

This seminar was funded and supported by the U.S. Department of Homeland Security's Science and Technology Directorate Office of University Programs through the Center for Borders, Trade, and Immigration Research under Grant Award Number DHS-14-ST-061-COE-00. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily as representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security, or any office of the United States Government.

The U. S. Department of Homeland Security Center of Excellence, Department of Homeland Security Science and Technology Directorate Center of Excellence through the Center for Borders, Trade, and Immigration Research, held a Homeland Security Symposium titled: **“DNA Barcoding: High Throughput DNA Sequencing Forensic Science.”** This symposium was a three-part conversation on forensic science focusing on the advances in DNA sequencing technology. In addition, the presenters discussed the current state of the field, as well as possible future applications and prospects.

Instructors Biographies

Dr. Jennifer Kovacs – Spelman College

Dr. Jennifer Kovacs is an Assistant Professor of Biology at Spelman College, a primarily undergraduate, historically black, all women's college in Atlanta, Georgia. Her lab uses a variety of DNA sequencing technology and methodologies to answer questions surrounding the evolutionary implications of symbiosis and other ecological interactions. She received her Ph.D. in Applied Biology at the Georgia Institute of Technology where she studied the genetics underlying differences between queens and workers in social wasp colonies. During her post-doctoral research, as an NIH-funded teaching and research fellow (FIRST) at Emory University, she studied the role of horizontal gene transfer in arthropod genome evolution as well as the ecological impacts of microbial symbionts on arthropod behavior and evolution. Her work on understanding how horizontal gene transfer produces new ecologically important traits in arthropods is currently funded by NSF. Her recent work has utilized high-throughput DNA sequencing and DNA metabarcoding to identify pollen in environmental samples done in collaboration with CBTIR.

Dr. Karen Bell – Emory University

Dr. Karen Bell is a postdoctoral fellow at Emory University, in the laboratory of Dr. Berry Brosi. She specializes in genetic methods of species identification, also known as DNA barcoding. Her current research involves method development in pollen DNA barcoding for national security forensics. Pollen is ubiquitous in the environment, making it an ideal marker for determining the geographic origin of objects. Traditional methods of pollen identification require highly specialized expertise, with only a small number of people sufficiently expert. Furthermore, traditional methods are frequently unable to identify the species, and may be slow with large numbers of samples. Recent developments from Dr. Bell's research will allow for higher throughput and greater accuracy in the analysis of pollen mixtures for forensic palynology.

Ms. Piper Schwenke – National Oceanic and Atmospheric Administration Fisheries

Piper Schwenke works for NOAA Fisheries at the Northwest Fisheries Science Center in Seattle, Washington. Piper received her Master's Degree from the University of Washington's School of Aquatic and Fishery Sciences during which she studied genetic introgression between three Pacific Rockfish species in the Salish Sea. Piper has been working as a Forensic Molecular Geneticist for 20 years and has been a certified as a

Wildlife Forensic Scientist. Piper was trained and mentored in DNA forensic science at a private crime laboratory in Seattle, WA where she worked on evidence from major crime scenes using human identification techniques. At NOAA, Piper uses a variety of DNA techniques to identify species and population of origin of biological evidence collected during fish and wildlife criminal investigations. Most recently our lab has been using high-throughput DNA techniques to identify origin and species many marine taxa from mollusks to marine mammals.

Topics Covered

1. Introduction to DNA barcoding & its applications in forensics
2. Pollen identification using DNA metabarcoding
3. Marine forensic DNA testing using high-throughput sequencing

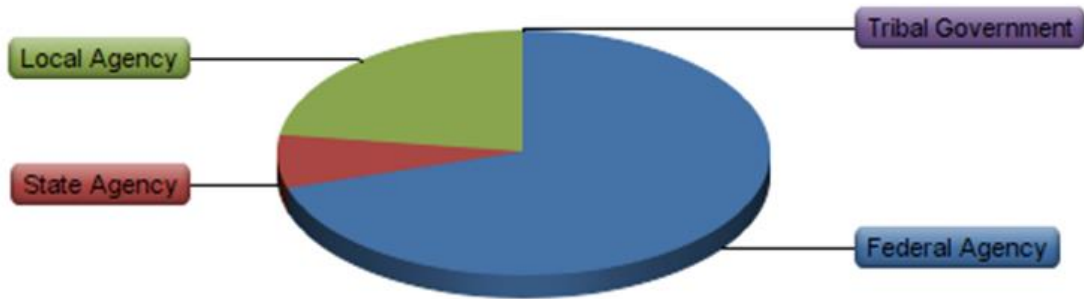
Analysis of Symposium Feedback

The symposium was well-attended with a total of:

- **71 Confirmed RSVPs**
- 63 Attendees (Approximately **89%** of RSVP total)

A total of 10 government agencies organization was represented by the symposium attendees. Attendees from New Mexico and Texas attended this event. This symposium afforded particular attention to participants with evidence collection responsibilities. The following table displays each of the agencies/organizations with the total number of representatives in attendance.

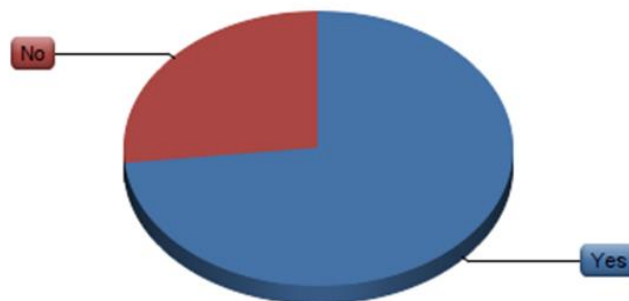
Federal Agencies		State Agencies	
ICE Homeland Security Investigations	07	UTEP (Police Department)	02
Federal Bureau of Investigation	01	New Mexico Forensic Laboratory Bureau	02
CBP - Office of Border Patrol – EPT Sector	32	Texas Rangers	01
CBP - Office of Field Operations	03		
DHS Intelligence & Analysis	01		
Total	44	Total	05
Local Agencies		Other	
El Paso Police Department	06		0
El Paso County Sheriff's Department	08		
Total	14	Total	0



Every attendee was asked to fill out a symposium evaluation. A total of 57 surveys (91% of total attendees) were submitted. Overall, the assessment feedback was overwhelmingly positive (listed percentages are the sum of both the “agree” and “strongly agree” percentages):

The seminar met my expectations	80.7%
The overall topics covered in this seminar were relevant and useful to my current assignment	31.6%
The seminar description accurately described the seminar content	82.5%
The seminar increased my knowledge of the subject matter	94.7%
The seminar increased my interest of the subject matter	80.7%
The overall quality of this seminar was excellent	96.5%
The instructors’ presentation style was effective	98.3%

The exit survey also contained the following question (Q3): Would you attend a second more in-depth symposium on this topic? The survey revealed that **74%** of the symposium participants would attend a second more in-depth symposium.



Open-attended responses indicated a common satisfaction with the course with particularly positive comments regarding the competence of the instructor and the content's utility and pertinence to their field of work. The following questions were asked in the exit survey and no edits have been made to the comments with the exception of spelling.

Q4. What other topic/subject matter would you like to see presented in similar seminars, tabletop exercises or practicums?

- Current practical forensic science applications that are approved in court. Impression evidence collection low level DNA samples - what can we expect?
- Topics more relevant to law enforcement invest (crime scene)
- Evidence analysis bloodstain analysis bullet trajectory
- Human DNA Law Enforcement Topics Evidence Packaging
- Next Generation DNA Sequencing for Human Identification Phenotypic SNP DNA Testing (Human)
- Nano forged powders for forensic applications (Texas A&M holds patent, presumably) fingerprint technologies
- Exercises in collection methods storage methods
- Perhaps a hands on collection of samples, so officers can learn collection preservation methods
- Forensic subject matter relating to crimes against persons
- How we can apply the symposium in our jobs
- Practicums
- Being able to apply these topics directly to law enforcement and crime scene
- Transnational Threat Symposiums Combating Human Smuggling
- Narco Trade Gangs
- Cyber forensics
- Cyber Crime Protecting Data Personal security on social media
- Narcotics Gangs Forensics - computer science
- More practical application of topics as they relate to LEO field work
- Gangs and Crime
- Practical Law Enforcement Topics
- Include video of actual testing/procedural or bring equipment
- Human behavior for interviewing purposes General Administration for mid-level managers
- Operational Planning Concepts
- Human trafficking cartels
- Needs more specific to this region
- Commercial fraud at the US/Mexico Border
- Immigration/narcotics smuggling
- Speakers with titles/degrees who may teach about drug law, constitutional law, immigration law or criminal immigration law

Q5. If there are any additional comments you have about the seminar topics covered please provide them below.

- Very technical for audience. Not sure if they got it. As a forensic scientist - I enjoyed it!
- Presenters were extremely knowledgeable, glad to hear from them. I believe the audience was not quite at their level & felt lost I comment them for the outstanding research & dedication to their work. I hope they will be able to apply this to law enforcement evidence in the near future. Good Luck!!!
- An entry level/basic would have been beneficial to my understanding of the material
- Very interesting, but in a more academic than practical sense
- Very informative

- The content for the symposium in certain sections was somewhat advanced to the point where the basic concepts of DNA and sequencing were not understood by certain students who don't typically deal in this subject. This being an excellent LEO tool, perhaps those of us who found ourselves a bit behind could attend an introductory course to DNA as a whole.
- Great Symposium!
- Needs to be more LEO oriented
- Good topics very interesting I will be looking out for more symposiums to attend Thank you
- Interesting topic; however; it's a topic that I would need to have more prior knowledge before attending a more advanced symposium
- Include real world examples
- Have it more "connected" with police
- Maybe a little too technical for most of the audience (law enforcement)
- Perhaps limit the scientific detail; focus more on what the attendees will focus out on the field
- Thank you. Excellent
- Great Content
- Good topics covered. Presenters did a great job presenting topics. Some topics discussion was very in the weeds ad needed a bit of law enforcement in them. Psychology/Sociology of why some individuals are predestine to commit crimes? Does environment, social factor play a role?
- Keep up the Great Service, We appreciate it!
- The presenters were excellent. Very knowledgeable and very good presenters. I disagree, however, that the target audience should include "those who handle crime and evidence material." Perhaps this material would be better suited for lab personnel rather than field crime scene investigators. The presentations were all very quality, however.

Webcast Analytics

This symposium was the second effort to add a webcast feature as part of the value added deliverable of this program. In addition, this was the first effort to place the symposium video on our website and YouTube account to enhance future viewings of the symposium series. The PI will continue with simultaneous webcast broadcasting of the symposium series with efforts to increase viewership through this medium.

Total views: 157

Total shares: 24

Geo-locations: California, District of Columbia, Texas, and the United Kingdom

Learning

Every attendee was asked to take a six (6) question Pretest Questionnaire in order to gauge the level of understanding of the topic. In addition, the participants were asked to take the same six (6) question Posttest Questionnaire at the conclusion of the symposium. The first question asked of the participant was to self-measure their level of knowledge on the topic on a 1 to 10 scale with 1 as very *Knowledgeable* and 10 as *No knowledge*. A total of 58 pretests/posttests (92% of total attendees) were returned by the participants.

Analysis: Self-evaluation by the participants indicated a **4% increase** in learning. The average Pretest Questionnaire score was **62%** and the average Posttest Questionnaire score was **87%**. The results of the Pretest and Posttest Questionnaires revealed a **25% increase** in learning. Although the **25%** increase in learning was above the self-evaluation, it did not meet the 30% benchmark targeted.

Lessons Learned

As part of the program's self-evaluation process the following areas will be addressed:

- Seek the assistance of the Homeland Security Symposium Series Advisory Board in achieving a higher rate of return for both the Exit Surveys and Pretest and Posttest Questionnaires.
- Continue to emphasize to symposium participants the importance of the Exit Surveys and Pretest and Posttest Questionnaires.
- Harvesting more precise information of webcast participation is currently being addressed.

Acknowledgements

The Principle Investigator, Victor M. Manjarrez, Jr., would like to acknowledge the efforts of Center for Human & Behavior's Manager Leonora Ortega-Martinez. In addition, the hard work, diligence, and "can-do" attitude of undergraduate research assistants Ms. Monica Diaz and Mr. Robert Vasquez helped make this symposium a success. Finally, the work by UTEP's Academic Technologies Associate Director Steve Varela and Adrian Meza is simply second to none.

Victor M. Manjarrez, Jr.

July 5, 2016

Victor M. Manjarrez, Jr.
Center for Law & Human Behavior
The University of Texas at El Paso

Date