THE IDENTIFIER



https://9gag.com/gag/azMoV3m

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FUTURE OF FORENSICS

FORENSCOPE MOBILE MULTISPECTRAL IMAGING SYSTEMS



Forensic Tablet

- IR Capability for Blood & GSR
- Fingerprints & Body Fluids
- Interchangeable Lenses
- 10 Lights & 8 Filters



4K Tablet

- Multiple Types of Evidence
 & Surfaces
- Most Advanced Forensic Imaging Device Ever
- 10 Lights & 8 Filters



Contactless

- Fingerprints on Glossy Surfaces
- No Contact or Processing
- Easy & Quick to Deploy
- 4 Lights



CSI Pro Smartphone

- Fingerprints & Body Fluids
- Android Operating System
- Multiple Wavelengths
- 6 Lights & 4 Filters



Patrol Smartphone

- Latent Fingerprint Recovery
- Android Operating System
- Multiple Wavelengths
- 3 Lights & 2 Filters



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LETTER FROM THE PRESIDENT

Hello SCIAI Members!

It's been about a month since our Spring Conference. On June 7th your officers will be meeting to plan out our upcoming year. Stay tuned for more details by email and Facebook once things are a bit more set in stone. We are excited to bring you another year of free/low cost in-state training and a Training Conference.

We are still looking for a Historian this year. As past Historian I can say it is a very manageable task. It involves posting trainings / announcements on our Facebook page and photographing events we have. If you are interested please reach out (<u>sprattl@charleston-sc.gov</u>). This division only exists because of people stepping up and getting involved as officers.

Just a reminder that member dues are due by July 1st. Active membership is \$50 and student membership is \$35. This can be paid online at www.sciai.org/membership or by mailing our membership form and payment to: 4 McGee St. Room 124 Greenville, SC 29601. These dues allow us to put on these events at a low cost and is vital to the continued growth of our division.

Lastly I just want to thank all of you for the hard work you put in at your agency. This can be a

thankless job and sometimes really rough- both in what we see and how the public can view us at times. Every one of you makes a difference and I encourage you to keep grinding. I read in a leadership book the motto "Fight Grind Repeat" and I try to remind myself of that when it gets tough. The road to success is not a straight line. Keep fighting and doing your best work. Remind yourself of that one (or few cases) where you know your work made the difference. Maybe you put the bad guy away or gave the victim / victim's family closure. Thanks again for all you do!



Luke Spratt



MEET THE OFFICERS

- Luke Spratt President
- Chris Wilson 1st Vice President
- Anita Moore 2nd Vice President
- Chris Gary Secretary & State Representative
- Harold Bouknight Sergeant at Arms
- Tyler Bucholtz Treasurer
- Brittany Brown Editor
- Jeffrey Scott Vendor Representative

by Greenville County Forensic
Evidence Technicians at the end of
this issue of *The Identifier*!

starts on page 18

INTERVIEW WITH OFFICERS

Getting To Know Your 2022-2023 Appointed Officers

During each issue of *The Identifier*, we will take time to introduce some of the appointed SCIAI officers in order to introduce our members to get to know their elected officers better. For this issue, we interviewed the SCIAI's Tyler Bucholtz who shared with us his work experience, what he enjoys most in forensics, what hobbies he enjoys, what his goals for the SCIAI are and improvements for the community! We also interviewed SCIAI's Chris Wilson who shared his work experience, advice for other technicians, and goals for the SCIAI.



(Continued on page 5)

MEET Tyler Bucholtz, Treasurer

- Tell us about your work experience. How long have you been a practitioner in the field and what is your current position? I started my law enforcement career in 2005 with the SC Dept. of Probation and Parole. That was a good introduction to the courtroom as we were in a more informal, post-sentence setting. So there was no jury, but we still dealt with defense attorneys and presented cases to judges and hearing officers. I took a new position with Greenville County DPS as a Crime Scene Technician in 2009. After 2 years working crime scenes, I transferred into a Criminalist position as a full-time latent print examiner and have been certified through the IAI since 2015.
- What do you enjoy most about your job? It is very satisfying when we get an AFIS hit on a complete whodunit case. Especially when there is video footage of a suspect, but they don't know who it is. Identifying the suspects in major cases is always thrilling. I also actually enjoy testifying in court. It's sometimes a little nerve racking, but I've never been caught off guard or asked something that I wasn't prepared for. Some of that goes back to training that I have attended specifically geared toward latent print testimony. It makes a big difference in your confidence on stand when you know ahead of time how to handle the challenges to your discipline.
- What hobbies do you enjoy? My daughter and I started Rewind Candle Company last year as a way to spend some productive time together. It's a good way to teach her some life lessons. She gets paid for her work, learns how to engage people in conversation and understands the importance of organization and record-keeping. It's a lot for a 10 year old, but we keep it fun. Sometimes she does more shopping than selling at the shows we go to!

INTERVIEW WITH OFFICERS

- What is your vision or (what goals do you have) for the SCIAI? Keep it simple and engage the membership to keep it going. The main purpose as I see it is to provide local, affordable training to the agencies here in SC. I know a lot of our members pay out of pocket for training. So as much as we can bring for little or no fee outside of membership dues is the goal. The more participation we have, the more we can bring to the state. When the vendors and speakers see a good crowd, they are more likely to return and sponsor events. This translates to more opportunity for our members.
- What improvements would you like to see in the forensic community? I think in the forensic community as a whole, agencies are starting to realize that we need to take better care of employee mental health. It's been a slow transition compared to the care that military veterans receive. The diagnostic manuals for PSTD were updated in 2014 to include those who experience repeated or extreme exposure to aversive details of traumatic events. Well, that's pretty much what goes on every shift for many of our crime scene personnel. Of course most will not be affected long-term in a negative way or a way that interferes with their daily life. But we do need to be aware that some may not know how to cope with certain situations and that everyone processes these events and scenes differently. In light of the fact that there were 136 LEO suicides last year, we need to be aware of our co-workers state-of-mind and have those conversations to talk things out. Just check on your people.

MEET Chris Wilson, 1st Vice President

- Tell us about your work experience. How long have you been a practitioner in the field and what is your current position? I started my Law Enforcement career in 1994 with the Anderson Sheriff's Office and become a certified Deputy in 1996. In 2001, I began my career in the Crime Scene field with the Greenville County Forensics Division and as of today I am a Senior Forensics Investigator with the Anderson County Sheriff's Office, as well as a CCSI through the IAI.
- What is something you have learned in your work experience that you can pass
 along to others? If I could pass anything along, I would say that when you work a
 scene, TAKE YOUR TIME! I know each scene is different and the weather changes
 daily and so on, but take your time, it's not a race and most times you only have
 one chance at that scene, victim or suspect. This would also apply with processing evidence.
- What is your vision or (what goals do you have) for the SCIAI? I want to see the SCIAI to continue to grow with new members and continue with training

SCIAI ANNOUNCEMENTS

- ALL MEMBERS are encouraged to review the SCIAI constitution and by-laws posted on the website located under the News tab.
- Renewal for memberships must be submitted by Thursday July 1st 2022 for the upcoming years' membership.
- Submissions for case study features and Member Spotlights are open. We want to
 highlight our members and interesting or unique cases that you have personally
 been involved with. If you would like to see yourself, a coworker, or one of your cases featured, please contact the Editor at bribrown@greenvillecounty.org
- Have a topic you would like to see covered or have an article you would like to submit for future issues of *The Identifier*? Submit your proposals to the Editor at bribrown@greenvillecounty.org guest authors are welcome!



OFFICER MEETING RECAP

During the June 7th virtual meeting, attending officers discussed future plans for conference locations in the Spring of 2023. Plans were discussed for holding a single day workshop(s) with the possibility of multiple disciplines in the Fall of 2023 to encourage members to attend. Officers also discussed the possibility of holding a Q&A round table with a provided lunch in the early months of 2023. Ideas for merchandise were discussed with having inventory but not necessarily storing large amounts of items. Advertising for the SCIAI at universities for student involvement was discussed for future professionals entering in the field. Reminder that membership dues are due on July 1st 2022! The idea of a state-wide photography contest was introduced, to involve members by sharing their photos with other professionals! Submissions would be added to future issues of *The Identifier* and the winner would be submitted for a grand prize at the Spring Conference!

Samuel Stebbins, 24/7 Wall St. via The Center Square. Dec 10, 2021

How the Murder Rate in South Carolina Compares to the Rest of the Country

The U.S. murder rate is at its highest level in nearly two and half decades. A total of 21,570 murders were committed nationwide in 2020, up nearly 30% from the previous year -- the largest annual increase on record.

The rash of deadly violence came during a tumultuous year in American history. The COVID-19 pandemic led to school closures and left millions of Americans out of work. The murder of George Floyd by a Minneapolis police officer rattled confidence in American law enforcement and sparked nationwide protests. Firearms sales soared, resulting in the proliferation of tens of millions of new guns.

Some experts speculate that each of these factors likely played a role in the rising homicide rate. While it may be years before the precise causal factors are identified, the effects are being felt in communities across the country. The Centers for Disease Control and Prevention lists homicide as a contributing factor in the historic 1.5 year decline in life expectancy in the U.S. last year -- trailing only COVID-19 and accidental deaths, like drug overdoses, in significance.

There were a total of 549 murders in South Carolina in 2020, or 10.5 for every 100,000 people -- the fifth highest murder rate among states. For comparison, the national homicide rate stands at 6.5 per 100,000.

Along with rape, robbery, and aggravated assault, murder is one component of the broader violent crime category. Just as South Carolina has a higher than average murder rate, its overall violent crime rate is also higher than average. There were a total of 531 violent crimes reported for every 100,000 people in the state in 2020, compared to 399 per 100,000 nationwide.

All data used in this story, including population figures used to calculate populationadjusted crime rates, is from the FBI's 2020 Uniform Crime Report.

Rank	State	Murders per 100,000 people, 2020	Total murders, 2020	Violent crimes per 100,000 people, 2020
1	Louisiana	15.8	734	639
2	Missouri	11.8	723	543
3	Arkansas	10.6	321	672
3	Mississippi	10.6	315	291
5	South Carolina	10.5	549	531

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent Fingerprint Matching

For more than a century, latent fingerprints have been one of the most important forms of evidence used by law enforcement and criminal investigative agencies worldwide. While tremendous progress has been made in conventional fingerprint matching, matching latent fingerprints has proven to be a more difficult problem due to the poor quality of the prints. Typically obtained under less than ideal conditions, latent prints are frequently incomplete or degraded by background noise. Since fingerprint identification depends on the quality of the print, matching technology with much higher accuracy is required to identify suspects, increase the arrest rate, and help build a safer and more secure society. NEC has been working on fingerprint recognition for nearly fifty years, constantly striving to increase the accuracy of our matching technology. This paper provides a historical overview of NEC's research in fingerprint matching technology and introduces our latest technological advances in this field.

Introduction

Today, biometrics such as face recognition, iris recognition, and vein recognition are employed in a wide range of applications from logging on to a computer or mobile device to national identification systems¹⁾. All of these modalities are relatively new — having only been made possible by advanced electronic technology. Fingerprint recognition, on the other hand, has a long and storied history, stretching back more than a century. NEC first got involved in fingerprint recognition R&D nearly 50 years ago and has developed and deployed a wide variety of solutions since then. It is worth noting that our first fingerprint identification solution was developed for use in criminal investigations.

Before the introduction of computerization to fingerprint matching, the process was a long and laborious one in which all collected fingerprints had to be visually compared with the reference pattern to see if they matched. Computerization made the process much more efficient, significantly reducing the time required for individual identification, thereby enhancing the effectiveness of criminal investigations. However, the quality of the latent fingerprints left behind at crime scenes remains a problem. In many cases, only partial prints can be obtained and these are often further corrupted by background noise as shown in **Fig. 1**. Finding a way to match fingerprints with high accuracy using limited information is essential.

(Continued on page 9)

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent

Fingerprint Matching

Improving the accuracy of latent fingerprint matching has been NEC's central focus since entering the field 50 years ago. In this paper, we will review history of NEC's research into latent fingerprint matching technology and introduce our current effort to improve matching accuracy using a new feature amount.



Fig. 1 Latent fingerprint images.

History of Research into Latent Fingerprint Matching

Establishment of automatic matching technology (1970s-1980s)

NEC started its research in fingerprint matching in 1971 and developed a system using the Minutiae and Related Method. Minutiae are the major features of a fingerprint image. In addition to minutiae location and orientation, this system incorporated ridge-count information present in the local four surrounding quadrants of each minutiae under consideration for pairing. This technique made it possible to overcome the inability of conventional fingerprint matching to cope with substantial distortion in latent fingerprints. Building on this technique, NEC introduced its first automated fingerprint matching system in 1983.

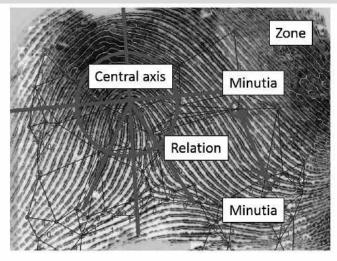


Fig. 2 Basic feature set.

Combining the minutiae and relation data with feature sets called zones that divide the fingerprint in two parts — the part where the central axis indicating the fingerprint's central position and ridges is clear and the part where it is unclear, this system established the basic feature amount as shown in **Fig. 2**, which would serve as the basis of NEC's fingerprint matching system.

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent Fingerprint Matching

Improvement of accuracy and palmprint matching (1990s)

Moving into the 1990s, we began working on improving the accuracy of an automatic fingerprint feature extraction system and developing techniques for latent palm print matching. Earlier feature extraction systems often missed the more minute feature points (minutiae), but our new system made it possible to extract them with high accuracy. Palm print matching posed a different set of challenges. Despite the apparent similarity between palm prints and fingerprints, they are actually quite different. A palm print has more wrinkles than a fingerprint; it is often difficult to automatically extract features as is as shown in Fig. 3. This meant that we had to develop a new feature extraction system that could better manage wrinkles. Another difference is that the center of the finger provides a clear reference point, making

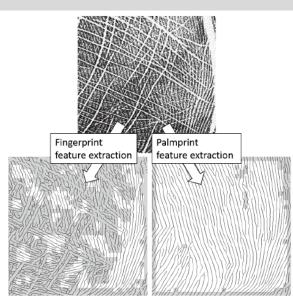


Fig. 3 Palmprint feature extraction that can better manage wrinkles.

positioning much less difficult. Palm prints have no such reference point. Moreover, the palm is much larger than the tip of a finger. These factors made it necessary for us to develop new positioning technology, which would provide the foundation for a palm print matching system.

Automated latent fingerprint matching

By the 2000s, research into automated latent fingerprint matching was accelerating thanks to the rapidly improving performance of computers. Until then, excessive noise and blurring had made it difficult to automatically extract features from latent fingerprints and match them. As a rule, minutiae such as ridge endings and bifurcations had to be entered manually by latent print examiners before the prints could be processed.

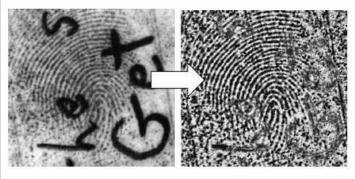


Fig. 4 Latent fingerprint noise reduction.

(Continued on page 11)

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent Fingerprint Matching

Automated latent fingerprint matching (continued)

Replacement of this painstaking and time-consuming process with automated matching was a matter of considerable urgency. In response, we developed noise reduction technology²⁾ as shown in **Fig.**4 and new feature extraction and matching technologies using multiple algorithms called fusion matching technology. We also began working on a system that would offer even greater accuracy by combining the new technologies. Ultimately, we were successful, and our new system was ranked first in the Evaluation of Latent Fingerprint Technologies 2017 (ELFT07)³⁾ conducted by the United States National Institute of Standards and Technology (NIST).

Putting our automated latent fingerprint matching technology into practical use and developing a new a feature amount (2010s)

In the second decade of the 21st century, our research focused on developing a system that would bring high accuracy and high performance into alignment. Up until the 2000s, the focus had been entirely on improving accuracy. Unfortunately, this meant sacrificing speed. Automated latent fingerprint matching systems were generally so slow that it was difficult to put them into practical use. One of the factors that caused the slow matching speed was the multiple fusion method used to improve accuracy, which combined hundreds of thousands of different algorithms in an effort to ensure precise, error-free matching. To increase speed, it was necessary to reduce the number of algorithms without compromising accuracy. The route we took was to combine multiple feature sets into a single feature set and to develop a high-speed system that could perform each match itself. This allowed to develop a system able to operate at speeds comparable to conventional matching speed while maintaining high accuracy. At the same, the limitations of matching systems that used conventional feature sets began to emerge. Starting the mid-2010s, we started trials to define a new feature set that would make it possible to match fingerprints that were normally diffi-

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent Fingerprint Matching

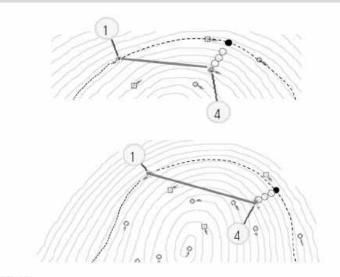
Our Efforts to Improve the Matching Accuracy Using the New Feature Set

Rich Relation

When latent print examiners examine the relationships between paired minutiae in detail, they track ridges and compare the number of the ridges in most cases. Simulating this task with a conventional relation feature amount was insufficient, so we expanded the relation feature amount and defined a new feature amount. This is what we call the rich relation.

• (1) Contour ridge-count now included

With respect to the count of ridges between minutiae, we also included the count of contour ridges as part of the definition, in addition to the count of intersections with straight lines as shown in Fig. 5. The contour ridge-count can be interpreted as the height difference between two minutiae assuming the mountain model generated by fingerprint ridges (assuming the fingerprint core/center as the mountain peak). We also included the directions of child minutiae when traced from parent minutiae in the new feature set. By adding the number of contour ridges, it is now possible to compare high curvature regions and areas with significant elastic deformation.



Notes:

- Regular ridge-count (number of intersections made by the straight line) is 3 in the upper latent print and 7 in the lower known print.
- This large difference is a cause of matching error.
- Contour ridge-count is 3 in the upper latent print and in the lower known print.

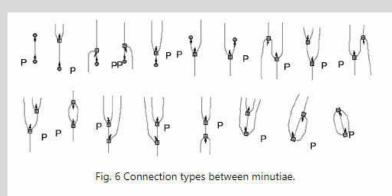
Fig. 5 Regular ridge-count and contour ridge-count between minutia #1 and minutia #4.

(Continued on page 13)

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent Fingerprint Matching

Introduction of connection types

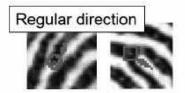
We also introduced connection types as shown in **Fig. 6**. These newly defined connection types are used when a single ridge connects two minutiae. They are useful for classification of how minutiae connect with each other and can be used for matching and comparison of minutiae. This is also expected to help improve accuracy.



Expansion of the number of relations

The number of relations in the conventional method is small. It has only the total of 4-1 in the nearest neighbor in each quadrant. When there are many false minutiae, many undefined cases occur, resulting in the deterioration in the accuracy. In the rich relation, this number has been expanded to 32 in the nearest neighbor.

Secondary direction of minutiae



It is often difficult to reliably discern minutiae that exist in high curvature regions. To solve this problem, we have defined a secondary direction for minutiae as shown in **Fig. 7**.

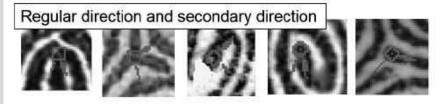


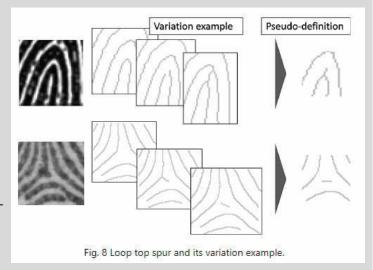
Fig. 7 Addition of secondary direction of minutiae.

Advanced New Technology Uses New Feature Amount to Improve Accuracy of Latent

Fingerprint Matching

Loop top spur and delta dot

Although there are no minutiae in the looped skeleton (the innermost ridge) and delta region, they can still provide a very effective feature set for use in crime scene investigations. As these configurations are susceptible to minor factors and likely to generate different extraction results depending on the condition, they cannot normally provide a stable feature set. However, by generating pseudo-short ridges at the top of a loop and in the delta region as shown



in Fig. 8, we succeeded in making it possible to use them to create a stable feature set.

Dubious Zones

There are often cases where latent print examiners wonder whether minutiae in a particular zone should be specified or not when they enter latent fingerprints.

For areas such as these, we defined dubious zones as a new feature amount, making it possible to enter questionable minutiae.

Skeleton

Skeletons (ridges converted to thin lines) can be treated as a feature set, and the relationships between them can be compared. We call this procedure skeleton matching. In skeleton matching, paired minutiae are first determined using minutiae matching. Then

minutiae that have the same type of ridge ending and bifurcation are searched. These minutiae are then paired with previously paired minutiae. As minutiae propagated in this manner, their validity is verified while any distortion is absorbed.

Future Prospects

Automation, high speed, and high accuracy are now expected from any latent fingerprint matching technology used in criminal investigations. In the coming years, applicable databases will be constantly expanded, increasing demand for matching technology with ever greater speed and accuracy. One way of meeting this demand will be through the incorporation of AI technology, which has seen dramatic advances in recent years, with deep learning especially showing spectacular results. By skillfully integrating new technology such as AI with the powerful technology we have developed thus far, we expect to produce faster, more accurate matching technology that will help achieve our dream of a world that is truly safe and secure.

Reference: https://www.nec.com/en/global/techrep/journal/g18/n02/180217.html

Calling All Forensic Photographers!

The Identifier wants your photos for a Photo Contest!

Rules:

Submit aesthetically pleasing, forensic related photos to show others in the SC Forensic Community! *Not limited to Crime Scene Technicians*

- No victims (or persons) and/or injuries, no probative items allowed, and nothing that identifies any specific agency.
- All eligible submissions will be added to the upcoming three issues of *The Identifier*.
- At the Spring Conference, the winners of each issue will be displayed and entered to win a Grand Prize!
- Submission examples are featured on pages 18-29.
- Deadline for Fall Submission is August 29th 2022
- **Note: Any submitted photos <u>MUST</u> be taken by the submitter and not merely taken from the internet!
- **Submitted photos are subject to audit prior to publishing.
- **Limit of (1) submission per person per issue.
- **Submit photos to bribrown@greenvillecounty.org



For this issue — The Editor reached out to Forensic Evidence Technicians from Greenville County to see what scenarios they've encountered. Examples for future submissions start on page 18.

FUN With Forensics

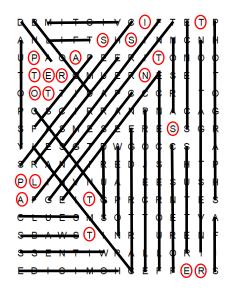
Frequently in the field of Forensics, we, as a whole, deal with a variety of difficult and demanding scenes, tough scenarios, and are often placed in stressful situations. This panel is designed for you to have the opportunity take a quick mental break, refresh your mind, and also to have a little fun. ©







CLỊCK TO GET RECỊPE FOR MAGNỊFYỊNG GLASS COOKỊES!



WORD SEARCH SOLUTION

(FEATURED IN LAST ISSUE)

REVEALED HIDDEN MESSAGE:

<u>IT'S SPATTER</u>

NOT SPLATTER!



UPCOMING TRAINING/EVENTS

Jun 14th—Jun 16th 2022: Louisiana Division IAI Conference

Hosted by LAIAI in Baton Rogue, LA-virtual option available

Jun 28th—Jul 1st 2022: Coroner's Training Conference

Hosted by South Carolina Coroner's Association in Myrtle Beach, SC

Jun 21st—Jun 23rd 2022: Crime Scene Photography Techniques

Forensic Training Source, 3 day 24 hour course @ SCELOA in Columbia, SC

Jul 18th—Jul 22nd 2022: Crime Scene Investigations

TriTech Training, 5 day 40 hour course @ Columbia Police Department, Columbia, SC

Jul 25th—Jul 29th 2022: Crime Scene Photography Techniques

Forensic Training Source, 40 hour course @ Pigeon Forge Police Department, Pigeon Forge, TN

Aug 29—Sept 2nd 2022: Crime Scene Photography Techniques

Forensic Training Source, 40 hour course @ Huntsville Police Department in Huntsville, TX

If you have upcoming training that you would like advertised in the newsletter, contact the Editor with course information and details!

EMPLOYMENT OPPORTUNITIES

Greenville County: Forensic Evidence Technician

SLED: DNA Analyst/Criminalist

North Charleston: Forensic Pathologist

Keep scrolling to see the photos submitted by Greenville County Forensic Evidence Technicians



Editor: Brittany Brown bribrown@greenvillecounty.org









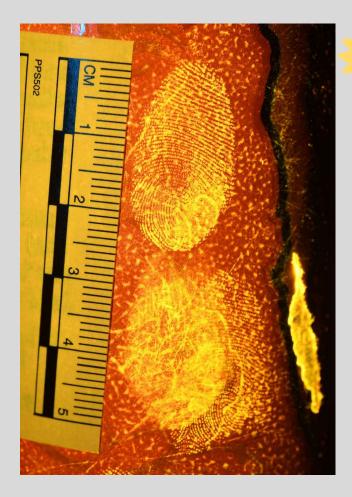
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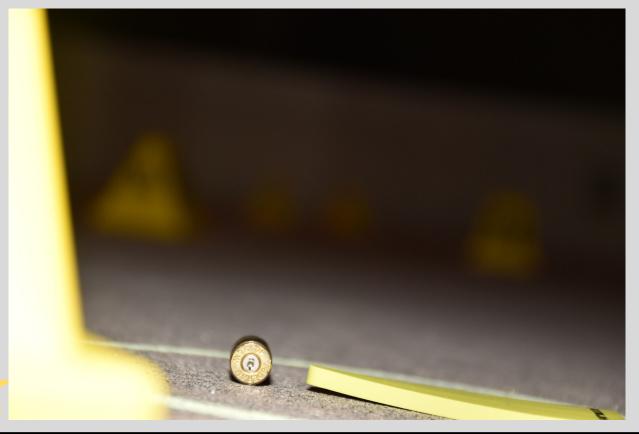








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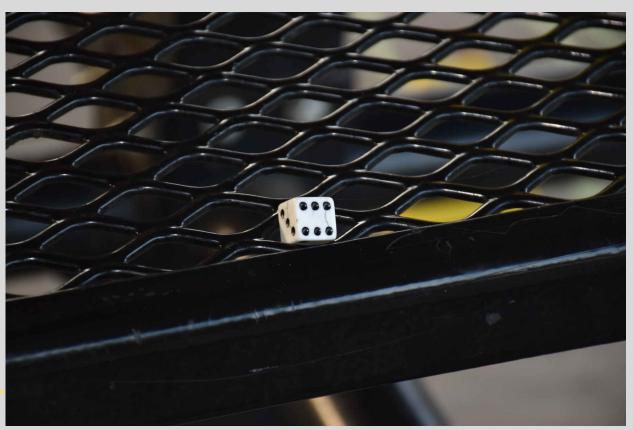


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The Editor reached out to Forensic Evidence Technicians from Greenville County to see what scenarios they've encountered







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Shout out to all of the
Forensic Evidence Technicians from
Greenville County who submitted
all their AWESOME photos for
this issue of *The Identifier!!*

Be sure to submit *your* photos for the state-wide contest for the future issues of *The Identifier*! Submit your photos to the Editor at bribrown@greenvillecounty.org

See page 14 for more details!