

Demonstrating the Reliability of Fingerprint Evidence

Are your examiners prepared to
handle challenges to the science
of fingerprints?



Melissa R. Gische
Physical Scientist/Forensic Examiner
Latent Print Operations Unit
FBI Laboratory

ASCLD Symposium
Anaheim, CA
September 17, 2009

FRE 702 - Expert Witness Testimony

- “If scientific, technical or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise if
 - 1) the testimony is based upon sufficient facts or data,
 - 2) the testimony is the product of reliable principles and methods, and
 - 3) the witness has applied the principles and methods reliably to the facts of the case.”

Daubert Legacy

- Factors that may be considered:
 - 1) Whether theory or technique can be, and has been, **tested**
 - 2) Whether theory or technique has been subjected to **peer review and publication**
 - 3) Whether theory or technique has a known or potential **rate of error**
 - 4) Whether there are **standards** controlling technique's operation
 - 5) Whether theory or technique has attracted **widespread acceptance** within a relevant scientific community

NAS Report Key Findings

- Lack of testing
- Lack of standards
- Subjectivity
- Lack of statistical support
- Bias
- Documentation issues (transparency)
- Error rate
- Lack of scientific culture

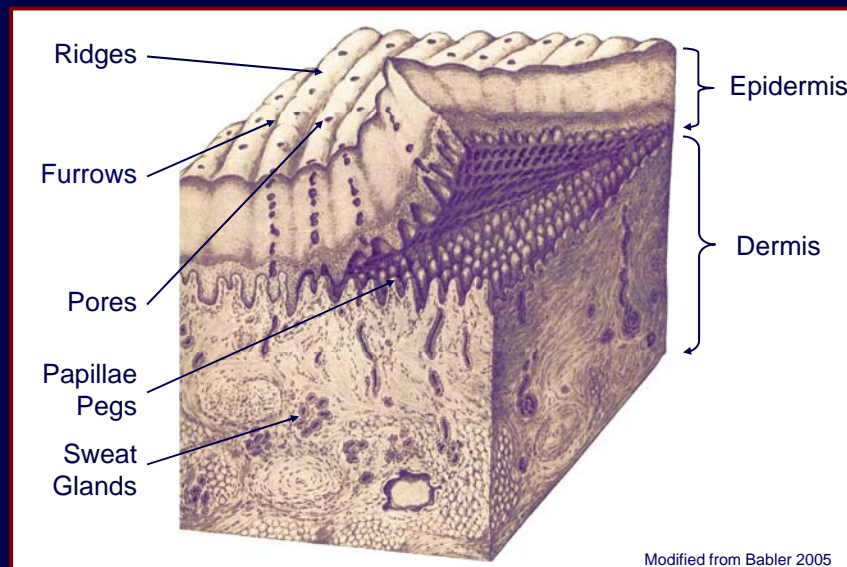
Are your examiners prepared to explain the following four topics?

1. The underlying theory that allows friction ridge impressions to be used as a reliable means of identification.
 - Has it been tested?
 - Has it been peer reviewed, published, and generally accepted?

Basic Factors of Friction Ridge Skin

- Persistent
 - The structure of thick skin is such that friction ridges remain in the same arrangement throughout life, barring permanent scarring or injury.
- Unique
 - Friction ridge arrangements are formed by a combination of genetic and random environmental factors.

Friction Ridge Skin



Development Timeline for Friction Ridge Skin

- **Weeks 5-7**
 - Fingers elongate and separate
 - Cartilaginous bones form
- **Weeks 7-11**
 - Volar pads form
 - Major creases form
- **Weeks 11-17**
 - Volar pads regress
 - Primary ridges form
 - Sweat glands, ducts and pores form
- **Weeks 17-24**
 - Primary ridge development stops
 - Secondary ridges form between primary ridges
- **Weeks 24-27**
 - Friction ridges are fully developed in their final arrangement
 - Papillae pegs form
 - Basement membrane joins epidermis to dermis



www.immunityhealthnews.com

2. The technique used to conduct comparisons of friction ridge impressions.

- Has it been tested?
- Has it been peer reviewed, published, and generally accepted?

Technique = ACE-V

Scientific Method

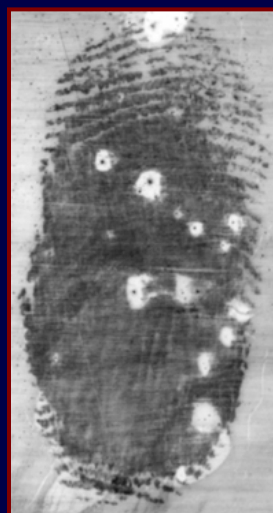
1. Observation
2. Question
3. Hypotheses
4. Experiment
5. Conclusion
6. Repetition
7. Record Results

Friction Ridge Comparison

1. Impression present
2. Who is the source?
3. The print does/does not come from this source
4. Analysis and Comparison
5. Evaluation
6. Verification
7. Report / testimony

Interpretation

- Not all prints are identifiable
- An individual can be excluded as being the source of a particular print, but can not be excluded from having touched the item.
- Just because an individual has been identified as the source of the print does not determine the circumstances of the touch.



3. The error rate for friction ridge comparisons.

~~Error rate is zero~~

vs.

Predictive rate of error is unknown

Key points:

- 1. No inherent error in ACE-V by itself, but ACE-V needs to be applied by a practitioner.*
- 2. Very difficult to calculate a predictive rate of error for the latent print discipline due to many different variables (quality of prints, training of examiner, etc.)*
- 3. Error history could be calculated, but is this necessarily a good predictor of the chance of another error occurring?*

4. The standards in place to ensure quality and consistency in examinations.

Quality Assurance

- Certification
 - Criteria for certification can be explained
 - International Association for Identification Certification
 - Agency Certification
- Accreditation
 - Objective review of all laboratory practices by external agency.
 - Demonstrates that the lab meets national or international operational standards.
 - Outlines criteria that must be met and documented.

Quality Assurance

- Competency testing
- Proficiency testing
- Technical and administrative reviews
- Audits (internal and external)
- Standard Operating Procedures
- Documentation
- Verification
- Blind verification

Bottom Line

- Examiners should be prepared to:
 - Demonstrate reliability of fingerprint evidence
 - Respond to questions regarding the NAS report
 - Identify recommendations already implemented
 - Identify alleged “shortcomings” being addressed
 - Respectfully disagree with inaccuracies

References

- . (1996). National Research Council II Report. The Evaluation of Forensic DNA Evidence. National Academy Press: Washington, D.C., pp. 85-88.
- . (2009). National Research Council. Strengthening Forensic Science in the United States: A Path Forward. National Academy Press: Washington, D.C. (<http://www.nap.edu/catalog/12589.html>)
- Ashbaugh, D.R., *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton, Florida, 1999.
- Babler, William J., (Ph.D., Indiana University, School of Dentistry), "Prenatal Origins of Human Variation in Friction Ridges", presentation given for FBI LPOU, Quantico, VA, September 20, 2005.
- Budowle, B. et al (2009). A Perspective on Errors, Bias, and Interpretation in the Forensic Sciences and Direction for Continuing Advancement. *Journal of Forensic Sciences* 54(4): 798-809.
- Daubert v. Merrell Dow Pharmaceuticals, Inc. (509 U.S. 579, 113 S.Ct. 2786)
- Reznicek, M.; Ruth, R.; Schilens, D. (in press). ACE-V and the Scientific Method
- Rothstein, P. F. *Federal Rules of Evidence (Third Edition)*. Thomson/West, 2008
- Wertheim, K. and A. Maceo (2002). The Critical Stage of Friction Ridge and Pattern Formation, *Journal of Forensic Identification*, 52(1): 35.