Fingerprint Analysis: Preparing for Trial and Expert Witness Testimony

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Disclaimers

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Michelle Machalka

Michelle is a Supervisory Physical Scientist/Forensic Examiner with the Latent Print Unit of the Federal Bureau of Investigation Laboratory in Quantico, VA. Michelle received her Bachelor of Science degree in Ecology from the University of Illinois Urbana/Champaign and her Master of Science degree in Environmental Science from the Florida Institute of Technology. Michelle's current duties include the supervision of case-working examiners, administrative and technical case reviews, and training. She is a member of her agency's Hazardous Evidence Analysis Team and the Fingerprint Legal Advisory Group. She assisted in the development of the ACE module for the FBI's Latent Print Unit Training Program and currently teaches lectures regarding the scientific foundation of the friction ridge discipline, document classification, and legal topics and testimony specific to the discipline.

John F. Wilkinson

John F. Wilkinson, an Attorney Advisor with AEquitas, presents on trial strategy, legal analysis and policy, and ethical issues related to violence against women at the local, state, national and international level. He conducts research; develops training materials, resources, and publications; and provides case consultation and technical assistance for prosecutors and allied professionals. John served as an Assistant Commonwealth's Attorney in Fredericksburg, VA prosecuting cases involving intimate partner violence and sexual assault, including cases of campus sexual assaults and domestic violence homicide. He also served on the Fredericksburg Area Sexual Assault Response Team and prosecuted child sexual and physical abuse and neglect cases and infant homicides.

Objectives

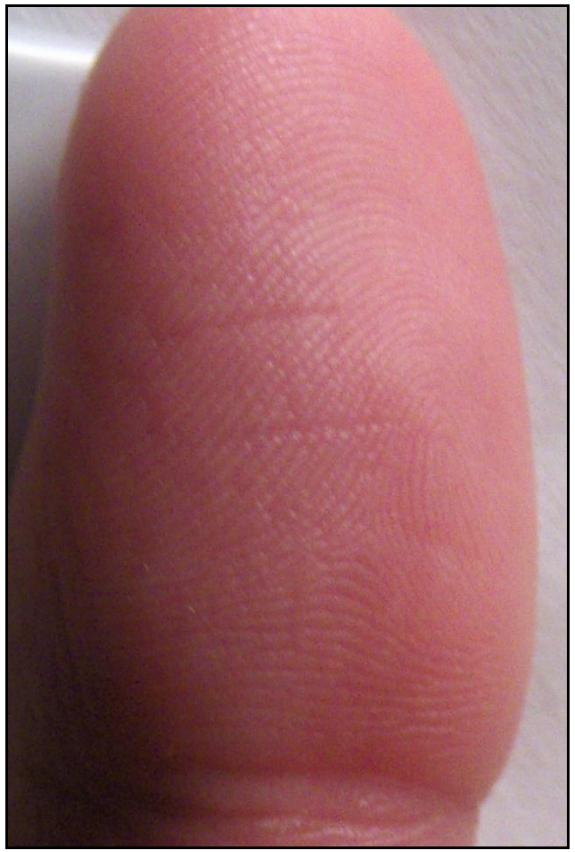
By the end of this webinar, attendees will be able to:

- Explain the foundational basis of the science of friction ridge examinations and the examination process.
- Explain the limitations of the friction ridge examinations.
- Explain the considerations and limitations of DNA from friction ridge prints.
- State alternative options if the examiner of record is unavailable to testify.
- Provide the necessary discovery request materials and conduct a pre-trial conference.
- Compile a list of qualifying questions relevant to the friction ridge discipline so the witness is admitted as an expert.
- Compile a list of questions to guide the expert witness in the introduction of friction ridge evidence into court and explain the significance of the presence or absence of friction ridge evidence.
- State the benefits and disadvantages of using a demonstrative aid to walk the judge and jury through the examination process.
- Identify challenges the friction ridge discipline currently faces.

Fingerprints

Foundation of the Science and Examination Process

Transferred Impression



Photograph of
Friction Ridge Skin

Reproduction of
Friction Ridge Skin

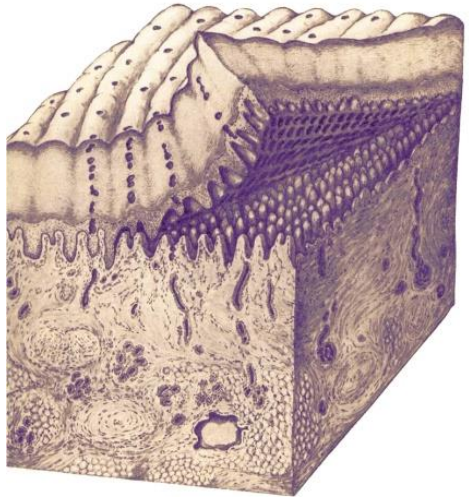
Friction ridge skin – foundational premises

Friction Ridge Skin is Persistent

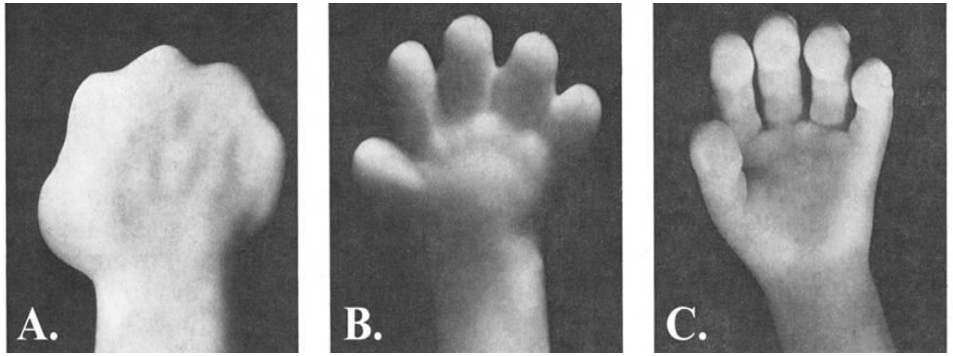
- Biological Basis
  - Underlying structure and regeneration process
- Empirical Basis
  - Observation
  - Experimentation

Friction Ridge Skin is Unique

- Biological Basis
  - Embryonic development
- Empirical Basis
  - Observation
  - Statistical models



Babler 2005



Ashbaugh 1998

Known Fingerprints

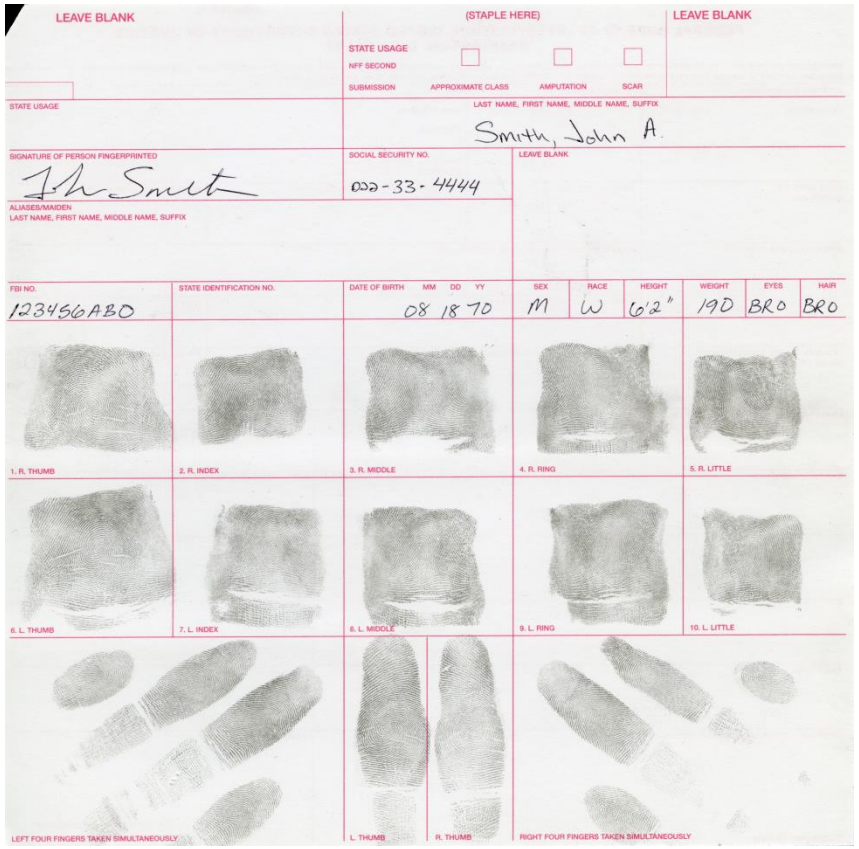
Intentional reproduction of the friction ridges from the end joints of the fingers.

Also referred to as:

- Standard 10-print card
- Inked fingerprints
- Known exemplar
- Known recordings

Major case prints:

- Complete recordings
- Include fingers, lower joints, palms
- Can include footprints



Latent Prints

Reproduction of the friction ridges in sweat, body oil, grease, dirt, blood, or paint, that covered the surface of the ridges.

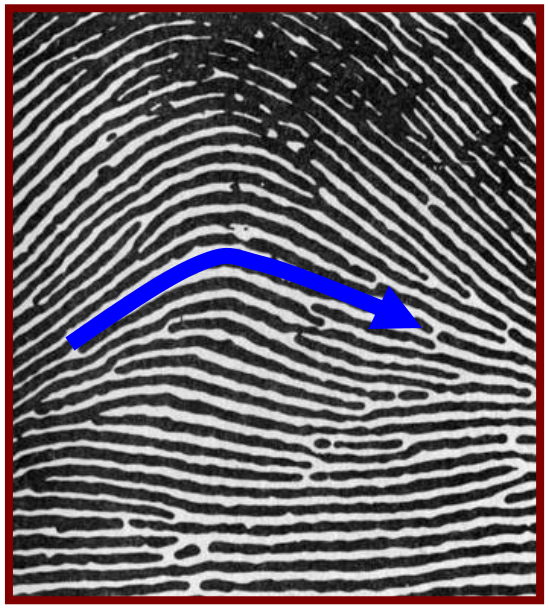
Also referred to as:

- Unknown prints
- Partial prints
- Patent prints
- In literature – marks

Considerations:

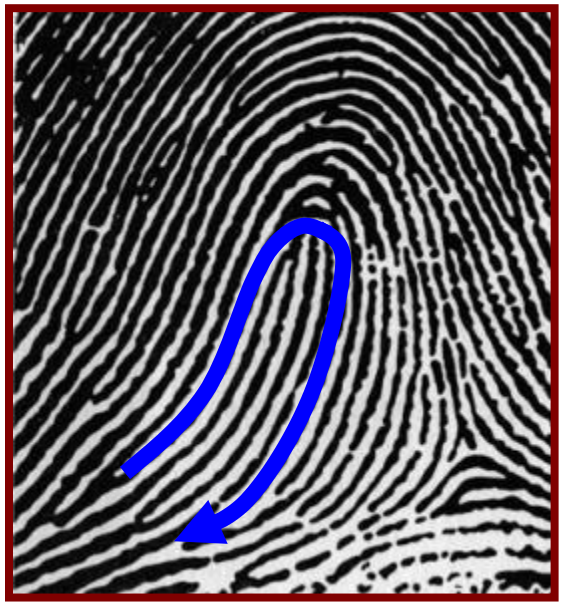
- Poor quality, small area, distorted
- Development often needed to visualize

Basic Pattern Types



Arch

~5%



Loop

~65%

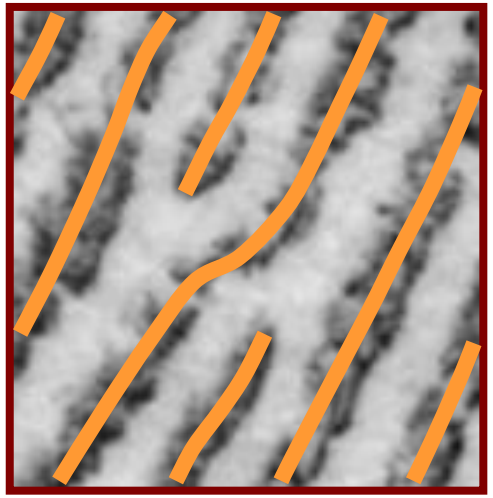
Whorl

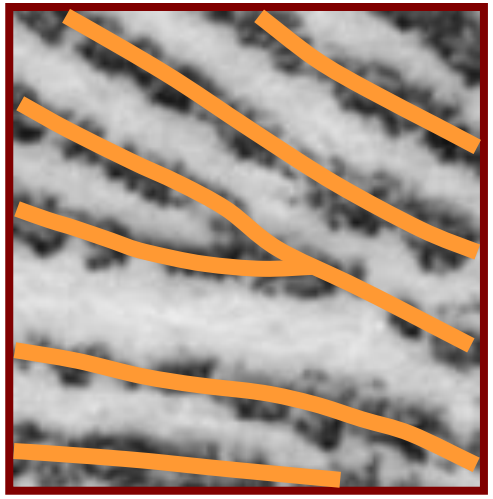
~30%

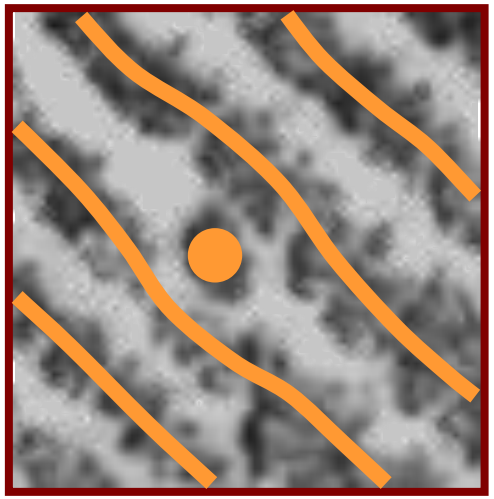
U.S. Department of Justice, Federal Bureau of Investigation. The Science of Fingerprints. U.S. Government Printing Office, Washington, DC. 1984

Ridge Paths and Characteristics

1) Continuous Ridges







2) Ending Ridge
~ 55-65%

3) Dividing Ridge
~ 26-36%

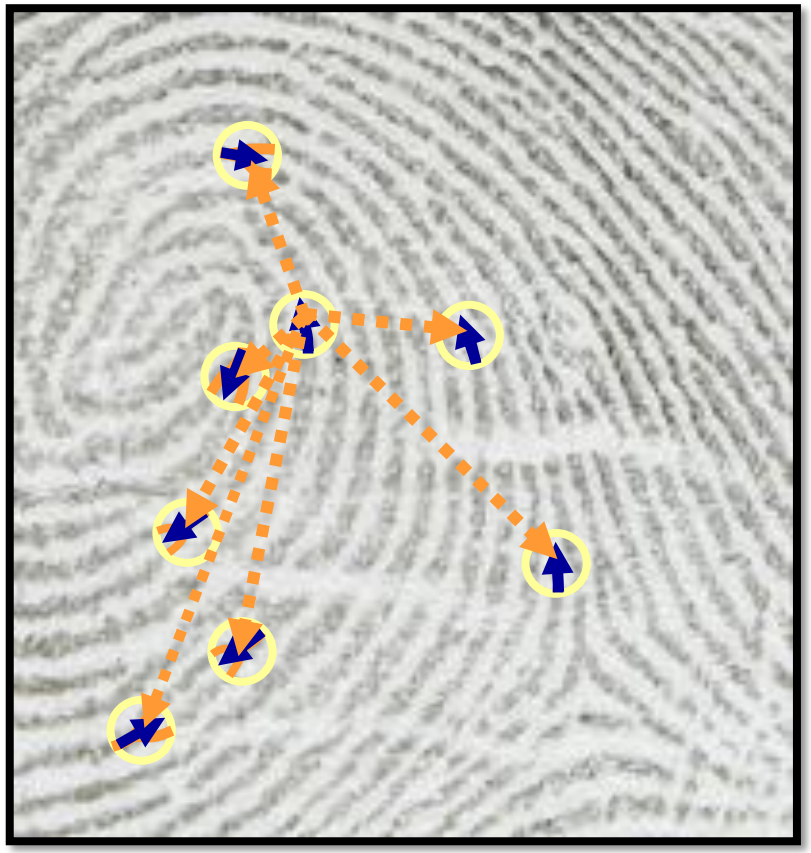
4) Dot
~ 3%

Gutierrez-Redomero E., et al. (2011). Distribution of the Minutiae in the Fingerprints of a Sample of the Spanish Population. *Forensic Science International* 208: 79-90.

Ridge Relationships

Single characteristics contain multiple types of information:

- Location
- Type
- Direction
- Spatial Relationship



Friction Ridge Prints

Friction ridge prints are highly reproducible.

- What does this mean? – The skin's ridges and even their most minute details can be reliably reproduced from 3-D to 2-D.
- Research support – persistency study: Monson, Keith L.; et.al. (2019) The permanence of friction ridge skin and persistence of friction ridge skin and impressions: A comprehensive review and new results. *Forensic Science International*. 297: 111-131.

Friction ridge prints are highly discriminable.

- What does this mean? – The combination of the friction ridge skin characteristics can be used reliably to distinguish impressions from different sources.
- Research support - twin studies: Srihari, S. N.; Srinivasan, H.; Fang, G. (2008). Discriminability of Fingerprints of Twins. *Journal of Forensic Identification* 58(1): 109-127.

Detection of Latent Prints

POROUS PROCESSING

Evidence items like paper - prints absorb into the item

1. Visual examination
2. Forensic light source examination
3. Chemical processes:
   - Indanedione-Zinc
   - Physical Developer

Detection of Latent Prints

NON-POROUS PROCESSING

Evidence items like a gun - prints remain on top of the item's surface

1. Visual Examination
2. Forensic light source examination
3. Chemical processes:
   - Cyanoacrylate Fuming
   - Forensic dye stain

Detection of Latent Prints

ADHESIVE PROCESSING

1. Visual Examination
2. Forensic light source examination
3. Chemical processes:
   - Cyanoacrylate Fuming
   - Adhesive process
   - Forensic dye stain

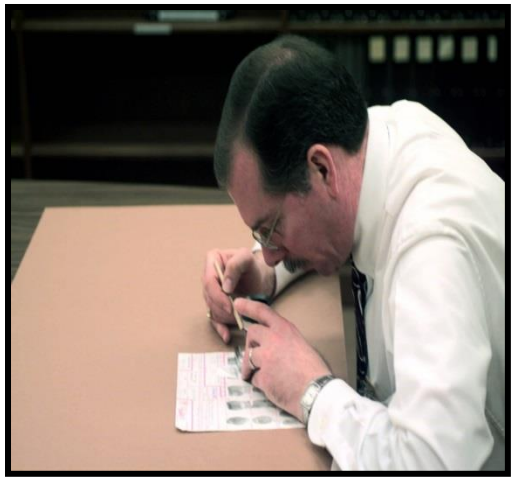
Friction Ridge Print Examination

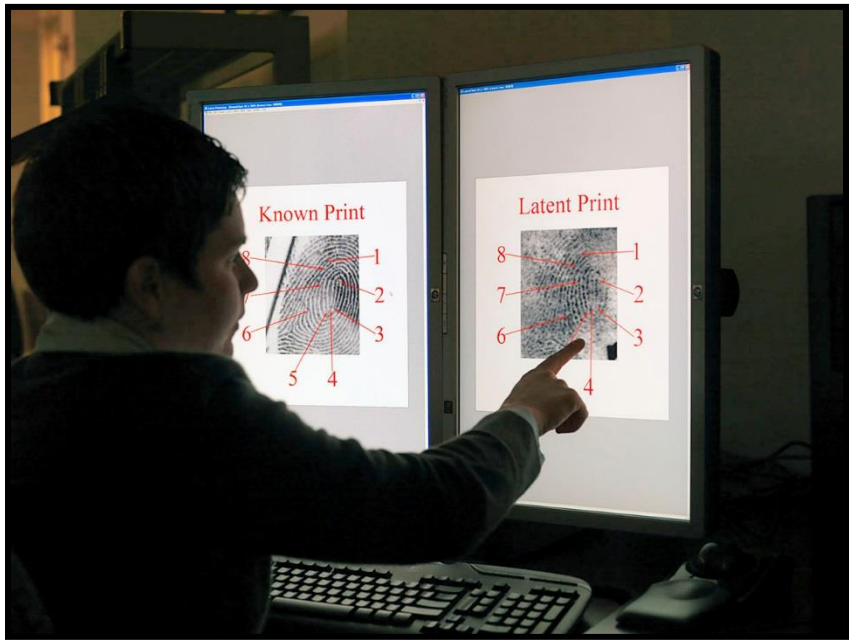
A nalysis

C omparison

E valuation

V erification





Steps of ACE-V

A nalysis - Information gathering to assess the information in a friction ridge print

C omparison - Side-by-side examination of the information present in two friction ridge prints

E valuation - Conclusion based on the agreement/non-agreement of information from analysis and comparison

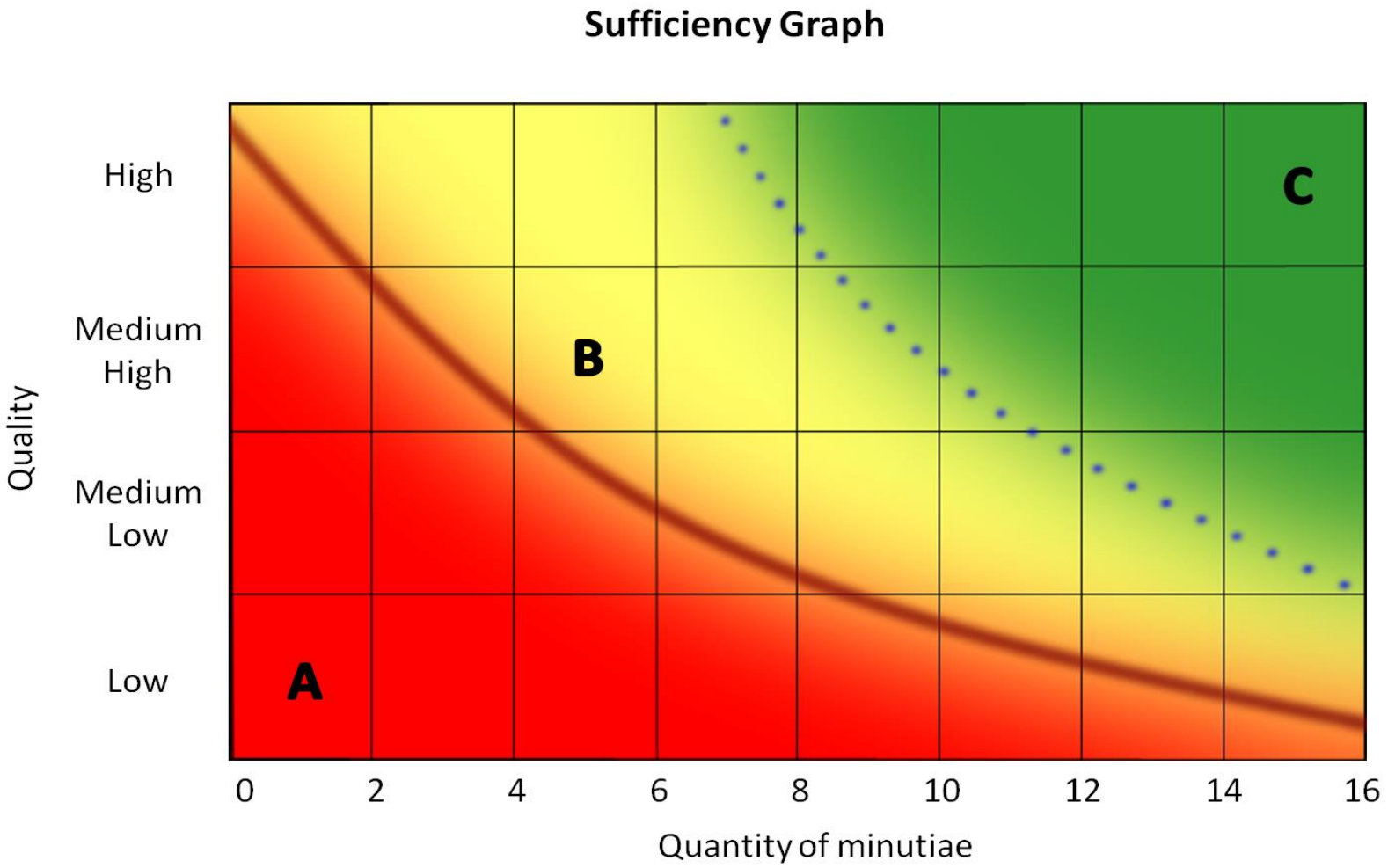
V erification - Independent application of analysis, comparison, and evaluation by a second qualified examiner

Analysis of Friction Ridge Prints

Suitability

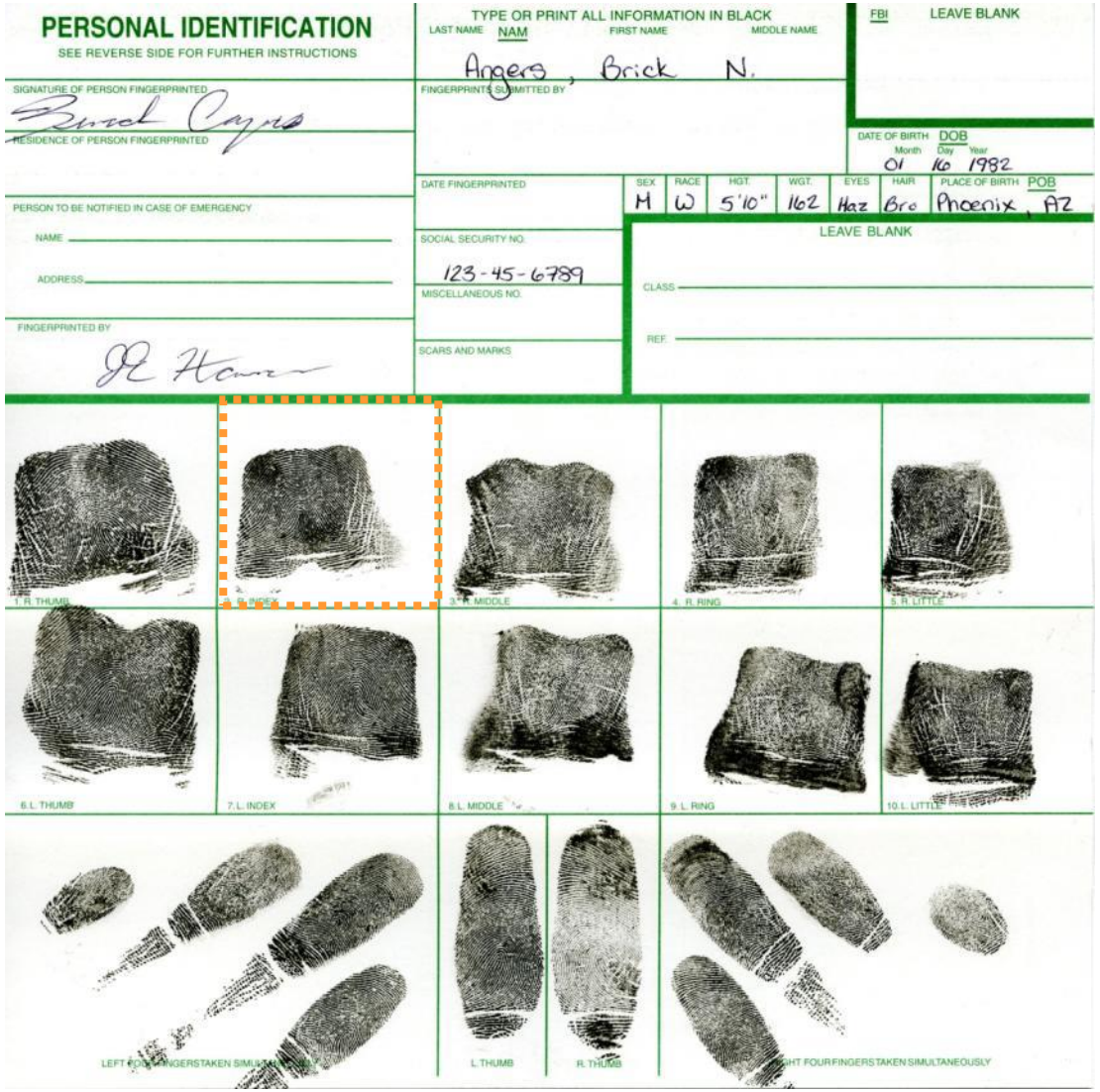
A print is suitable for comparison when the examiner determines that sufficient reliable information may be present such that an identification decision could be reached.

Sufficiency

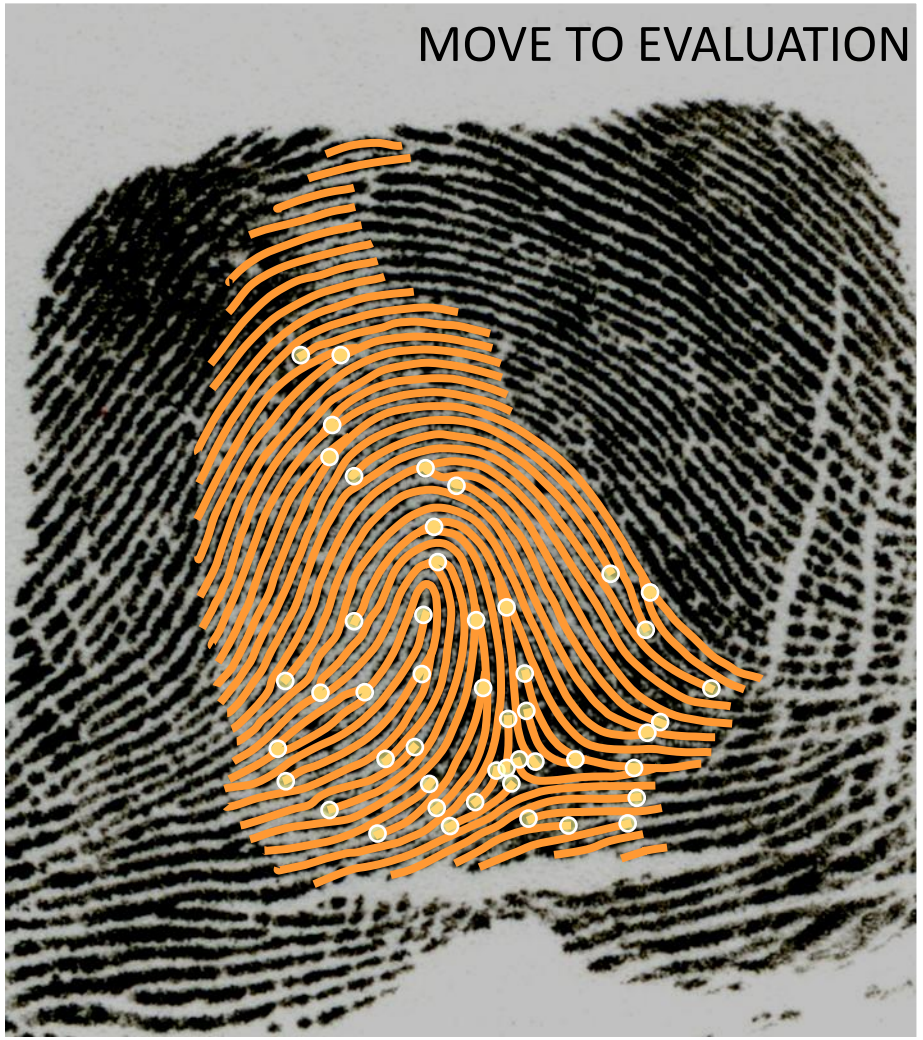


This graph does not suggest or endorse the use of minutiae counts as the sole criteria for a decision threshold
SWGFAST Document #10 Standards for Examining Friction Ridge Impressions and Resulting Conclusions Ver. 2.0

Analysis of Known Prints



Comparison



Evaluation

Conclusions reached:

Exclusion – the latent print and the known print were not made by the same person.

Inconclusive – a determination cannot be made because there is insufficient information to make a conclusive exclusion or identification. Often, submitting better quality or complete recordings of known exemplars can result in a conclusive decision.

Identification – the latent and the known print were made by the same person.

United States Department of Justice Uniform Language for Testimony and Reports for the Forensic Latent Print Discipline, effective 8/15/2020

Verification

Verification:

- Application of Analysis, Comparison and Evaluation (ACE) by another qualified examiner
- This is a quality assurance measure
- Some agencies do 100% verification, some only verify identifications, some have conditional verifications

Blind verification:

- A type of verification by another qualified examiner who has limited case information and does not know the evaluation decision of the primary examiner
- Blind verification is used as a means to reduce confirmation bias and limit contextual bias in the examination process
- When done, blind verification is typically a QA measure written into policy specifying conditions under which a blind verification must occur

Fingerprints

Limitations

Limitations

Scientific research does not support an examiner stating:

- When a print was left
- The significance of the touch
- The conditions or circumstances under which a print was left
- Why no usable prints were detected on the item of evidence
- A predictive error rate
- A zero-error rate
- That the information relied upon to reach a conclusion is objective
- That a print is identified to an individual to the exclusion of all other people
- That latent impressions are unique

Fingerprints

DNA from Latent Prints

DNA from latent prints

Considerations:

- Swabbing for DNA from areas that are most likely to be touched may destroy friction ridge prints.
- Requests can be made to swab areas most likely to be touched, but least likely to yield friction ridge evidence – for example, textured surfaces like the ridged part of a shot shell, the opening of a plastic or aluminum beverage container, or a fabric handle of a bag.

DNA from Latent Prints

Research shows some success with the recovery of DNA after friction ridge processing:

- Joy, Jessica; Cox, Jordan O.; C. Hudson, Brittany; Armstrong, Julissa; Miller, Marilyn T.; Dawson Cruz, Tracey. Comparison of Cyanoacrylate Fuming Techniques of Bloody and Latent Fingerprints and the Examination of Subsequent DNA Success. Journal of Forensic Identification. 2020, 70 (2), 171-185.
- Thirty-nine percent of latent non-blood fingerprint samples were found to have detectable STR alleles for subsequent DNA exams.
- There were no statistically significant differences in the amount of DNA recovered from
  1) latent prints developed on different substrates (tile, glass, wood, **glossy paper, or drywall**)
  2) developed using 4 different superglue fuming techniques.
- Caution - Results should be applied only to situations utilizing the specific processing chemicals (different superglues) and substrates used in the study

Fingerprints

Preparing with the Expert

Review Fingerprint Report

- What item(s)/object(s) were fingerprints recovered from?
- Description of surface.
- Method used to detect/collect fingerprints.
- How were comparison prints obtained?
- Is the analyst still available?

Meet with Analyst

- Review report/conclusions.
- Review qualification questions.
- Determine most effective direct examination questions.
- Review handling of physical evidence/demonstrative evidence.
- Discuss expected areas of cross-examination.
- Discuss potential challenges to the evidence.

Will the Defense Call an Expert?

- Obtain/Review CV.
- Request defense report if one was prepared.
- Explore defense expert's background:
  - Consult with prosecution expert.
  - Confirm accuracy of CV.
  - Search for transcripts of prior testimony.
- Contact defense expert.
- Prepare for cross examination with prosecution expert.

Professionalism

- Make expert available to the defense.
  - Enhances credibility.
  - Previews defense theories.
- Avoid vulnerabilities:
  - Social media.
  - Familiarity with recent research.
  - Demeanor during cross-examination.
- Do not opine on issues outside of expertise.

The best testimony is…

Original Analyst Unavailable

- Consult with Lab about original report.
- Was another analyst involved in analysis/peer review?
- Is original report sufficient for new analyst to form an opinion?
- Can testing be re-created?

Crawford and Forensic Evidence

Melendez-Diaz v. Massachusetts, 557 U.S. 305 (2009)

Bullcoming v. New Mexico, 564 U.S. 647 (2011)

Williams v. Illinois, 567 U.S. 50 (2012)

See THE PROSECUTORS' RESOURCE ON CRAWFORD AND ITS PROGENY, *available at* https://aequitasresource.org/resources/

Fingerprints

Alternatives if Examiner of Record is Unavailable

Alternatives if Examiner of Record is Unavailable

- Ideally, the original examiner is still qualified and available to testify.
- If the original examiner is unavailable or not qualified to testify, there are 2 options:
  - A verifier or blind verifier may be available to testify in place of original examiner.
  - The case can be assigned to a new examiner for re-exams to the extent possible.
    - Can conduct new exams (new subject, victim prints located at ME's office, new or unexploited evidence submitted, etc.).
    - Can write new report as needed.
    - Can write a confirmation report of previous conclusions if appropriate.
    - Can testify.
    - Can launch new automated database (NGI/AFIS) searches of all suitable unidentified prints.

Fingerprints

Discovery Requests and Pre-trial Considerations

Discovery Requests

- Each agency has its own rules.
- Examiner/Laboratory typically provides copies of:
  - Curriculum vitae
  - Report of examination
  - Case notes (also called bench notes)
  - Images of latent and known prints used in comparison
  - Chain of Custody
  - Communication log
  - Standard Operating Procedures
  - Other documentation as requested

Testimony Requests

- A subpoena is required for testimony.
- Some federal examiners may require a Touhy letter to testify in state or local courts.
- Some examiners may not testify in Grand Jury proceedings as the Report of Examinations is typically sufficient.
- Contact the examiner for a pre-trial conference to discuss:
  - Examiner availability
  - The examinations conducted

Fingerprints

Testimony - Qualifying Questions

Suggested Qualifying Questions

1. Please state your name.
2. Where are you employed?
3. What is your title?
4. How long have you been employed in fingerprint work?
5. What are your official duties as an examiner?
6. What is your educational background?
7. What training do you have in the area of fingerprints?
8. Have you testified as an expert witness before today?
9. What is a known fingerprint?
10. What is a latent fingerprint?
11. What are the basic factors in the use of fingerprints as a means of identification?
12. What is the process used for fingerprint comparison?

Fingerprints

Testimony - Introduction of Friction Ridge Print Evidence

Suggested Questions for Introduction of Evidence Questions

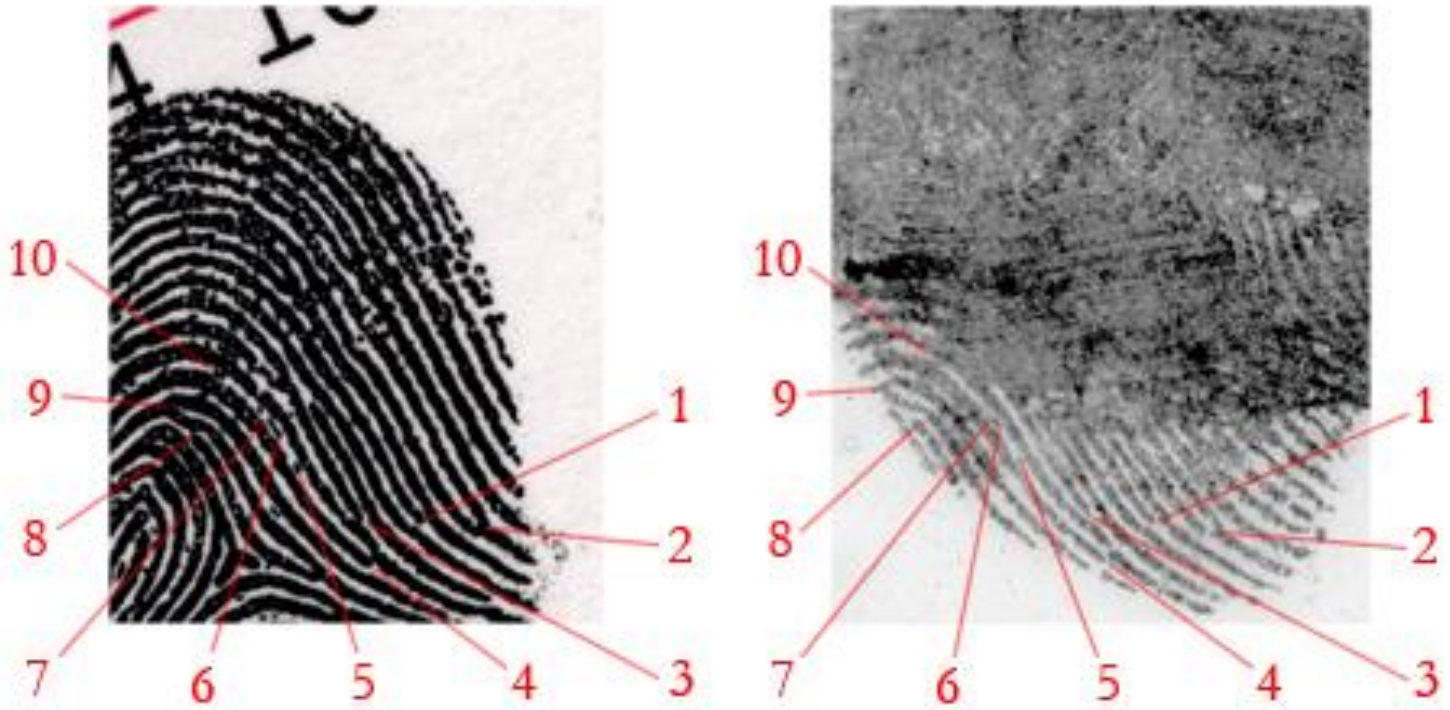
1. How do you examine evidence for latent prints?
2. Have you seen exhibit(s) _____ before? (evidentiary items)
3. Can you describe what that is for the court?
4. Did you examine exhibit(s) _____ for latent prints?
5. What processes did you apply to this item?
6. Did you develop any latent prints?
7. (Repeat for additional exhibits)
8. Have you seen exhibit(s) _____ before? (known cards)
9. Can you describe what that is for the court?
10. Did you compare the latent prints on exhibit _____ with the prints on this card?
11. What were the results of those comparisons?
12. Have you seen exhibit(s) _____ before? (charts)
13. Can you describe what that is for the court?
14. Will you please demonstrate the method used to compare the prints in this case?

Fingerprints

Demonstrative Aids

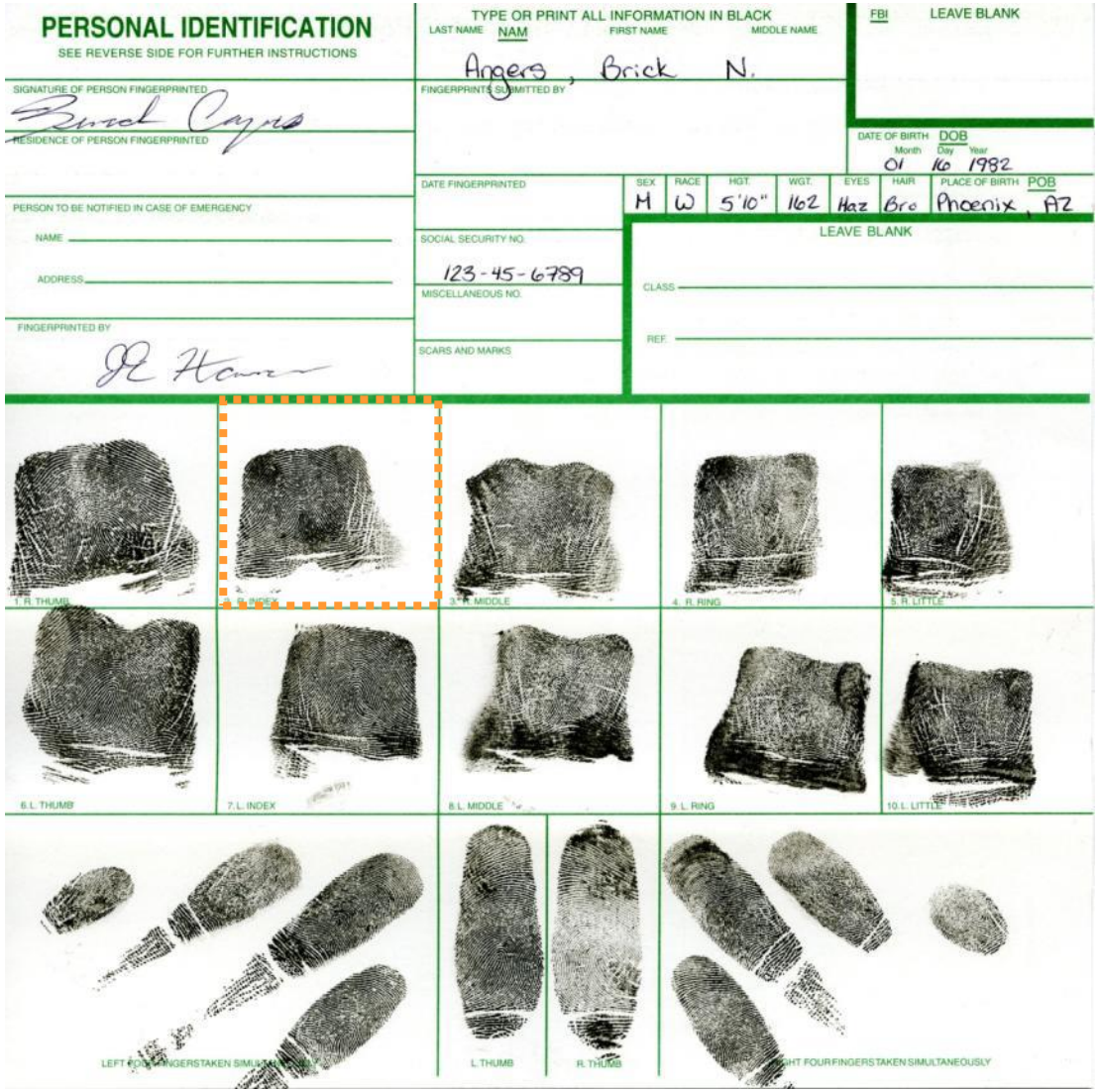
Charted Enlargements – ACE Demonstrative Aids

- Are used to demonstrate the ACE comparison process to the jury.
- Can use a latent and known print from the case if suitable for demonstration.
- Can be physical charts – old fashioned bi-fold annotated charts.
- Can be digital charts with animation – similar to this presentation's ACE slides.

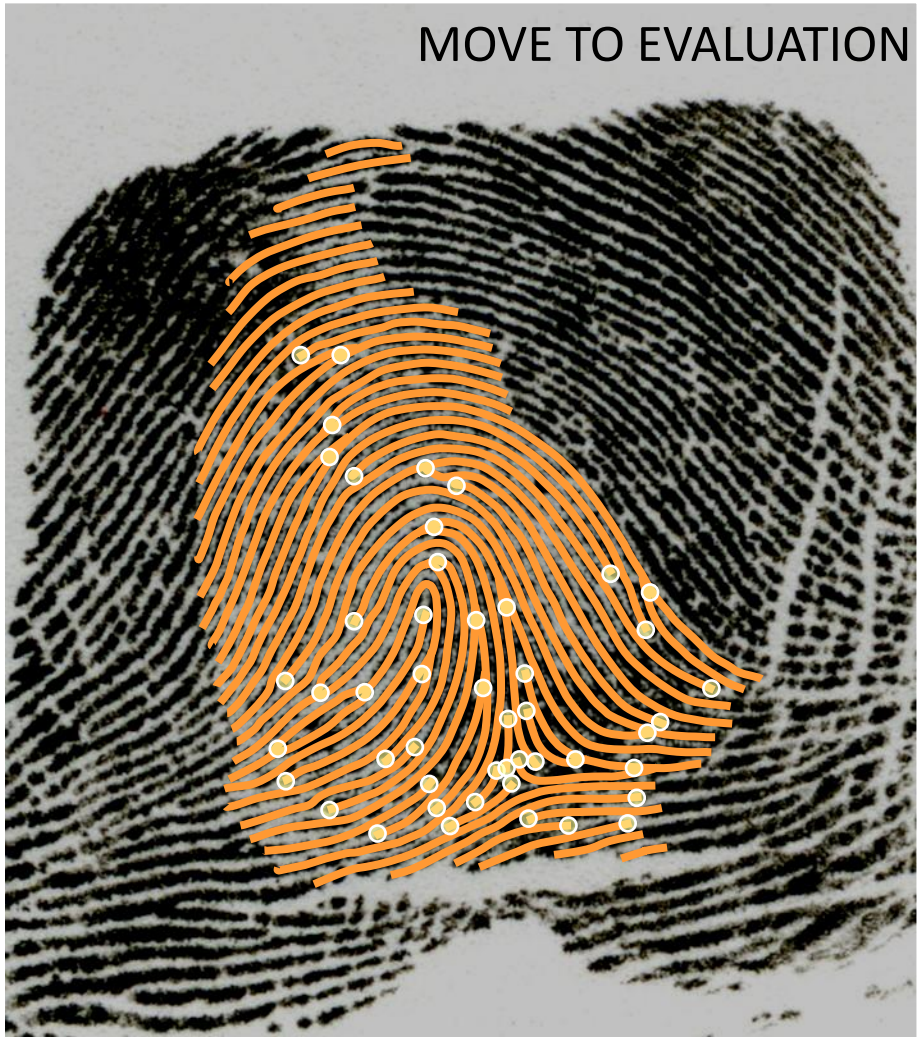


Analysis of a Latent Print

Analysis of Known Prints



Comparison



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United States Department of Justice Uniform Language for Testimony and Reports for the Forensic Latent Print Discipline, effective 8/15/2020

Dahlberg v. MCT Transp., LLC, 571 Fed. Appx. 641, 647 (10th Cir. 2014)

- We have recognized the value of exhibits that summarize data contained in other exhibits and that present the evidence in a 'simpler form.' *United States v. Downen,* 496 F.2d 314, 321 (10th Cir. 1974).
- Demonstrative aids may be effective in illustrating relevant information to a jury, assuming a proper foundation is laid. *Sanchez v. Denver & Rio Grande W.R.R.,* 538 F.2d 304, 306 (10th Cir. 1976).
- In assessing foundation in this context, courts consider (among other things) whether the proffered demonstrative exhibit 'fairly and accurately summarize[s] previously admitted competent evidence.' *Wilson v. United States,* 350 F.2d 901, 907 (10th Cir. 1965).

Federal Rules of Evidence Rule 403, 28 U.S.C.A.

The court may exclude relevant evidence if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.

Laboratory – Latent Print Discipline

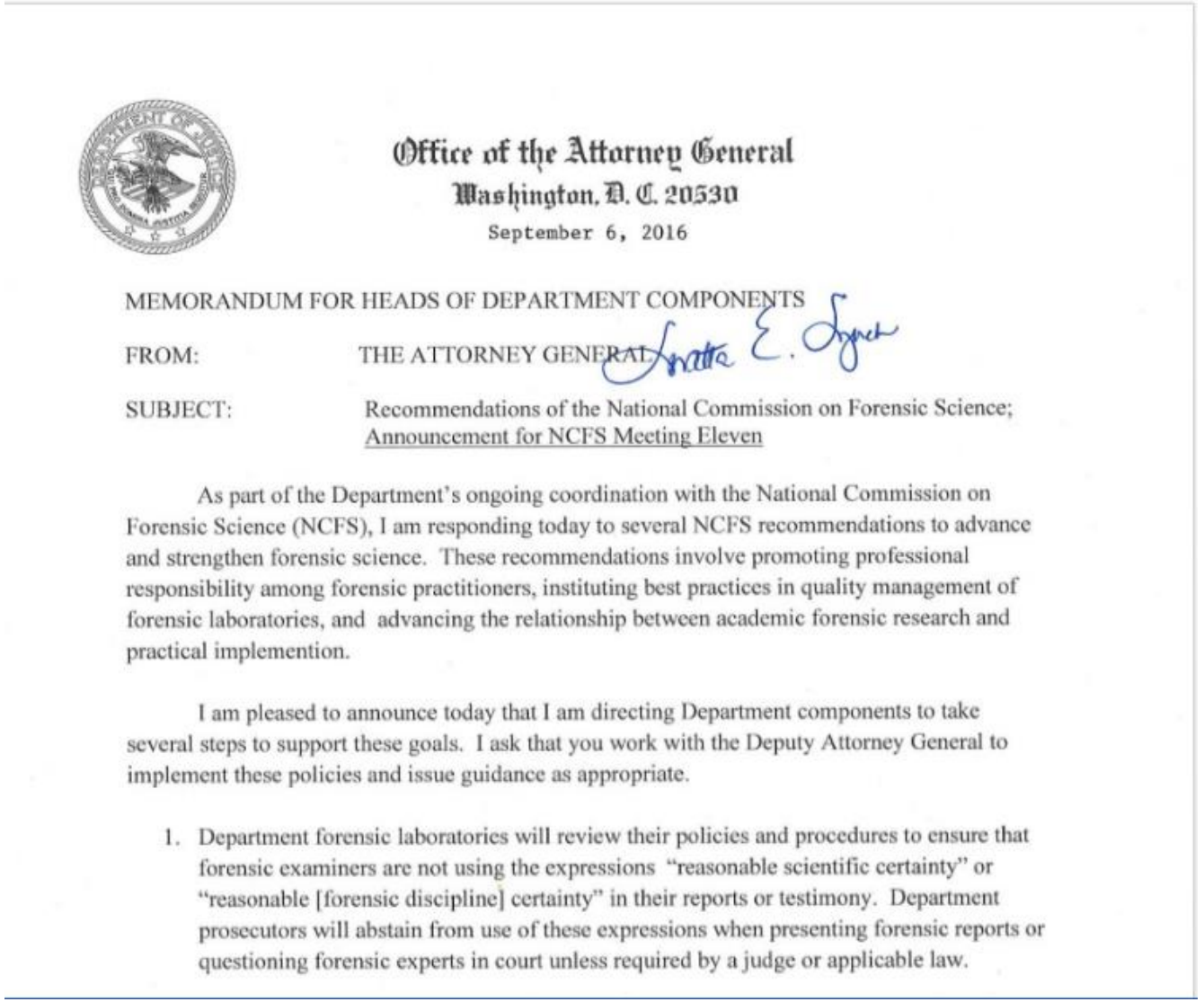
Challenges

Current Happenings in the Discipline

At the Federal level:

- Uniform Language for Testimony and Reports (ULTRs) – Approved language for all DOJ components.
- Approved Standards for Scientific Testimony and Reports (ASSTRs) – Approved language for FBI examiners.
- These protocols dictate language for testimony and reports regarding:
    - ‘To the exclusion of all others’ or similar phrases – NOT allowed
    - ‘Uniqueness’ to describe latent or known **print** – NOT allowed
    - ‘Individualize’ to describe an identification – NOT allowed
    - Zero error rate – NOT allowed
    - Statements of conclusions in terms of a probability – NOT allowed
    - A measure of accuracy in a case based on his/her past conclusions – NOT allowed
    - The use of the expression ‘reasonable degree of scientific certainty’ or similar expressions – NOT allowed (See Attorney General directive on next page)

Current Happenings in the Discipline



Office of the Attorney General
Washington, D. C. 20530
September 6, 2016

MEMORANDUM FOR HEADS OF DEPARTMENT COMPONENTS

FROM: THE ATTORNEY GENERAL

SUBJECT: Recommendations of the National Commission on Forensic Science; Announcement for NCFS Meeting Eleven

As part of the Department's ongoing coordination with the National Commission on Forensic Science (NCFS), I am responding today to several NCFS recommendations to advance and strengthen forensic science. These recommendations involve promoting professional responsibility among forensic practitioners, instituting best practices in quality management of forensic laboratories, and advancing the relationship between academic forensic research and practical implemention.

I am pleased to announce today that I am directing Department components to take several steps to support these goals. I ask that you work with the Deputy Attorney General to implement these policies and issue guidance as appropriate.

1. Department forensic laboratories will review their policies and procedures to ensure that forensic examiners are not using the expressions "reasonable scientific certainty" or "reasonable [forensic discipline] certainty" in their reports or testimony. Department prosecutors will abstain from use of these expressions when presenting forensic reports or questioning forensic experts in court unless required by a judge or applicable law.

Defense Challenges – General

Challenges to expert's qualifications:

- Trained to competency
- Certified by outside entity or qualified by one's agency as an examiner
- Proficiency tested
- Continuing education
- Research, publications, affiliations

Challenges to lab protocols:

- Accredited
- Standard operating procedures available and followed

Defense Challenges – Discipline Specific

Challenges to the state of the science:

- Uniqueness & persistency
- Conclusion language
- Method validation
- Error rate
- Certainty
- Subjectivity
- Contextual bias
- Documentation
  - Contemporaneous examination
  - Support for conclusion

Frye/Daubert Challenges

Motion to exclude fingerprint evidence – What an examiner should do:

- Get a copy of the motion.
- Work with the prosecutor to write a strong response.
  - Explain the scientific basis.
  - Address specific points raised in motion to exclude.
  - Don’t allow misleading or false statements to go unchallenged.
  - Ensure hearing is requested, rather than exclusion based on motions alone.
- Gather materials to support examiner’s opinion.
- Prepare PowerPoint presentation.
- Prepare for cross exam, using defense motion as guide.
- Practice, practice, practice.
- Help prosecutor prepare for proposed defense witnesses.

Challenges Due to External Reports

Challenges stemming from four external reports:

- 2017 – AAAS *Forensic Science Assessments: A Quality and Gap Analysis - Latent Fingerprint Examination*
- 2016-2017 – PCAST *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*
- 2012 – NIST *Human Factors Report*
- 2009 – NAS *Strengthening Forensic Science in the United States: A Path Forward*

Fingerprints

Admissibility vs Weight

Federal Rules of Evidence Rule 702, 28 U.S.C.A.

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) the testimony is based on sufficient facts or data;

(c) the testimony is the product of reliable principles and methods; and

(d) the expert has reliably applied the principles and methods to the facts of the case.

Reliability

General Acceptance

- Frye v. United States, 293 F. 1013 (D.C. Cir. 1923)

Scientific Knowledge

- Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993)

Technical and other specialized knowledge

- Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999)

Criteria Under Daubert

- Can be or has been tested.
- Subjected to peer review or published.
- Known or potential rate of error.
- Standards controlling the technique’s operation.
- Generally accepted in the relevant scientific community.

Admissibility

In determining that the evidence was reliable, the district court acted in accordance with our caselaw and the decisions of other circuits that have upheld such evidence as reliable under *Daubert*, notwithstanding the subjective nature of the ACE-V method.

We have previously upheld the admission of fingerprint evidence as being sufficiently reliable under *Daubert*. *Abreu*, 406 F.3d at 1307. We reasoned that (1) other federal circuits had determined that such evidence was sufficiently reliable under *Daubert*; (2) district courts in general are given broad latitude in deciding how to determine reliability; and (3) the district court had considered information provided by the government regarding the uniform practice followed by fingerprint examiners and the error rate of fingerprint identification.

United States v. Hood, 846 F. Appx. 825 (11th Cir. 2021)

Weight

The district court denied this motion, holding that Liszkiewicz was qualified as an expert in fingerprint identification, that his "data and methodology ... were within the mainstream of forensic fingerprint technology," and that any flaws in his opinion went to the weight of the evidence, rather than its admissibility.

Given the evidence of Liszkiewicz's training, experience, and skill, the district court did not abuse its discretion in finding him sufficiently qualified to testify as an expert on fingerprint comparison, as that ruling fell within the broad purview of the trial court's discretion.

United States v. Vargas, 471 F.3d 255 (1st Cir. 2006)

Additional Resources

- Organization of Scientific Area Committees, Subcommittees webpage, <nist.gov/topics/organization-scientific-are-committees-forensic-science/osac-subcommittees>
  - Proposed discipline standards and terminology
  - Approved discipline standards and terminology
  - Lists of additional external standards and guidelines

- FBI Laboratory Services webpage, <Fbi.gov/services/laboratory>
  - Services we provide
  - Handbook of Forensic Services
  - Quality System Documents

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