INTERNATIONAL SYMPOSIUM ON HUMAN IDENTIFICATION

May 2024

The ISHI Report

News from the World of DNA Forensics

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The ISHI Report

Letter from the Editor

As we embrace the vibrant spirit of spring here in Madison, Wisconsin, our May issue blossoms with insights and revelations from the forefront of forensic science. This edition is dedicated to not only uncovering the latest advancements but also to exploring practical challenges and innovative solutions within our field.

Workshop presenters Jason Moran, Kimberly Gin, and Dr. Claire Glynn delve into the intricacies of cold case resolutions through advanced DNA approaches, as detailed in the "Engaging Collaboration" workshop. Here, they share transformative strategies for tackling these challenging investigations with new genetic technologies and collaborative frameworks.

We also explore the significant advancements in forensic DNA analysis technologies, focusing on the integration of Next Generation Sequencing (NGS) with STRmix™ technologies. This feature specifically highlights STRmix™ NGS, the newest application of STRmix™ technology designed for the probabilistic genotyping of NGS-generated DNA profiles. This development represents a major leap forward, promising to enhance the depth and reliability of forensic analysis by integrating more sensitive and comprehensive data handling capabilities.

Our colleague, AnnaKay Kruger, caught up with former Student Ambassadors who share how the program shaped their careers and expanded their professional networks. It’s a testament to the enduring impact of early career support and community engagement in shaping the future of forensic science. Plus, we introduce this year’s Ambassadors!

Another highlight is the DNA Trainers Meeting, where leaders in forensic DNA training discuss optimizing educational practices to keep pace with technological advancements. Our interview with co-chairs Kelly Elkins and Eugene Lien offers a window into the evolving landscape of forensic training and its critical role in enhancing investigative outcomes.

In the realm of forensic communication, we present a compelling piece on the challenges and opportunities of science communication in forensic science from a Ghanaian perspective. It's a thoughtful exploration of how effective communication strategies are essential for the advancement of forensic science in diverse international contexts.

For a lighter yet profoundly impactful read, don't miss our feature on therapy dogs in forensic settings. Discover how these four-legged friends contribute to alleviating stress and enhancing well-being for forensic professionals.

Lastly, Mike Cariola and Abigail S. Bathrick of Bode Technology provide a detailed account of their current research on Forensic Investigative Genetic Genealogy (FIGG) technologies. Their article focuses on a comparative evaluation of genotyping technologies in sexual assault casework, highlighting the challenges and solutions for implementing high-density SNP genotyping in forensic investigations. This research is crucial for developing best practices and enhancing the identification of suspects and resolution of cases through FIGG.

We invite you to dive into these articles, which are designed not just to inform but also to inspire new ideas and foster discussions that propel our field forward. Your feedback and contributions are invaluable to us, and as always, we look forward to your active participation in the ongoing dialogue that shapes our community. If you are interested in drafting an article for a future issue, please email Tara Luther (tara.luther@promega.com).

Warmly,

The Editorial Board

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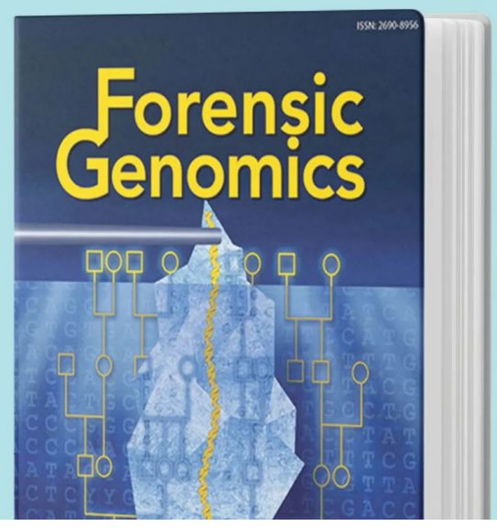

ISHI Student Ambassadors

Where Are They Now?

Interview written and condensed by Annaliese Kruger, Promega

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Every year, the International Symposium on Human Identification (ISHI) offers an opportunity for students pursuing careers in forensic science to participate in the conference as student ambassadors. This Student Ambassador Program not only provides a front-row seat to the latest advances in human identification but also allows participants to network with seasoned professionals and thought leaders in the field. Here, we catch up with three former ISHI student ambassadors who share their personal journeys through the program. In this Q&A, former ambassadors Nidhi Sheth, Olivia McCarter and Allie Sherrier reflect on how their experiences enriched their understanding of forensic science, bolstered their professional networks, and steered their career trajectories in meaningful ways.

Sheth, student ambassador in 2021, earned her master's degree in forensic science from Pace University and completed her Ph.D. in Computational and Integrative Biology from Rutgers University Camden.

McCarter, also an ambassador in 2021, attended the University of South Alabama and graduated in May 2022 with a degree in anthropology.

Sherrier served as an ambassador in 2019 and attended the Oklahoma State University Center for Health Sciences. She graduated in 2016 with an M.S. in Forensic Biology with Dr. Robert Allen and then worked for the Center for Human Identification at the University of North Texas Health Science Center, in the Research and Development Lab with Dr. Bruce Budowle. She completed her Ph.D. in Biomedical Sciences in January 2022.

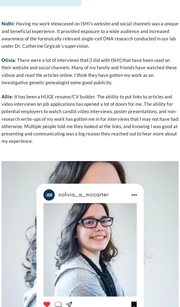
This article was lightly edited for length and ISHI Report style.

Where has your career taken you since graduating?

Nidhi: Since graduating, I've been working as a DNA Analyst for the Legal Aid Society in New York.

Olivia: I worked at the Mobile County Sheriff's Office until March of 2024, and recently started a job as a crime scene and evidence technician at Foley Police Department in Baldwin County, Alabama. I also co-own Moxxy Forensic Investigations, where we offer forensic investigative genetic genealogy (IGG) services, cold case consultations, and laboratory and funding assistance to support challenging investigations.

Allie: My career post-graduation feels like a wild ride. Before defending my dissertation, I accepted a job with Caris Life Sciences forming a new Pharmacogenomics team focusing on how to use genetics to guide drug selection for cancer treatment as a Data Scientist. I was then promoted to Bioinformatics Scientist, where I focused on sequencing data analysis and report generation for oncologists. I worked at Caris Life Sciences for two years before returning to academia. I loved parts of working in industry but greatly missed research and more traditional data science methods. During those two years at Caris, I was an Adjunct Professor at Abilene Christian University. I quickly fell in love with teaching, specifically machine learning and artificial intelligence courses. In March 2024, I started a Postdoctoral Fellowship at Oklahoma State University Center for Health Sciences.



Did your time as an ISHI Student Ambassador play a role in how your career path evolved?

Nidhi: Being an ISHI Student Ambassador not only provided me with a sense of community but also boosted my confidence in presenting my work, which has been invaluable in shaping my career path.

Olivia: When I attended ISHI as a student ambassador, I had a chance to network with many individuals in the investigative genetic genealogy field. These people later became my peers, as I now co-own my own IGG company, Moxxy Forensic Investigations. I know that if I ever need advice, many of the other company heads would help me.

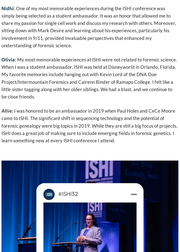
Allie: While my education and initial job post-Ph.D. are not a traditional straight line to a forensic genetics job, being an ISHI student ambassador made a big difference in my career. Being an ISHI student ambassador helped me learn more about science communication and networking. The friends and connections I made as an ISHI student ambassador set me up well to have connections nationwide. I talk to people I met as an ambassador to this day. Being an ISHI student ambassador also allowed me to talk to keynote speakers and several prominent names in forensics that I would have never had the courage to talk to on my own.

What was your experience having your work showcased on ISHI's website and social channels?

Nidhi: Having my work showcased on ISHI's website and social channels was a unique and beneficial experience. It provided exposure to a wide audience and increased awareness of the forensically relevant single cell DNA research conducted in our lab under Dr. Catherine Grgicak's supervision.

Olivia: There were a lot of interviews that I did with ISHI that have been used on their website and social channels. Many of my family and friends have watched these videos and read the articles online. I think they have gotten my work as an investigative genetic genealogist some good publicity.

Allie: It has been a HUGE resume/CV builder. The ability to put links to articles and video interviews on job applications has opened a lot of doors for me. The ability for potential employers to watch candid video interviews, poster presentations, and non-research write-ups of my work has gotten me in for interviews that I may not have had otherwise. Multiple people told me they looked at the links, and knowing I was good at presenting and communicating was a big reason they reached out to hear more about my experience.



Did you make any connections during ISHI that were particularly influential in your career? How did these relationships impact you?

Nidhi: I had the pleasure of making several valuable connections during ISHI. Learning about the advances in the field, especially from the experts, was invaluable. Connecting with fellow attendees was a source of great joy, and meeting Dr. Colleen Fitzpatrick left a lasting impression on me. Additionally, interviewing Mark Desire was a privilege and provided valuable insights that impacted my career journey.

Olivia: Many of the people that I met at ISHI were people I had spoken to only online. Meeting them in person was a wonderful experience. I have kept many of these relationships and friendships and continue to hold many of these people dear to me.

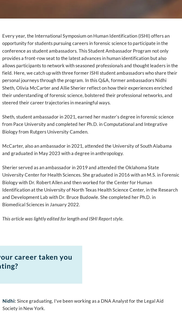
Allie: From Promega, Tara, Ann, Carol, and Travis are some of my favorite people. They were happy to chat with me while I was looking for a job in 2022 when I graduated and again in 2024, when I started looking for a new job. Meeting other student ambassadors and learning about their research and career goals was an impactful experience that taught me a lot about other forensic graduate programs and potential career opportunities.

What was one of the most memorable experiences you had during the ISHI conference, and how did this experience enhance your understanding of forensic science?

Nidhi: One of my most memorable experiences during the ISHI conference was simply being selected as a student ambassador. It was an honor that allowed me to share my passion for single-cell work and discuss my research with others. Moreover, sitting down with Mark Desire and learning about his experiences, particularly his involvement in 9/11, provided invaluable perspectives that enhanced my understanding of forensic science.

Olivia: My most memorable experiences at ISHI were not related to forensic science. When I was a student ambassador, ISHI was held at Disneyworld in Orlando, Florida. My favorite memories include hanging out with Kevin Lord of the DNA Doe Project/Intermountain Forensics and Cairenn Binder of Ramapo College. I felt like a little sister tagging along with her older siblings. We had a blast, and we continue to be close friends.

Allie: I was honored to be an ambassador in 2019 when Paul Holes and CeCe Moore came to ISHI. The significant shift in sequencing technology and the potential of forensic genealogy were big topics in 2019. While they are still a big focus of projects, ISHI does a great job of making sure to include emerging fields in forensic genetics. I learn something new at every ISHI conference I attend.



Looking back, how did the mentorship and collaborative opportunities offered at ISHI impact your personal and professional growth?

Nidhi: For future ISHI Student Ambassadors, I recommend fully immersing yourself in the ISHI experience. Take advantage of every opportunity to engage with the community, attend sessions, and participate in networking events. Don't hesitate to share your work and insights, as these interactions can lead to valuable connections and opportunities for personal and professional growth.

Olivia: Network, network, network!!

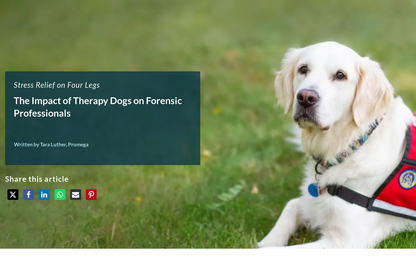
Allie: Prepare for the conference! Review who is presenting. Try to attend at least one workshop. Make sure you try to go to as many posters as possible. Talk to the sales representatives at company tables — you never know when you might need that contact. If there is someone specific you want to meet, talk to, or even interview, tell the wonderful people who organize the ISHI Student Ambassador Program. You will be exhausted by the end of the conference, but this is truly a once-in-a-lifetime opportunity. Use every minute of it!

Have you kept in touch with any other former student ambassadors?

Nidhi: We still follow each other on Instagram and LinkedIn.

Olivia: Yes, I have stayed in touch with several former student ambassadors, and it's always a joy to see how they are progressing in their careers. I hope there are other ways for us to stay more connected.

Allie: For me there is not one big moment, but a bunch of small moments that helped me build a strong network with a wide range of forensic professionals. The insight into careers, areas of research, and potential collaborations is priceless.



Stress Relief on Four Legs

The Impact of Therapy Dogs on Forensic Professionals

Written by Tara Luther, Promega

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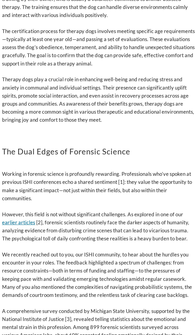
I'd had dogs before, but I swore to myself that this dog was going to be different. Shortly after the 2018 ISHI conference in Phoenix, I brought home a lovable, wiggly, fluff ball of an English Golden Retriever named Max. My husband and I decided almost immediately that we wanted Max to be a therapy dog, and thankfully Max seemed to agree to this plan. We found a great training organization just minutes from our house that would allow us to join the Madison, WI chapter of the Go Team Therapy Dogs, and we spent most of 2019 getting ready for the following year's certification. In fact, we had just submitted our application to join when a little thing called COVID-19 started making headlines.

So, instead of testing one dog to become a therapy dog, we doubled down and brought home a (stubborn) Newfoundland named Sully and we started over with training intending to certify both of them. In July of 2021, both Max and Sully received their vests, and we started volunteering.

To be honest, I had no idea of what to expect as a volunteer, but we began visiting senior living facilities and all of us (the two-legged and the four-legged) fell in love with the work. Residents who never came out of their room were excited to come into the common area to pet the dogs and regale us with stories of dogs they had once loved. Stressed college students flock to the dogs when they see them, and you can see the tension in their body melt. Many people live with their own pets, including dogs, but there is something uniquely special about a dog being somewhere unexpected at the moment they are needed most.

We've now been with Go Team for almost three years and just shy of 250 visits. Along with senior living facilities, we've visited local schools and universities (especially during finals), 911 communications centers, and fire departments. We've participated in our local National Night Out and have been to numerous charity events. Needless to say, this is a cause that is near and dear to my heart, so I was excited to hear that many forensic laboratories have also begun to bring in therapy dogs, also known as Animal-Assisted Interventions (AAI) or Canine-Assisted Interventions (CAI).



Understanding Therapy Dogs: Their Role and Impact

Therapy dogs are specially trained pets that provide comfort, affection, and emotional support in various public settings. Unlike service dogs, whose training focuses on specific tasks to assist their handers, therapy dogs interact with a wide range of people to offer therapeutic benefits. This interaction aims to improve both the mental and physical health of individuals they engage with.

Therapy dogs are known for their calm demeanors and friendly, approachable personalities, making them ideal visitors in places like schools, hospitals, rehabilitation centers, and nursing facilities. To become a therapy dog, the animal must undergo training by their owner, who is usually a volunteer committed to animal-assisted therapy. The training ensures that the dog can handle diverse environments calmly and interact with various individuals positively.

The certification process for therapy dogs involves meeting specific age requirements —typically at least one year old—and passing a set of evaluations. These evaluations assess the dog's obedience, temperament, and ability to handle unexpected situations gracefully. The goal is to confirm that the dog can provide safe, effective comfort and support in their role as a therapy animal.

Therapy dogs play a crucial role in enhancing well-being and reducing stress and anxiety in communal and individual settings. Their presence can significantly uplift spirits, promote social interaction, and even assist in recovery processes across age groups and communities. As awareness of their benefits grows, therapy dogs are becoming a more common sight in various therapeutic and educational environments, bringing joy and comfort to those they meet.

The Dual Edges of Forensic Science

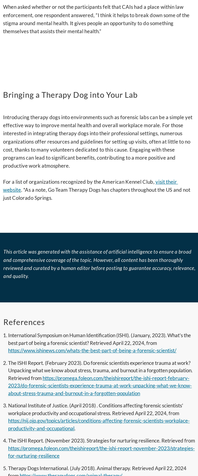
Working in forensic science is profoundly rewarding. Professionals who've spoken at previous ISHI conferences echo a shared sentiment [1]: they value the opportunity to make a significant impact—not just within their fields, but also within their communities.

However, this field is not without significant challenges. As explored in one of our earlier articles [2], forensic scientists routinely face the darker aspects of humanity, analyzing evidence from disturbing crime scenes that can lead to vicarious trauma. The psychological toll of daily confronting these realities is a heavy burden to bear.

We recently reached out to you, our ISHI community, to hear about the hurdles you encounter in your roles. The feedback highlighted a spectrum of challenges: from resource constraints—both in terms of funding and staffing—to the pressures of keeping pace with and validating emerging technologies amidst regular casework. Many of you also mentioned the complexities of navigating probabilistic systems, the demands of courtroom testimony, and the relentless task of clearing case backlogs.

A comprehensive survey conducted by Michigan State University, supported by the National Institute of Justice [3], revealed telling statistics about the emotional and mental strain in this profession. Among 849 forensic scientists surveyed across various American labs, about 60% reported feeling emotionally drained by their work. Moreover, 57.1% expressed frustration with their roles, and unsurprisingly, more than 60% felt substantial pressure and stress. Despite these challenges, a strong majority—85.6%—reported feeling satisfied with their careers, and over 64% would choose the same career path again without hesitation.

The essential role that forensic scientists play in the criminal justice system and broader society cannot be overstated. It's crucial that we find effective ways to support the well-being of those dedicated to this demanding career path. Beyond integrating therapy dogs, which has shown promising results in alleviating workplace stress, we continue to explore and share strategies for building resilience [4] and fostering mutual support among peers [2] in the forensic community.



The largest and smallest dogs on our team - 14lb Cavalier King Charles Spaniel, Leia, perched on top of 210lb English Mastiff, Gary.

The Benefits of Therapy Dogs in High-Stress Professions

Therapy dogs have been providing emotional support and comfort since the 1960s, beginning with the pioneering work of Dr. Boris Levinson [5], who noticed the positive effects his dog had on his young patients with mental impairments. Recognizing the potential of animal-assisted interventions (AAIs), the Delta Society was formed in 1989, establishing a certification program to formalize and enhance the effectiveness of animals in therapeutic settings. Over the years, the popularity of therapy dogs has surged, particularly in the last few decades, reflecting a growing acknowledgment of their benefits.

Emily LR Thelwell's 2019 study [6] specifically investigates how therapy dogs could alleviate stress among university students—a group notably more prone to psychological distress compared to the general population. The study measured the effects of direct interaction with a dog versus merely watching videos of dogs on students' mood and anxiety. This study involved 82 participants who were assessed both before and after interacting with a dog or watching dog videos, using standardized psychological tools like the State-Trait Anxiety Inventory (STAI) and the Positive and Negative Affect Schedule: Expanded Form (PANAS-X). The findings revealed that students who physically interacted with the dogs experienced significantly more profound reductions in anxiety and enhancements in mood compared to those who watched videos.

In a separate study, Freya L. L. Green & John-Tyler Binfet [7] explored the use of CAIs within a law enforcement environment to assess their effectiveness in stress reduction among police officers. The qualitative study was conducted on members of the Royal Canadian Mounted Police (RCMP) who reported experiencing high levels of occupational stress.

In the study, eight RCMP members participated in interviews to discuss their experiences with stress and the impact of therapy dog sessions. The therapy sessions, which were part of an organized CAI, involved regular visits from therapy dogs and were intended to provide relief from the daily stresses associated with police work. Participants reported overwhelmingly positive experiences, noting that the presence of therapy dogs offered a significant reduction in stress, improved mood, and provided a beneficial break from their routine duties.

One participant noted, "What I really liked about it, and what I got from it, was that I felt like our senior management was doing something, you know, actionable, that was a gesture of caring about their people." Another added, "When you're coming from a negative, it's such a big positive to be in the presence of something that seems to want you there, and enjoys you [being] there."

When asked whether or not the participants felt that CAIs had a place within law enforcement, one respondent answered, "I think it helps to break down some of the stigma around mental health. It gives people an opportunity to do something themselves that assists their mental health."

Bringing a Therapy Dog into Your Lab

Introducing therapy dogs into environments such as forensic labs can be a simple yet effective way to improve mental health and overall workplace morale. For those interested in integrating therapy dogs into their professional settings, numerous organizations offer resources and guidelines for setting up visits, often at little to no cost, thanks to many volunteers dedicated to this cause. Engaging with these programs can lead to significant benefits, contributing to a more positive and productive work atmosphere.

For a list of organizations recognized by the American Kennel Club, visit their website. As a note, Go Team Therapy Dogs has chapters throughout the US and not just Colorado Springs.

This article was generated with the assistance of artificial intelligence to ensure a broad and comprehensive coverage of the topic. However, all content has been thoroughly reviewed and curated by a human editor before posting to guarantee accuracy, relevance, and quality.

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Enhancing Forensic Accuracy

Comparative Evaluation of Genotyping Technologies in FIGG

Written by: Mike Cariola, CEO, Bode Technology and Abigail S. Bathrick, Senior Research Scientist, Bode Technology

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What is FIGG?

Forensic Investigative Genetic Genealogy (FIGG) pairs advanced genotyping technologies with traditional genealogical research methods to provide investigative leads for unknown DNA evidence when CODIS searching is unproductive. It gained worldwide attention as an investigative tool after the 2018 arrest of the suspected Golden State Killer, Joseph DeAngelo. Since then, it has been used to resolve hundreds of cold cases and has become a time-efficient method for identifying missing persons and perpetrators of violent crimes. FIGG's continued success in resolving high-profile cases and sustained media attention have led to a surge in inquiries and requests from investigators interested in applying FIGG to their cold cases. However, the forensic community has identified the need for further development, assessment, and evaluation of FIGG testing procedures to establish best practices for crime laboratories.

Our Current Research:

Comparative Evaluation of Genotyping Technologies for FIGG in Sexual Assault Casework

Development of best practices must start with a systematic evaluation of the technologies currently used to generate high-density single nucleotide polymorphism (SNP) genotypes. These technologies were developed and validated with pristine, high-yield samples intended for use in clinical genomics, whereas forensic samples typically contain old, degraded, biologically contaminated, and low-template DNA. Our work evaluates how degradation and low-template DNA affect the quality, accuracy, and reproducibility of SNP genotypes and how this affects downstream genealogical database searching and identification of potential relatives.

Three genotyping technologies were investigated in this study: SNP microarray testing with Illumina's Global Screening Array v2 BeadChip (array), whole genome sequencing (WGS) on the NovaSeq 6000, and targeted sequencing with Qiagen's ForenSeq Kintelligence Kit on the MiSeq FGx. The technologies were compared for their sensitivity to low-level DNA input concentrations and specificity for degraded DNA. All three technologies were found to be sensitive to low-level DNA inputs. DNA inputs of at least 500 pg generated call rates >85% with both array and WGS analyses, while Kintelligence produced call rates >90% with as little as 100 pg DNA. Comparisons between the technologies demonstrated >95% concordance. Prior to genotyping, DNA degradation was estimated with Quantifiler Trio's Degradation Index (DI), with DI 1–10 indicating slight to moderate degradation and DI >10 indicating significant degradation. For samples degraded via UV irradiation, increased degradation adversely affected call rates for both array and WGS processing, whereas Kintelligence call rates were robust against degradation (Table 1). While genotype concordance was negatively impacted for array, WGS and Kintelligence demonstrated concordance of >98% and >96%, respectively, regardless of DI value (Table 1).

Genotyping Technology	Concordance (%)				Call Rate (%)			
	DI 1.85	DI 4	DI 10	DI 19.8	DI 1.85	DI 4	DI 10	DI 19.8
Array	96	88	81	75	85	62	49	41
WGS	99	99	98	98	97	92	76	61
Kintelligence	99	98	97	97	99	97	93	95

Table 1

The high-density SNP genotypes resulting from the sensitivity and specificity samples were compared against genotypes databased in GEDmatch to determine the maximum distance at which known or potential genealogical associations could be identified. Robust matching was observed out to the 2nd cousin level with low-level DNA inputs for all technologies. Slight to significant degradation (i.e., DI 1.85–19.8) had minimal impact to 2nd cousin matching for Kintelligence and WGS, while moderate degradation (i.e., DI >4) significantly impacted 2nd cousin matching from array processed samples. Additional limitations became apparent during GEDmatch searching/matching. Anomalous results were observed with the WGS-based SNP set of >2 million loci or donors of non-European ancestry, and inconsistencies were observed in genotypes generated with Kintelligence when compared to array and WGS. Kintelligence also displayed limited utility due to its incompatibility with third-party comparison tools.

The limitations of each technology will be further tested by examining challenging samples exhibiting both low-level DNA concentration and degradation using a known donor for whom family members of known relationship distance greater than 5th degree (first cousin once removed) are present in GEDmatch. After genotyping with methods most applicable to each sample's particular characteristics, a full genealogical investigative workflow will be applied to demonstrate whether increasingly distant relatives can be identified and at what distance identification is no longer possible. Genealogical workflows for the three technologies will also be compared for range and accuracy. All genealogical workflows will conform to the Genealogical Proof Standard, which is a set of criteria used by genealogists to evaluate the quality of their research and the conclusions they draw from it. By adhering to these standards, genealogists can ensure that their research is thorough, accurate, and reliable, leading to more credible genealogical conclusions.

By demonstrating the strengths and limitations of the current technologies, we hope to assist FIGG practitioners in making more informed decisions, optimizing resources, and enhancing investigative outcomes. Additionally, our evaluation may provide support for the development of new genealogical workflows for samples that generate suboptimal results. Such analyses empower forensic experts to select the most effective methods tailored to specific cases, accelerating the identification of suspects and resolution of cases.

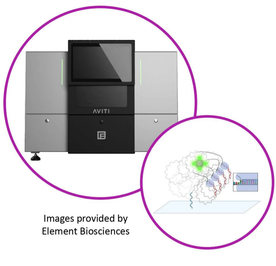
This project is supported by Award No. 15PNIJ-21-GG-04143-MUMU, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect those of the Department of Justice.

Improving FIGG Success with Challenging Forensic Samples

In addition to criminal casework, FIGG has become critical for the identification of missing persons and unidentified human remains. These cases present unique challenges as bone, the primary source of DNA, is highly subject to environmental and chemical damage. Additionally, DNA isolated from bone often contains more exogenous microbial DNA than endogenous human DNA, which can interfere with both microarray analysis and library preparation prior to WGS. In collaboration with the University of Tennessee Knoxville Forensic Anthropology Center, we are using lessons learned from the ancient DNA community to optimize a workflow for library preparation and target enrichment hybridization capture from compromised bone samples that is amenable to implementation in a standard forensic laboratory. With support under NIJ Award No. 15PNIJ-23-GG-04224-RESS, this project aims to improve sequencing of DNA obtained from degraded and contaminated bone samples and ultimately allow for more identifications of human remains.

Transitioning from Outsourcing to In-House Operations

FIGG presents a unique challenge to forensic laboratories, which are not typically equipped with the sequencing technologies used to generate high-density SNP genotypes. Initially, sequencing was outsourced by sending extracted DNA to third-party laboratories specializing in SNP microarray testing and WGS. However, due to the sustained success using FIGG, practitioners are now considering how to integrate end-to-end FIGG processing within an accredited forensic laboratory setting.



Images provided by Element Biosciences

Leveraging our years of forensic and sequencing experience, Bode has validated two FIGG sequencing methods to the standards required by ISO 17025: the ForenSeq Kintelligence Kit on the MiSeq FGx and WGS on Element Bioscience's Element AVITI™ System. The AVITI is a short-read, mid-throughput sequencer that uses Element Bioscience's novel sequencing-by-binding chemistry to reduce run costs and improve performance when compared to sequencing-by-synthesis chemistry, the current gold standard. AVITI sequencing offers shorter run times and improved base call accuracy and detection, with mean quality scores exceeding Q40 (only one base call in 10,000 is predicted to be incorrect) — a 10X improvement on the current benchmark. Collectively, these innovations have set a new standard for sequencing and make AVITI sequencing ideal for challenging forensic evidence. With this technology, our full-service pipeline now encompasses all steps of the FIGG process: receipt of evidence, sampling, DNA extraction, library preparation, sequencing of SNP genotypes, bioinformatic processing, upload to genealogy databases, genealogical research, and court-ready reporting.

Moving FIGG Forward

Bode is proud to be a leader in the FIGG community. Through ongoing research efforts, we continue to explore FIGG's potential, contributing new data to the broader body of FIGG knowledge and pushing our work to the forefront of forensic science. We remain committed to advancing FIGG while ensuring the technology adheres to the rigorous standards required for traditional DNA casework methods. Since launching our FIGG service in 2018, Bode has processed over 500 FIGG cases, and 30 cases were processed with our end-to-end FIGG workflow with AVITI sequencing directly following its release. Over 300 investigative leads have resulted from this work, underscoring FIGG's value to modern forensic investigations. We look forward to the future of FIGG and plan to continue sharing the results of our ongoing FIGG research with the wider community.

Shaping the Future of Forensic Training

Inside ISHI's First DNA Trainers' Meeting

Interview written and condensed by Tara Luther, Promega

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This year, the International Symposium on Human Identification (ISHI) is proud to introduce a new addition to its lineup: the DNA Trainers' Meeting. Recognizing the challenges inherent in forensic DNA analyst training, this meeting was established to enable trainers to share best practices, discuss innovative training strategies, and explore potential improvements in training efficiency.

Below, Eugene Lien and Kelly Elkins, who are co-chairing this inaugural meeting, offer their insights into the creation of this new meeting at ISHI, the pressing issues facing today's forensic trainers, and what attendees can expect from participating in this workshop.

What is the inspiration behind the DNA Trainers' Meeting and what attendees can expect from this event?

Forensic DNA laboratories have been working on making their DNA analyst training programs more effective and efficient. The training process typically takes 12 to 18 months, and it is not unusual for a lab's training program to run upwards of 2 years! What if there were ways to cut down the training timeframe without losing quality? Laboratory Directors and DNA Technical Leaders have dedicated meetings/conferences to discuss issues, learn from each other, and improve their lab, but trainers do not. We saw the DNA Trainers' Meeting as an opportunity for conversations and ideas to emerge. We hope that anyone involved with DNA training in a forensic lab can meet others in the same role, and that a Community of Practice develops.

Who is this meeting designed for and what do you anticipate the format of the meeting to be?

We hope to create a Community of Practice where trainers can feel comfortable discussing important issues and learning from each other. Therefore, this meeting is designed for anyone from a forensic DNA laboratory with a role in training. The format will include talks from trainers from different sized labs since they take different approaches to training as they onboard different numbers of new analysts annually. They will provide an overview of how they conduct training and what they would improve, if given the opportunity. Mentoring is a topic that will be discussed as well since it reduces the chances of new staff becoming unhappy and leaving, which will ultimately save the company time and money. Results from a National study of training in U.S. public labs will also be shared.

What are the most pressing training challenges currently facing forensic laboratories, and how can these be effectively addressed?

One of the most pressing challenges facing forensic laboratories includes the pressure of getting new staff online to process casework as soon as possible. Funding is typically allocated to hiring new staff when there is an immediate need to lower the backlog of cases. However, it might be hard for some to tell their bosses that the funding will not go towards any improvement for at least a year. As a matter of fact, each time a new staff member is hired, existing staff are often pulled from casework to train them, thereby lowering productivity. But everyone must be trained, and their skills must be carefully tested and verified before they can move on to casework. This struggle becomes a balancing act – we try to shorten the training program, but will we still have quality analysts at the end?

Another pressing challenge is to train current staff in new technologies, which includes newer versions of probabilistic genotyping software and new instruments. Labs already struggle to find time to conduct validations, but to train their people takes a special effort. Again, existing staff are often pulled from casework to train others, but the demand for new technologies is so constant that they are not able to contribute much to casework.

How does the rapid evolution of forensic technology impact the training needs of laboratory personnel, and what strategies can be implemented to keep pace?

New forensic technologies, such as Proteomics, Massively Parallel Sequencing, Rapid DNA, and Forensic Investigative Genealogy have emerged within the last 10 years. Even when labs decide not to implement any of these new technologies, staff members need to learn and understand what these new technologies are for. Labs can have ongoing and frank conversations with their academic institutions to assist with these prerequisites so that new staff will have more knowledge when they are hired.

What role does standardization and accreditation play in shaping training programs within forensic laboratories, and how can labs ensure compliance while fostering skill development?

Standards and Guidelines, from well-known organizations such as SWGDAM and OSAC, are valuable tools that can be used to assist labs to create a standardized comprehensive training program for their staff. Standards, such as the FBI's Quality Assurance Standards for Forensic DNA Testing Laboratories (QAS), include education and training requirements for laboratory personnel involved in forensic DNA analysis. Guidance documents, such as the SWGDAM Training Guidelines, provide a recommended program of standardized study and training for laboratory personnel. Accreditation assessment teams and auditors can review all training documentation to ensure that the goal of the training program is met, and new analysts can be interviewed about their training to determine if the program was effective. The benefits of standardization and accreditation include constantly improving the overall quality and consistency of work when performing forensic DNA analysis and developing the technical skills and knowledge of laboratory staff.

That said, labs must also understand that Standards and Guidelines provide a bare-minimum recommendation for training. To foster skill development, training programs must be somewhat tailored to the individual. After all, one cannot develop an in-depth understanding of DNA amplification without the educational prerequisites. Again, labs need to have ongoing and frank conversations with their academic institutions to assist with these prerequisites. Otherwise, this knowledge may have to be provided by the laboratory and training will take more time.

How can forensic laboratories balance the need for specialized training in emerging areas with the broad foundational knowledge required of all forensic analysts?

From discussions with forensic lab directors and trainers, we found that analysts come with broad foundational knowledge in biology, molecular biology, and biochemistry theory. The labs focus on specialized on-the-job training, geared towards their SOPs, using their approach for interpreting DNA mixtures, and reporting results/conclusions in their format. Labs should not need to reteach the basics of a college degree, but they do need to ensure that new analysts gain competency and meet the FBI DNA QAS. Experts on these emerging areas should be called upon to provide continuing education to ensure that all forensic DNA analysts understand these emerging technologies.

In what ways can mentorship and peer learning be more effectively integrated into forensic laboratory training programs to enhance skill acquisition and professional growth?

Mentoring and training both involve "knowledge transfer" and are important to onboard new employees, but the approach to both is very different. The purpose of the knowledge transfer in *Training* is to upskill your staff and your workplace. The relationship between the Trainer and Trainee is similar to a Teacher and a Student. The purpose of the knowledge transfer in *Mentoring* emphasizes long-term career development and personal growth. The relationship between Mentor and Mentee is more personal, confidential, and friendly.

In many ways, labs utilize mentoring during training. New analysts shadow their trainers, are watched carefully, and instructed when they perform methods in the lab for the first few times to ensure that the SOP is followed. The same trainers could also act as mentors by offering general advice based on personal experience and empowering trainees to find their answers. This "general advice" could be anything ranging from where to get lunch to how to organize a casefile. In these cases, the general well-being of trainees may be better. On the other hand, you may not want trainers to slip into a mentoring role, or the relationship can become confusing. If you feel this way, then having different individuals serve as Trainers and Mentors might be the best to keep the roles separate. For analysts thinking about lateral moves or moves to new positions, a mentor outside their lab can also be a great resource.

Ready to enhance your approach to forensic DNA training? Join us at the inaugural DNA Trainers' Meeting at ISHI. This specialized workshop, led by experts Eugene Lien and Kelly Elkins, offers a platform for trainers to connect, share insights, and explore innovative training strategies.

Register now to secure your participation and contribute to shaping the future of forensic DNA analyst training. For details and registration, visit our website.

Next-Generation Forensics

Unlocking Complex DNA Cases with NGS and STRmix™ Technology

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

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The field of forensic DNA analysis has long been transformative. Over the past 50 years, though, two step changes in the forensic examination of biological traces have been particularly impactful: the advent of DNA typing in 1989; and the advent of probabilistic genotyping (PG).

Since its introduction, forensic DNA typing methods have evolved rapidly. Technological improvements have massively increased the sensitivity of the technique, resulting in the use of increasingly complex DNA profiles. In addition, the likelihood ratio (LR) has now become the accepted method of assigning the weight of evidence for complex and mixed DNA profiles.

Implementation of the LR requires numerical assignment of a probability of a set of peak heights, given a proposed set of donor genotypes. This involves creating mathematical models that account for the effects of DNA template and degradation, artefact creation, and the variability of these. These models are applied using Markov Chain Monte Carlo methods, leading to the creation of the field now known as probabilistic genotyping.

The success of PG software in interpreting complex autosomal short tandem repeat (STR) profiles, in turn, has given rise to its widespread use in casework. STRmix™ forensic software, for example, has generated usable and legally admissible DNA evidence in more than half a million criminal cases globally since its introduction in 2012.

A more recent innovation for the forensic analysis of DNA evidence is 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. A number of experts in the field contend that NGS (also known as Massively Parallel Sequencing or MPS) technology has the potential to assist forensic laboratories in cases involving human identification, kinship, and ancestral origin by offering ultra-high throughput, scalability, and speed. Reported benefits include faster resolution of criminal cases and reduced costs.

Should those benefits come to fruition, NGS technology not only could revolutionize traditional forensic DNA analysis but also could synergize with emerging techniques like Forensic Investigative Genetic Genealogy (FIGG). FIGG can analyze vast datasets of single nucleotide polymorphism (SNP) loci to harness genealogical research and advanced DNA testing. As a result, it can identify potential familial links to unknown profiles, offering invaluable insights into cold cases and unidentified remains. Some forensic laboratories are already using SNP loci routinely to analyze small, degraded samples, such as bone samples.

The researchers here at STRmix, increasingly have been considering the possibility of integrating our PG and LR assignment technology with NGS technologies. These tools now incorporate a growing NGS analysis capability, including within the investigative functions of DBLR™, our tool for rapidly calculating likelihood ratios in DNA evidence. DBLR™ can accept NGS sequence-based inputs and assign LRs within the Kinship module for single source profiles containing both STR and SNP loci generated using NGS technology.

The STRmix team also recently launched STRmix™ NGS, the first application of STRmix™ technology expressly for the probabilistic genotyping of autosomal NGS profiles. Employing a fully continuous approach for interpretation of NGS-generated STR DNA profiles, STRmix™ NGS allows users to research the potential implementation and validation path of probabilistic genotyping alongside NGS chemistries and sequencing equipment.

While not currently available for casework, this Research and Validation release of STRmix™ NGS has been designed for laboratories familiar with STRmix™ that are investigating future implementation of emergent NGS technology. Pairing NGS with STRmix™ potentially could unlock the value of complex mixtures analyzed using more loci and more sensitive technologies.

The STRmix™ NGS workflow and user experience is grounded on the capillary electrophoresis- based STRmix™ technology, which has been extensively validated and is used for casework interpretation in more than 100 forensic labs worldwide. STRmix™ NGS has many features in common with standard STRmix™ technology, including the ability to model any type of stutter, undertake quality checks of the data, assign LRs with flexible propositions, and generate reports including run diagnostics in a configurable reporting module. Further functionality development and improvement is planned as a result of our very active scientific research program.

Looking to the future, the STRmix team expects NGS technology and its use with PG software to continue to be evaluated and refined by members of the forensic community. While proponents contend this technology can provide a depth of information beyond the capacity of traditional forensic DNA technologies interpreting solely autosomal STRs, we must still grapple with how it will be used in combination with legacy databases.

Globally, these databases contain tens of millions of STR profiles from known individuals. CODIS alone contains more than 20 million offender and arrestee profiles. As a result, autosomal STR loci seem likely to be the workhorse of forensic laboratories, at least for the immediate future.

Despite this legacy data, a logical next step for the STRmix team with the expansion of its PG software solution is the ability to interpret SNP data. By multiplexing thousands of SNP loci, increased discrimination power can be achieved. Given the small sample sizes required, SNPs on NGS platforms will be more sensitive and discriminatory than STRs analyzed on CE technology. This will enable them to produce additional information, such as identity-specific ancestry and phenotypic data.

The anticipated opportunities from use of NGS technology lie in its potential to add significant value to the entire field, promising a third step change for forensic analysis of biological material.

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/.

Dr. Bright will also be presenting in the Supporting Your Laboratory During Probabilistic Genotyping Implementation: from Validation to Admissibility *workshop held on Monday, September 23rd in conjunction with ISHI 35.*

Meet The 2024 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 35th International Symposium on Human Identification in San Antonio, Texas. Follow Charlotte, Ashley, Ahana, Martin, and Kierra 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.

My path into forensic science, or more precisely into forensic genetics, is quite a cliché. I have always loved television crime series, and when I entered university the first voluntary elective course I took was a forensic toxicology analysis course. I did not understand much about the chemical basics at the time, but I also got a short introduction into other fields in forensic science, most prominently forensic genetics. Then I learned that forensic genetics is even more fascinating in real life than on television. Ever since then I knew I wanted to do research in this field, and in this field only. Fortunately, my hometown has an excellent forensic genetics institute and I was fortunate enough to do both my bachelors and masters thesis there. After finishing my studies, I started a PhD position in Switzerland, where I am currently focusing on DNA methylation analysis for forensic applications. In particular, I am focusing on age estimation from stain donor in different tissues and scenarios and whole methylome analysis of sudden unexplained death cases. Never having worked in any other biomedical field for a mentionable amount of time, I really hope to continue an academic career in forensic genetics after my graduation.

What made this field so much more appealing to me than any other biomedical field, is the direct impact that scientific research has on real-life applications. In my short time as a PhD, I have seen how research I have done on methylation-based age estimation has affected decisions made for real casework samples. This direct applicability of my research onto the "real world" is something I find rather unique to our field and extremely fascinating and rewarding!

If I wasn't a forensic geneticist, I would likely be a musician.

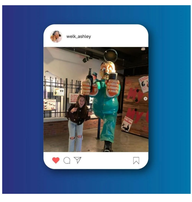
Connect with Charlotte

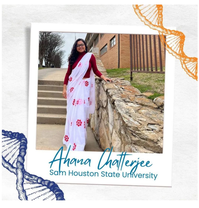
My path to forensic science started on a Take Your Daughter to Work day. My father brought me along to his lab, let me wear a long, white lab coat that draped to my feet, along with goggles and gloves that were much too big. I felt like a real scientist and after that experience I knew I wanted to be in that environment in the future. Flashing forward to high school, I took a biology class with an instructor, Mr. Kenney. He taught a genetics unit and mentioned the application of genetics in the forensic field which interested me greatly. As I looked toward university, I decided to pursue forensic science and biology at Marian University of Wisconsin largely because of his influence. During my time at Marian, I learned the importance of the intersection between science and the criminal justice system, and I wanted to build on that knowledge with further education. This led me to begin my Master of Forensic Biology with Thomas Jefferson University, where I am currently in my second semester.

I recognized Jefferson as an environment where I could develop and evolve into a scientist capable of enduring the challenges and demands of a forensic science career, primarily due to their collaboration with the Center for Forensic Science Research and Education (CFSRE), a non-profit dedicated to research, education, and outreach in the forensic sciences. It was my program director, Dr. Mirna Ghemrawi, that encouraged me to apply to be an ISHI student ambassador as she was among the first ambassadors. Throughout my time with the CFSRE, I have processed mock cases, as well as assisted with ongoing forensic biology projects. These experiences have prepared me for a career in the field and have sparked a further interest in research.

I played soccer at Marian University, and I still play in a co-ed league because I love the sport so much!

Connect with Ashley





In 2017, my introduction to the Innocence Project during a recombinant DNA technology class in my undergraduate Biotechnology program sparked an interest in forensic science. The realization of how a simple DNA profile had the potential to rectify wrongful convictions deeply resonated with me, given my background in the life sciences. This interest led me to leave my home country to pursue a master's degree in forensic science at the University of Alabama at Birmingham (UAB) in 2021. Upon entering the field, I recognized that forensic science transcended the glamorous depictions often portrayed in mainstream media. It became evident to me that the discipline not only held immense potential but also faced significant financial constraints, whether due to the extremely expensive DNA analysis kits or the equipment in-use.

Armed with this understanding, I embarked on my master's journey with a determination to address this issue. In 2022, I began my research project in forensic biology, where we successfully developed and validated a multiplex STR amplification kit tailored for students in the field. This endeavor not only enhanced accessibility but also significantly reduced costs, making forensic education more attainable for academic institutions operating within limited budgets. By lowering the price of the kit to a mere $0.74 per reaction, we bridged a critical gap, enabling students to engage in forensic laboratory work despite financial constraints. During the first year of my master's program, my passion for the field only intensified, driving me to pursue doctoral studies to further expand my knowledge, conduct impactful research, and learn from global experts. Hence, upon completing my master's degree in 2023, I transferred to Sam Houston State University (SHSU) for my Ph.D. in Forensic Science. As I dive deep into my doctoral studies, my commitment to solving cost related issues in the field remains constant.

Last week, I made history by becoming the first Grand Champion in the 3 Minutes Thesis competition from SHSU's forensic department, achieving this in my first year. Outside academics, I've been experimenting with Indianizing recipes, with my current favorite being Indianized Lasagna—a fusion of Italian and Indian flavors that's both innovative and delicious. Here's to breaking boundaries, whether in academia or the kitchen!

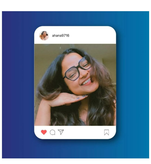
Connect with Ahana

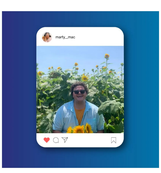
My aspirational path for a career in forensic science is fairly non-traditional, as it began with a summer camp while I was in middle school. What started as an enrichment camp learning the basics of matching footwear impressions has now become a pursuit for a master's degree in forensic science ten years later. Ever since that summer class, I have had an innate feeling that forensic science is my calling. Having participated in multiple research projects at this point in my academic career, I am well aware of the demands a career in science entails. Personally, the goal has never been to achieve recognition; it has been to get the job done correctly and thoroughly. I think this mentality has been recognized by my supervisors and the Principal Investigators I've worked for, as I've earned a reputation of being a "workhorse" when a task for a project needs to be completed. I think this determination and drive pairs nicely with a career in forensic science, as it is rare that experiments work out for you on a first attempt. Therefore, having a strong work ethic, coupled with a positive attitude, makes me feel a career in forensic science is for me.

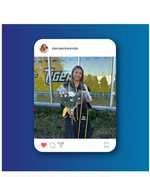
My scientific focal area is forensic biology. Currently, I am working on a project that aims to use mitochondrial DNA from 19th century juvenile bones to provide the biogeographic ancestry for these individuals. These remains are presumed to be from enslaved individuals whose graves were robbed for anatomical demonstrations at a medical college. The discovery and removal of these remains were improperly handled, resulting in a massive commingling of bones. This research would offer dignity to these individuals, who had been denied such in life and death. This current project has taught me a plethora of invaluable laboratory skills that I want to carry with me to my future career post-graduation. I aspire to work in a forensic laboratory, either public or private, and someday be a full forensic DNA analyst. The scientific area of focus I have chosen, both in the classroom and in the laboratory, have given me the knowledge and skills to achieve my aspirations.

I have hiked the Maryland portion of the Appalachian Trail!

Connect with Martin







My first introduction to forensic science was when I was twelve years old. I had recently taken an interest in the DC and Marvel comics and a new show called "The Flash" had just come out. The main character, Barry Allen, is a forensic scientist. After researching the field, I knew this was the path for me. Not only would I be able to work in biology, a subject I had always enjoyed in school, but I would also get to play a part in serving justice. Now, ten years later, I have maintained my love for forensic science, earning a bachelor's degree in forensic chemistry with a concentration in DNA analysis. I am currently pursuing a master's degree in forensic science at Towson University, and again concentrating in DNA analysis. After graduating next spring, I would love to immediately start working in the forensics field as a DNA analyst. As I progress in my career, a goal of mine would be to aid in forensic investigative genetic genealogy cases. There are so many unsolved crimes containing DNA evidence that have not been able to be matched to a suspect. Forensic investigative genetic genealogy (FIGG) has shown to be a successful tool in aiding in the process of identifying the individuals responsible for these crimes. If implemented into forensic laboratories, FIGG could greatly reduce the time it takes to identify suspects in cases where DNA was left behind. I aspire to work in this discipline to seek justice for victims who thought they may never get it, and to ensure current and future victims do not have to wait decades for an answer.

I was one of 5 students from my high school graduating class to receive the International Baccalaureate Diploma.

Connect with Kierra

A Ghanaian Perspective

Transformative Strategies for Forensic Science Communication

Yahaya Sumara Sulley, Snr. Research Assistant, Department of Forensic Sciences, University for Development Studies

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I wish to discuss the global importance and challenges of science communication in the context of forensic science. Despite facing challenges with funding and visa acquisition, I was undeterred in my commitment to contribute to the panel discussion on "Raising the Standards of Science Communication in Forensic Science" at the 17th International Public Communication of Science and Technology Conference (1). Participating through a prerecorded video as the sole Ghanaian and African representative on the panel, I wanted to addressed the topic within the Ghanaian context, believing that the challenges faced in Ghana resonate across several African countries, given Ghana's acknowledged level of forensic science capability on the continent.

Forensic scientists, integral to the criminal justice system, employ scientific methods to investigate crimes and provide evidence in court (2). This role necessitates communication with diverse audiences, including the court, fellow experts, and the general public. Effective communication, grounded in the values of science and law, is crucial for both specialist and non-specialist audiences.

Two significant challenges in forensic science communication include the rapid advancement and complexity of technology (3). The public often struggles to comprehend the implications and applications of these advancements. New technology demands heightened technical expertise for explanation, posing a challenge for effective communication with non-experts. However, I view this as an opportunity to engage the public by demonstrating how forensic technology can address contemporary social and environmental challenges within forensic science.

I align with Vanessa Lynch's assertion about disparities in opportunities, aiming to contribute to the conversation on a forensic science revolution in Africa (4). Despite limited funding, my focus revolves around engaging the public in this era of rapid technological advancement in forensic science. The primary question to address is: How can training in forensic science communication be integrated into the careers of forensic scientists, who provides the necessary support and who benefits from the impact?

Particular Challenges in Forensic Science Communication in Ghana

Ghana lacks specific training programs for forensic scientists in science communication within its universities and academic institutions. The scarcity of skilled experts and forensic science communicators, coupled with the technical nature of forensic science, hinders effective communication to non-experts. A 2019 study I conducted highlighted this gap, which appears linked to limited research funding, infrastructure, scholarship and graduate opportunities (5). Forensic science students, confined to labs like their counterparts in other sciences, lack exposure to communication opportunities, impacting their interest in engaging non-expert audiences.

In my interactions with Ghanaian forensic science experts, barriers such as public mistrust and misunderstanding of forensic science emerged. These issues are rooted in institutional mistrust, historical events, and perception bias, where the public often associate forensic scientists with police officers. This perception hampers the success of forensic science practice in Ghana.

Forensic science is an emerging field in Ghana, and research indicates a lack of basic understanding among the population (5). While the educated population relies on CSI shows for awareness, the uneducated, facing socio-economic disparities and language barriers, remain excluded. Communicating forensic technologies becomes challenging when conveying complex technical information in a culturally sensitive manner to diverse communities. A digital divide further exacerbates these challenges, with unequal access to technology and digital literacy. Also, while digital access can widen the audience reach, media sensationalism and inaccuracies distort public understanding of forensic science practices.

A World of Opportunities in Forensic Science Communication

My journey in forensic science communication began in 2019, where I initiated Forensic Science Outreach Ghana (FSOGH) as part of my undergraduate thesis recommendations. FSOGH aims to reach the next generation of forensic science professionals in Ghana and promote forensic science among the general public. Utilizing social media, symposiums (6), outreach and other science communication approaches, I have used FSOGH as a medium to engage with high schools and the public.

Noteworthy moments in my forensic science communication journey include a radio show appearance in collaboration with GhScientific and the Ghana Science Association during the COVID-19 period. I realized the power of social media which played a pivotal role during this time, highlighting its potential for communication when physical engagement was challenging. Again, my involvement in popular YouTube live forensic talks in 2021 on the topic "Forensic Science Ghana", following an online presentation at the Canadian Society of Forensic Sciences Conference (7), underscored the impact of social media in disseminating forensic science information to a wider audience.

In 2022, I communicated my research work on the need for effective forensic DNA policies to manage the plight of nameless and unknown bodies in Ghana through a short three minutes video in the first ever ISHI Threesis competition. After placing second in the maiden competition (8) which was widely broadcasted through social media, it opened an opportunity to be part of the DNAforAfrica crusaders (9) which I never thought of being a part. I also had the opportunity to present on "Working towards a draft law and policy that can be implemented in West Africa" at the first ever DNAforAfrica workshop in West Africa (10), Ghana. From there I have built a wider network of forensic specialists and experts in the field including Professor Bruce Budowle. I also received a nomination for the MyVoice for Justice awards organized by DNAforAfrica in 2022 (11) which means a lot to me at my career stage and my contribution to forensic DNA through advocacy, education and science communication. The recognition received, affirmed the value of effective science communication.

In 2023, together with a team of STEM enthusiasts, I aimed to communicate the science of DNA and its role in sustainable development by moving beyond conventions through a DNA fair and conference (12). The combination of scholarly presentations and an art exhibition which displayed forensic relevance received positive feedback, emphasizing the effectiveness of artistic representations in conveying forensic DNA concepts. In April 2024, I worked with a team of undergraduate students carrying out their project work at our lab, Dr Quansah Lab (QLAB), to develop science communication stratergies to communicate the concept of microbiomes in forensic human identificiation. Some of the stratergies adopted included the use of an indigenous game in Ghana known as "Pilolo" to simulate the diversity, stability and variability of microbiomes within population groups and how they could be used to establish differences. This approach would enable non-scientific audiences to grasp the concept, minimize sensitive ethical and sociocultural issues and appreciate scientist interaction in future sample collection activities. In December 2023 as I was walking in the bustling city of Tamale, northern Ghana, a young female High School graduate approached and reminded me of a forensic science outreach our team embarked on in her school. She said was on her way to purchase forms to apply for BSc forensic science at my department. At this moment I felt I have made an impact with forensic science communication in Ghana at least.

Forensic science communication has not only been instrumental in my personal and professional growth, but also holds the potential to be a beacon of opportunity for a myriad of individuals and societal issues. This extends beyond the realm of academic and professional circles to touch the lives of those seeking closure, justice, and the truth. Forensic science communication should transcend academic dialogues and symposiums; it should be a lifeline for those who have longed to find missing relatives, for families grappling with unidentified deceased loved ones, and for survivors of sexual assault still yearning for justice. Moreover, it should extend its reach to the incarcerated innocent individuals wrongfully convicted, who, out of desperation, may have given up hope. In Ghana, where a lack of awareness among the uneducated contributes to a significant number of prisoners not pursuing their cases, effective communication becomes a tool for empowerment. Television programs and outreach initiatives to prisons could prove transformative, providing an avenue to showcase the potential of forensic science in proving innocence even after years of incarceration. The world of opportunity presented by forensic science communication should be accessible to everyone, making a tangible impact on lives and bringing justice to those who need it most.

Potential Interventions

Recently, I read a paper that incorporated cartoons to aid in understanding DNA analysis (13), and it left a lasting impression on me. This practical approach emphasizes the need for content that aligns with the public's learning style, transcending scholarly publications and conference presentations.

Achieving successful forensic science communication in Ghana involves increasing public understanding and trust, fostering engagement in the scientific process. Advocating for international collaborations to share resources, knowledge, and expertise is essential. Establishing these partnerships can facilitate an exchange of ideas and best practices, contributing to a more global perspective on the forensic science communication. Incorporating science communication training into forensic science programs, along with media training for forensic experts, can bridge the communication gap with diverse audiences. Public engagement through forensic science fairs, exhibitions, and collaboration with artists provides a practical and relatable avenue for communication. If applicable, we can consider translating key materials in forensic sciences into culturally sensitive and widely spoken languages so that it can reach a broader local and international audience. More opportunities should be offered to share Ghana's experiences and learn from global practices at international conferences related to forensic science and science communication.

Forensic science communities in Ghana must embrace diversity, developing multilingual and culturally sensitive strategies. While doing this, citizen science approaches can be used to educate the public and demonstrate forensic science's real-world impact. Collaboration between forensic science bodies can address socio-economic challenges and enhance inclusivity. These could come in the form of open forums and conferences, as they can turn skepticism into an opportunity to showcase the commitment to reliable forensic science through transparency and accountability.

Leveraging media, including TV, radio, and social media, is crucial for increasing public awareness. Forensic science communities and university forensic associations should lead by example in popularizing forensic science discourse. This could include the provision of expert analysis on forensic cases to help the public understand the science behind forensic investigations. Just as there are TV and radio shows that focus on specific issues in health and agriculture, I have a strong conviction that forensic science discourse can be a great way to successfully communicate forensic science to the Ghanaian public. Also, leveraging social media platforms not only for local outreach but also to engage with the global community. We can use this to share success stories, insights and updates to create an international conversation on forensic science communication.

Concluding Remarks

This piece may have not been considered for publication in mainstream journals which is not a result of the reflection of the message but rather a commitment to our interest in terms of diversity, equity and sustainability. While the context may vary globally, the importance of forensic science communication cannot be overstated. For Ghana, the challenges appear to be numerous, but the potential benefits may be enormous. Establishing a global network for science communication in forensic science can promote collaboration and knowledge sharing worldwide. Effective communication can increase public understanding and trust in forensic science, ensuring a successful global forensic science discourse. It is worth recognizing the importance of effective forensic science communication in a country where there is lack of specific training programs for forensic scientists within its universities and academic institutions. It therefore becomes imperative to address the question: How can training in forensic science communication be seamlessly integrated into the careers of forensic scientists, and who should be the primary providers of necessary support?

Answers to this question includes the need for a structured approach to training within academic and professional forensic science settings. Strategic collaboration is a necessity for forensic science institutions, educational bodies, and relevant stakeholders towards the implementation of these comprehensive training programs. When this framework is established to recognize effective communication skills as indispensable as technical expertise in the field of forensics, forensic scientists can be better equipped to engage diverse audiences, contributing to increased public understanding and trust in the field. To maximize the impact of this call on an international level, these potential interventions would contribute to global knowledge if published in an international journal.

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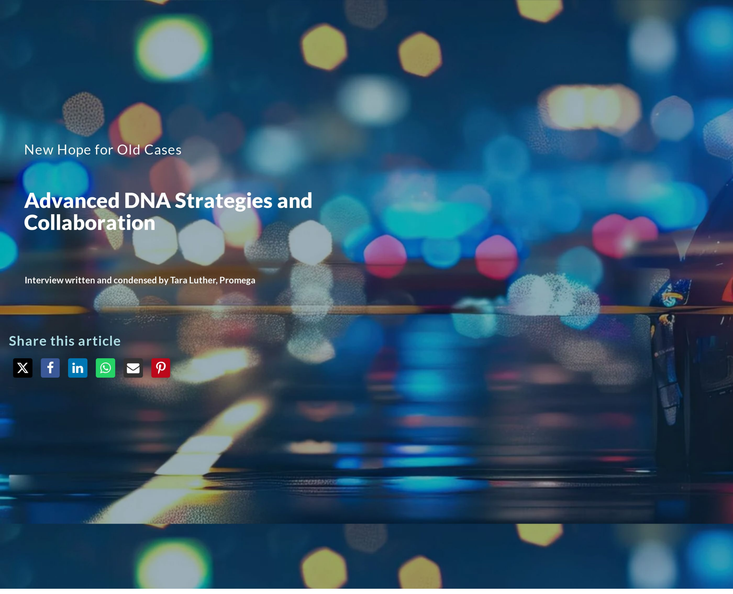
14. For an example, see: https://dnadoeproject.org/case/kern-co-jane-doe/



New Hope for Old Cases

Advanced DNA Strategies and Collaboration

Interview written and condensed by Tara Luther, Promega

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With thousands of unsolved cases lingering in the archives of law enforcement agencies nationwide, the need for innovative and effective solutions has never been more pressing. This year, ISHI introduces an essential workshop: "Engaging Collaboration: How to Further Cold Cases with Advanced DNA Approaches." Designed to bridge gaps and foster partnerships among forensic scientists, law enforcement officers, and legal professionals, this workshop promises to unveil cutting-edge DNA technologies and collaborative strategies that could turn the tide in cold case investigations. Attendees will gain unprecedented insights into the latest advancements in forensic DNA technology, learn from success stories, and explore practical techniques for enhancing multidisciplinary efforts. Whether you are a seasoned investigator or a forensic novice, this workshop is poised to equip you with the tools necessary to bring long-awaited closure to many awaiting justice.

Below, Jason Moran, Kimberly Gin, and Dr. Claire Glynn, who are presenting the workshop, offer their insights into the importance of this event at ISHI. With their combined expertise in forensic science, they address the pressing challenges in cold case investigations and discuss how attendees can benefit from the advanced DNA technologies and collaborative strategies presented during the workshop.

What motivated you to present this workshop at ISHI, and why do you believe it's a crucial addition to the conference?

The United States is experiencing a silent mass disaster of Missing and Unidentified Persons and has been for many, many years. This has led to massive amounts of Cold Cases sitting on the shelves of police departments and medical examiner/coroner's offices throughout the country. Using DNA approaches to identify the unidentified and therefore locate the missing, is the key to solving this problem. Forensic scientists play a crucial role in terms of operating the DNA technologies and their appreciation of the outcome and impact of their work is more relevant than ever. That is why this workshop, "Engaging Collaboration: How to further cold cases with advanced DNA approaches" is a crucial presentation at ISHI 2024.

What unique challenges do cold case investigations present, and how does this workshop aim to address those through advanced DNA technologies and multidisciplinary collaboration?

Cold Case investigations have many unique challenges. Some of these are document and evidence retention, low quantity or degraded DNA samples, lack of skill set and resources from investigative agencies, and lack of support from decision makers. The composition of the workshop panelists exemplifies the importance of collaboration between law enforcement, coroners and forensic scientists and the utility of forensic investigative genetic genealogy. This workshop will discuss how to overcome these challenges using modern DNA approaches and multi-disciplinary teams.

In your experience, what are the main challenges in fostering multidisciplinary collaboration among forensic scientists, law enforcement, and legal professionals? Can you give us a sneak peek into the workshop and share some strategies for improving coordination in the cold case solving process?

The main challenge in fostering collaboration between multidisciplinary teams has less to do with agencies wanting to collaborate and more to do with a forum and resources to do so. Missing Person Days and DNA drives create an environment that fosters collaboration between teams and these relationships can be long lasting.

With the rapid advancements in DNA technology, what challenges do multidisciplinary teams face in ensuring ongoing education and training?

One of the challenges for multidisciplinary teams regarding rapid advancements in DNA technology is that the education and training is not able to adequately keep up with the advancements. This means agencies may need to learn from each other in many cases. Presentations such as this one can provide some much-needed information for these teams.

Many workshop attendees have never participated in a DNA Drive involving the public. Can you suggest some tips for organizing a successful event? What additional considerations need to be taken into account when engaging the public?

One tip for organizing a successful Missing Persons Day or DNA Drive is PLANNING. These types of events should be a "one stop shop" for families with Missing Persons in their lives. This goal requires planning and organization from event planners. The workshop will detail many of the steps required for success. Another consideration is managing the public's expectations and wellbeing. For many reasons, the public's expectations of the event outcomes may be unrealistic. This is especially true when it comes to timelines for success. The media is filled with stories of Cold Cases being resolved. This may influence how the public perceives individual outcomes. Planning ensures that many investigative items are completed prior to the event. An example would be to have all unidentified decedent's DNA profiles available for comparison prior to the event to ensure that results are available contemporaneous to the event.

What unique perspectives do each of you bring to the workshop that attendees, especially forensic DNA analysts, will find invaluable in their pursuit of resolving cold cases?

Each of the presenters has extensive experience in human identification and working on multidisciplinary forensic teams surrounding Cold Cases. The presenters come from law enforcement, coroner, mass disaster, and forensic investigative genetic genealogy backgrounds. The presenters have utilized conventional, rapid, and consumer DNA to bring cases to a successful conclusion.

Registration is now open for "Engaging Collaboration: How to Further Cold Cases with Advanced DNA Approaches." Designed for professionals seeking to integrate the latest DNA technologies into solving cold cases, it provides a platform to gain insights that can transform your laboratory's approach to forensic science.

Reserve your spot to participate in discussions that could redefine the future of cold case investigations. For more details and to register, visit our website.

The ISHI T-Shirt Contest Awaits Your Creativity

Design and Shine!

Written by Tara Luther, Promega

As the 35th International Symposium on Human Identification (ISHI 35) approaches, we're turning the spotlight onto you, the creative minds of the forensic community. This is your chance not just to attend ISHI, but to showcase your design on the official conference t-shirt.

Unleash Your Artistry:

Craft a design that encapsulates the spirit of ISHI. Whether you draw inspiration from the meticulous art of DNA analysis or the broader strokes of the ISHI conference throughout the years or the hills of San Antonio, your design should resonate with professionals across the globe.

Here's How to Enter:

Submit your design below following these specs:

- Designs must be digitally created. No hand-drawn designs will be accepted. Design is for the front of the shirt only and must be created by using a maximum of three Pantone or CMYK colors.
- Designs must be created in either Adobe (InDesign, Illustrator, Photoshop), Canva, or CorelDRAW
- Artwork must be received as BOTH a vector (.ai, .eps., .pdf) AND a .jpg
- Design resolution must be a minimum of 300dpi and fit into an 8″ square space

Remember, all eyes will be on the clock— June 16th is the cut-off date!

From Sketch to Stage:

A panel of judges from Promega Corporation and our ISHI Advisory Committee will select the top four designs, which will then be put to a community vote. If your design captures the hearts and minds of your peers, you'll not only win free registration to this year's conference but also the honor of having your artwork featured on the official ISHI 35 t-shirt.

Mark These Dates:

- June 16: Submission deadline.
- June 24: Top four finalists announced.
- July 5: Voting closes.
- Week of July 8: Winner revealed.

Learn More and Submit Your Design

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Oral and Interesting Case Abstracts Due

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Contact Tara Luther to inquire about rates and specifications. Space is strictly limited.

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