discriminating monozygotic twins because current STR typing methods are incapable of doing so. Pyrosequencing can be used to detect differences in DNA methylation between monozygotic twins. Before sequencing, each monozygotic twin sample will go through the typical beginning steps of STR typing workflow including extraction and quantitation. After quantitation, the samples are bisulfite treated so that the methylation can be detected with pyrosequencing and amplified. Then the prepared samples are placed on the PyroMark Q48 Autoprep where multiple CpG are sequenced, and the methylation levels are calculated. If the project is successful, it will provide a cost and time-efficient method for discriminating monozygotic twins in a crime laboratory. I cannot wait to present this research at ISHI in the fall and thank you for your consideration!

Follow Cassie on Instagram **and** Facebook **and connect with her on** LinkedIn**.**

Fun fact: I actually have hated the taste of cake since I was a child, so I eat ice cream on my birthday instead.

Kayli Carrillo

Forensic Science Program, Sam Houston State University



The challenges found within the demanding career of forensic science provide the fuel necessary for me to excel in this field – as I possess an insatiable appetite to acquire knowledge. Professional and personal gratification is rewarding enough for a job well done. Forensic science serves as a non-biased entity within the criminal justice system, and while DNA evidence is not the sole contributing factor regarding a verdict to convict or exonerate, I am very excited to be able to combine science and justice.

My interest in forensic science began around eight years of age while in third grade. I discovered a keen interest in crime-solving television programs. CSI: Miami became my favorite never-miss show. My ever-consistent viewing partner (mom) and I found the intricate details and techniques applied to crime-solving fascinating. Consequently, my elementary and high school teachers quickly learned that I had a profound passion for forensic science.

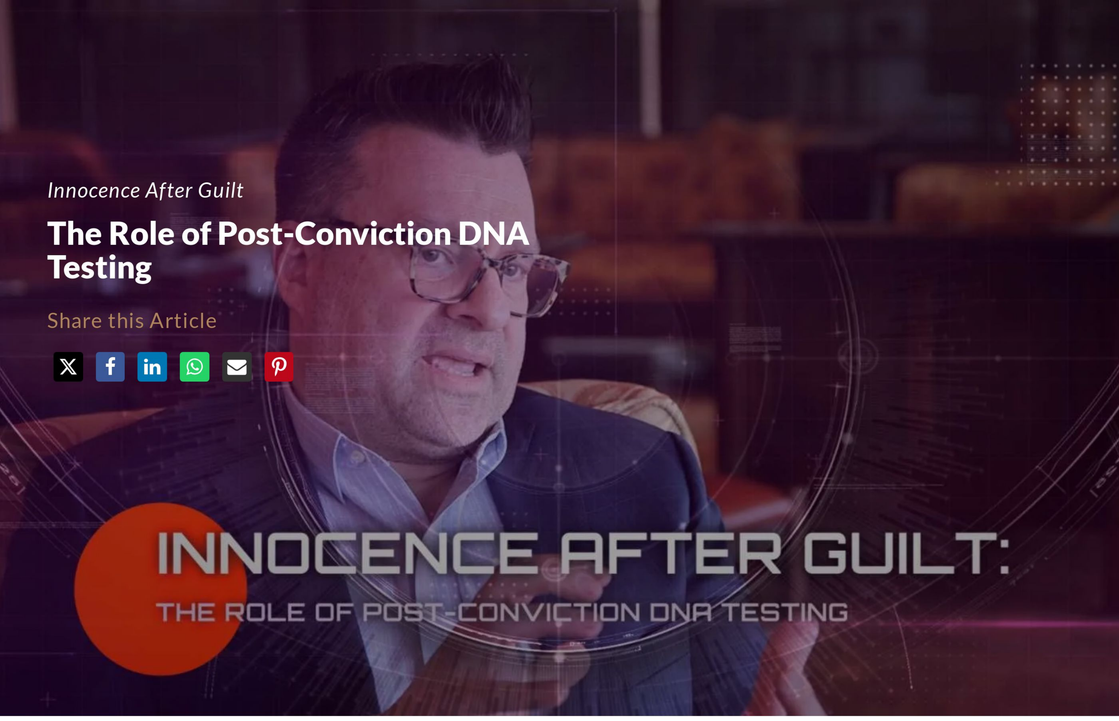
My passion for forensic science only continued to grow as I progressed through my high school years; as a result, I conducted much research surrounding the steps necessary to pursue a career in forensic science. Learning about the complexities of DNA is what initially captivated me and sparked my interest in pursuing forensic biology.

Upon completing my doctoral studies, my initial step is to gain valuable exposure and experience within the crime lab environment at the local, state, or federal level. In time, I aspire to enter the realm of academic higher education in order to contribute towards further developing and advancing the minds of future forensic scientists. As I have been surrounded by great mentors, my ultimate desire is to be a mentor for the next generation of students.

My scientific area of focus involves research into low-template DNA (LT-DNA) or "touch" DNA. Advancements have been made to better process LT-DNA samples. At present, there is no standardized approach for processing LT-DNA samples. Consequently, I am investigating different methods with the aim of enhancing current techniques in the field. My research encompasses techniques ranging from sample collection to extraction, as well as downstream processes, with the ultimate goal of obtaining a greater amount of information from these samples. Furthermore, I am fascinated by the potential of enhancement techniques, such as whole genome amplification, to generate a DNA profile from only a few cells, which I find to be truly mind-boggling.

Follow Kayli on Instagram, Twitter **and** Facebook**, or connect with her on** LinkedIn**.**

Fun fact: I love to dance salsa, cumbia, and bachata. I even enjoy 50s music.



Innocence After Guilt

The Role of Post-Conviction DNA Testing

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In our quest for justice, how do we work to eliminate wrongful convictions? What has history taught us? What role has forensic DNA played since its emergence? In the upcoming six-part *Innocence After Guilt* video series we delve into the role of DNA testing in the United States in post-conviction work to exonerate the innocent and reassert convictions of the guilty.

Growing Concern

Ted Bundy, one of America's deadliest serial killers, was executed in Florida in 1989.

That same year, Gary Dotson was the first person to be exonerated using DNA evidence after serving 10 years for an aggravated kidnapping and rape that he did not commit. DNA evidence was an emerging technology at the time, and this was the case that arguably broadcast the dawn of the forensic DNA era to the larger public.

It was during this period that support for the death penalty waned as more Americans recognized its irreversibility within a justice system that was not infallible.

Four years later, when former Marine Kirk Bloodsworth was sentenced to death at 22 and then subsequently exonerated nine years later in large part due to DNA evidence, the concern regarding wrongful convictions, particularly those based on eyewitness testimony with little or no physical evidence, gained additional traction.

Expecting any human-led system to be perfect is unreasonable. Yet the likely numbers of innocent individuals serving years for crimes they didn't commit is staggering. If only 1% of the almost 2,000,000 incarcerated prisoners (as of March 2023) were truly innocent, then approximately 20,000 innocent people are serving unjust sentences. Additionally, for every innocent incarcerated individual there is a guilty party responsible for these crimes who remains free to offend again. And, quite poignantly, when it comes to the death penalty there is simply no going back. A profoundly troubling thought when at least 190 people who had been wrongly convicted and sentenced to death in the U.S. have been exonerated since 1973, according to the non-profit Death Penalty Information Center in Washington D.C.

A Movement Emerges

In 1992, Barry Scheck and Peter Neufeld realized that if DNA technology was able to assist in identifying those who had committed crimes, then the reverse was also true: DNA technology could be valuable when making a case for innocence. This led the duo to found the Innocence Project, which operates as a law clinic at the Benjamin N. Cardozo School of Law. Since its inception, a network of organizations have joined the innocence movement, with member organizations in all 50 states and in numerous countries around the world. All told, there have been 3,293 exonerations since 1989, accounting for more than 29,000 years of freedom lost.

In the *Innocence After Guilt* series, we examine post-conviction DNA testing to learn more about the factors that contribute to wrongful convictions, the years-long process of re-examining a case, the people involved and the roles that they play, and the key learnings that will hopefully lead to fewer wrongful convictions in the future.



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Registration is open for ISHI 34!

What does the future hold for forensic DNA? At the 34th International Symposium on Human Identification (ISHI 34) we'll be covering these topics and more through our workshops, General Session presentations, poster presentations, and focused topic lunches. If your lab is wondering how to prepare for the future, you're not alone. Building a network by discussing these issues at conferences is a great way to move the field forward together.

View the full agenda and register on our website: www.ishinews.com.



Deadlines

June 1, 2023
Oral Abstracts Due

June 1, 2023
Interesting Case Abstracts Due

July 7, 2023
Poster Abstracts due

July 15, 2023
Early Registration Deadline

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