A Typology of Underexploitation of Latent Print (Fingerprint) Evidence

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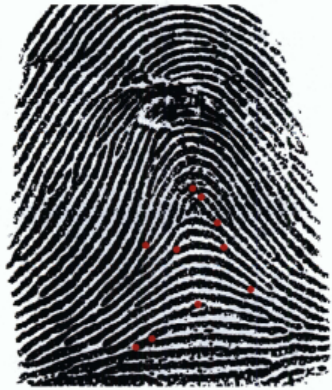and
Barry Scheck
Cardozo School of Law, Yeshiva University

Fingerprint Error

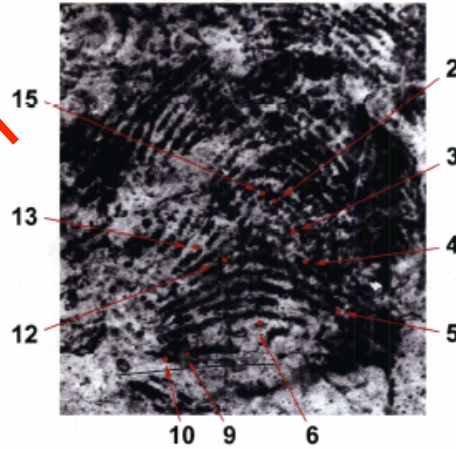- Erroneous Individualizations

Erroneous Individualizations

Daoud record print

Ouhnane Daoud
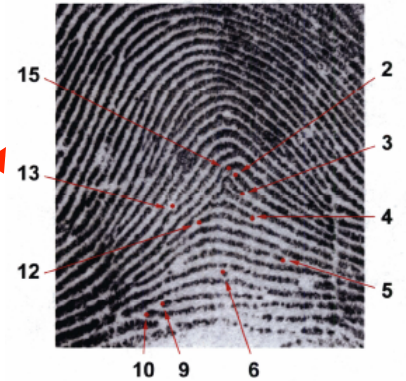
Madrid latent

Mayfield record print

Brandon Mayfield

Cowans Case

- 35-yr. sentence for non-fatally shooting police officer
- Fingerprint match + 2 eyewitnesses
- Worked biohazard duty to get $ for DNA testing
- 1st post-conviction DNA exoneration of fingerprint case
- 16 points
- 2 Boston PD examiners
- 2 defense "consultants"
- A lucky, lucky man
  - Loftus & Cole, 304 SCIENCE 959.

Sources

1. Innocence Project data set of cases

2. National Registry of Exonerations

3. Latent print error cases compiled by Los Angeles County Public Defender/District of Columbia Public Defender

4. Personal knowledge of authors

N.B. Not all cases discussed in this paper are wrongful convictions.

Signal Detection Theory

Table 1. Standard in signal detection theory.

		Ground truth	
		Same source	Different source
Examiner response	Same source	Hit	False positive
	Different source	False negative	Correct exclusion

NIST/NIJ Report Matrix

Table 2. Adapted from NIST, *Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach,* (2012), Table 2.7 (p. 31).

		Desired Outcomes as Determined by Experts			
		Identification	**Exclusion**	**Inconclusive**	**Insufficient**
Examiner	**Identification**	CORRECT	False positive	False positive	False positive
	Exclusion	False negative	CORRECT	False negative	False negative
	Inconclusive	Missed an identification	Missed an exclusion	CORRECT	Missed insufficient
	Insufficient	Missed an identification	Missed an exclusion	Missed an inconclusive	CORRECT

Final Matrix

Table 3. Adapted from SWGFAST, *Standard for the Definition and Measurement of Rates of Errors and Non-Consensus Decisions in Friction Ridge Examination*, ver. 2.0, (Scientific Working Group on Friction Ridge Analysis Study and Technology Nov. 15, 2012), available at http://www.swgfast.org/documents/error/121124_Rates-of-Error_2.0.pdf.

<table>
<tr><td colspan="2"></td><td></td><td colspan="5">Ground truth and/or consensus judgment</td></tr>
<tr><td colspan="2"></td><td></td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td></tr>
<tr><td colspan="2"></td><td></td><td>Exclusion</td><td>Individualization</td><td>Inconclusive</td><td>Of value but no suitable candidate</td><td>No value</td></tr>
<tr><td rowspan="8">Examiner</td><td>A</td><td>Exclusion</td><td>CORRECT</td><td>Erroneous exclusion
3</td><td>Non-consensus exclusion</td><td>N/A</td><td>Erroneous exclusion</td></tr>
<tr><td>B</td><td>Individualization</td><td>Erroneous individualization
> 40</td><td>CORRECT</td><td>Non-consensus individualization
1</td><td>Erroneous individualization</td><td>Erroneous individualization</td></tr>
<tr><td>C</td><td>Inconclusive</td><td>Non-consensus inconclusive
0</td><td>Non-consensus inconclusive
0</td><td>CORRECT</td><td>N/A</td><td>Non-consensus determination of value</td></tr>
<tr><td>D</td><td>Of value but no suitable candidate</td><td>N/A</td><td>Failure to provide suitable candidate
4</td><td>N/A</td><td>CORRECT</td><td>Non-consensus determination of value</td></tr>
<tr><td>E</td><td>No value</td><td>Non-consensus determination of no value
5</td><td>Non-consensus determination of no value
1</td><td>Non-consensus determination of no value</td><td>Non-consensus determination of no value</td><td>CORRECT</td></tr>
<tr><td>F</td><td>Not reported</td><td>Failure to report
2</td><td>Failure to report
1</td><td>Failure to report</td><td>Failure to report</td><td>Failure to report</td></tr>
<tr><td>G</td><td>Not analyzed</td><td>Failure to conduct an analysis
0</td><td>Failure to conduct an analysis
5</td><td>Failure to conduct an analysis</td><td>Failure to conduct an analysis</td><td>Failure to conduct an analysis</td></tr>
<tr><td>H</td><td>Not recovered</td><td>Failure to recover probative evidence
0</td><td>Failure to recover probative evidence
1</td><td>Failure to recover probative evidence</td><td>Failure to recover probative evidence</td><td>Failure to recover probative evidence</td></tr>
</table>

Key

(blue)	Missed exclusions
(pink)	Missed individualizations
(yellow)	Other underutilization types

Odd-sounding category

- Of value, but no suitable candidate
  - "no subjects were compared or all AFIS candidate images that were compared were excluded"

Final Matrix

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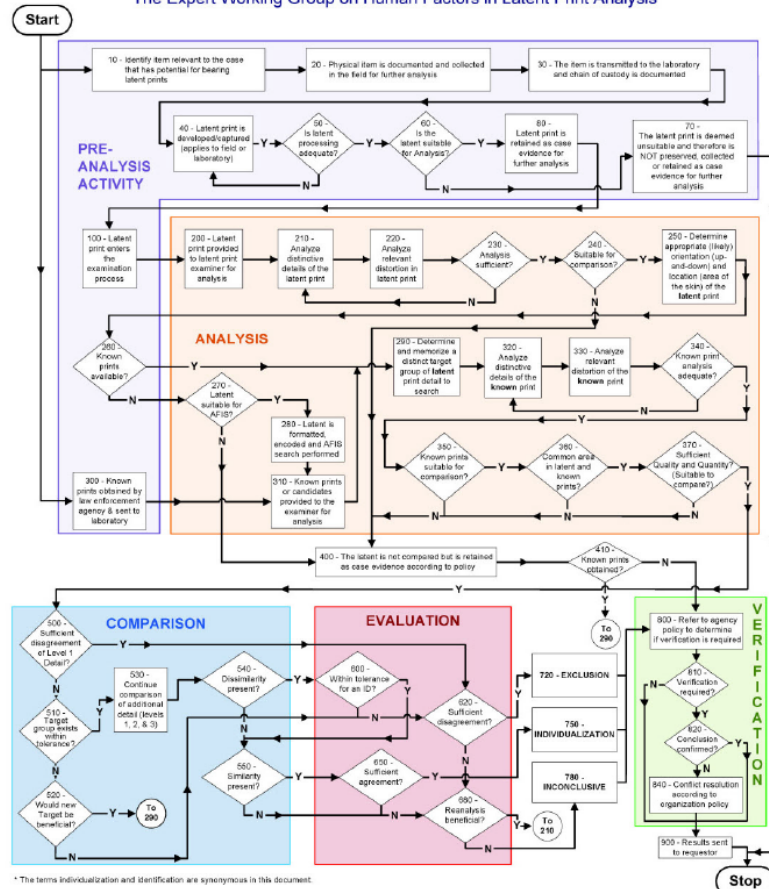|			Ground truth and/or consensus judgment				
			I	II	III	IV	V
			Exclusion	Individualization	Inconclusive	Of value but no suitable candidate	No value
Examiner	A	Exclusion	CORRECT	Erroneous exclusion 3	Non-consensus exclusion	N/A	Erroneous exclusion
	B	Individualization	Erroneous individualization > 40	CORRECT	Non-consensus individualization 1	Erroneous individualization	Erroneous individualization
	C	Inconclusive	Non-consensus inconclusive 0	Non-consensus inconclusive 0	CORRECT	N/A	Non-consensus determination of value
	D	Of value but no suitable candidate	N/A	Failure to provide suitable candidate 4	N/A	CORRECT	Non-consensus determination of value
	E	No value	Non-consensus determination of no value 5	Non-consensus determination of no value 1	Non-consensus determination of no value	Non-consensus determination of no value	CORRECT
	F	Not reported	Failure to report 2	Failure to report 1	Failure to report	Failure to report	Failure to report
	G	Not analyzed	Failure to conduct an analysis 0	Failure to conduct an analysis 5	Failure to conduct an analysis	Failure to conduct an analysis	Failure to conduct an analysis
	H	Not recovered	Failure to recover probative evidence 0	Failure to recover probative evidence 1	Failure to recover probative evidence	Failure to recover probative evidence	Failure to recover probative evidence

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From "error" to "underexploitation"

The Latent Print Examination Process Map

The Expert Working Group on Human Factors in Latent Print Analysis

Start

PRE-ANALYSIS ACTIVITY

10 - Identify item relevant to the case that has potential for bearing latent prints

20 - Physical item is documented and collected in the field for further analysis

30 - The item is transmitted to the laboratory and chain of custody is documented

40 - Latent print is developed/captured (applies to field or laboratory)

50 - Is latent processing adequate?

60 - Is the latent suitable for Analysis?

80 - Latent print is retained as case evidence for further analysis

70 - The latent print is deemed unsuitable and therefore is NOT preserved, collected or retained as case evidence for further analysis

ANALYSIS

100 - Latent print enters the examination process

200 - Latent print provided to latent print examiner for analysis

210 - Analyze distinctive details of the latent print

220 - Analyze relevant distortion in latent print

230 - Analysis sufficient?

240 - Suitable for comparison?

250 - Determine appropriate (likely) orientation (up-and-down) and location (area of the skin) of the latent print

260 - Known prints available?

270 - Latent suitable for AFIS?

280 - Latent is formatted, encoded and AFIS search performed

290 - Determine and memorize a distinct target group of latent print detail to search

320 - Analyze distinctive details of the known print

330 - Analyze relevant distortion of the known print

340 - Known print analysis adequate?

300 - Known prints obtained by law enforcement agency & sent to laboratory

310 - Known prints or candidates provided to the examiner for analysis

350 - Known prints suitable for comparison?

360 - Common area in latent and known prints?

370 - Sufficient Quality and Quantity? (Suitable to compare?)

400 - The latent is not compared but is retained as case evidence according to policy

410 - Known prints obtained?

COMPARISON

500 - Sufficient disagreement of Level 1 Detail?

510 - Target group exists within tolerance?

520 - Would new Target be beneficial?

530 - Continue comparison of additional detail (levels 1, 2, & 3)

540 - Dissimilarity present?

560 - Similarity present?

To 290

EVALUATION

600 - Within tolerance for an ID?

620 - Sufficient disagreement?

650 - Sufficient agreement?

680 - Reanalysis beneficial?

720 - EXCLUSION

750 - INDIVIDUALIZATION

780 - INCONCLUSIVE

To 210

VERIFICATION

800 - Refer to agency policy to determine if verification is required

810 - Verification required?

820 - Conclusion confirmed?

840 - Conflict resolution according to organization policy

900 - Results sent to requestor

Stop

* The terms individualization and identification are synonymous in this document.
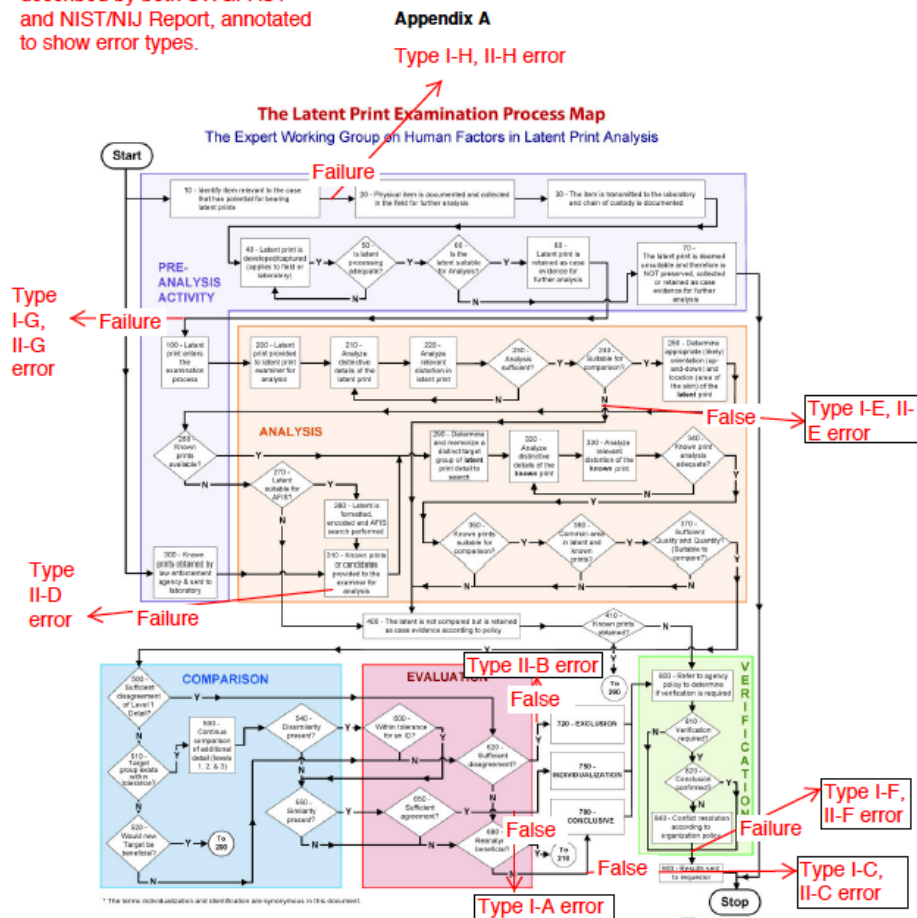
This diagram documents the steps of the ACE-V process as currently practiced by the latent print examination community. The numbers in each of the boxes correspond to "steps" that are more fully described in the report. The purpose of this process map is to facilitate discussion about key decision points in the ACE-V process.

Expert Working Group on Human Factors in Latent Print Analysis. *Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach.* U.S. Department of Commerce, National Institute of Standards and Technology, 2012

NIST — National Institute of Standards and Technology

OLES — Law Enforcement Standards Office

NIJ — National Institute of Justice

http://www.nist.gov/oles/prints-022112.cfm

Figure X. ACE-V Process, as described by both SWGFAST and NIST/NIJ Report, annotated to show error types.

Document #10 Standard for Examining Friction Ridge Impressions and Resulting Conclusions, DRAFT FOR COMMENT, Ver. 2.0	Date of First Issue 09/13/11	Current Issue Date 09/10/12 Web Posting Date 11/24/12
Date of Last Review N/A	Date of Next Review 09-2016	Appendix present/Letter Yes/A&B

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Ulery et al. (2011)
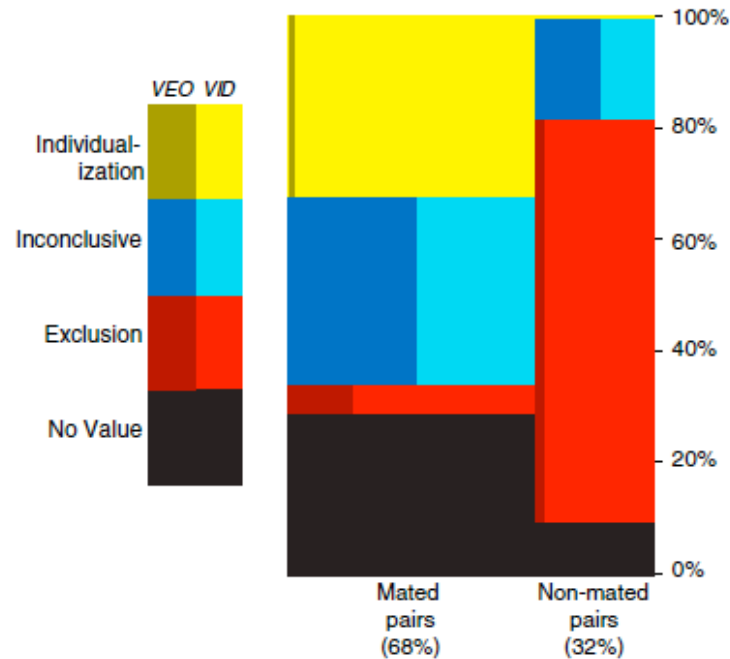
Fig. 2. Distribution of 17,121 decisions. 23% of all decisions resulted in no-value decisions (no comparison was performed); comparison decisions were based on latents of VID and of VEO; 7.5% of comparisons of mated pairs resulted in exclusion decisions (false negatives); 0.1% of comparisons of nonmated pairs resulted in individualization decisions (false positives—too few to be visible) (*SI Appendix*, Table S5).

Ulery et al. (2011)

Table X. Ulery results

		Ground Truth	
		Exclusion	**Individualization**
Examiner	**Exclusion**	CORRECT 71.2%	Erroneous exclusion 5.3%
	Individualization	Erroneous individualization 0.1%	CORRECT 31.9%
	Inconclusive	Non-consensus inconclusive 18.6%	Non-consensus inconclusive 33.4%
	No value	Non-consensus determination of no value 10.1%	Non-consensus determination of no value 29.3%
	Total	100%	100%

(blue)	Missed exclusions
(pink)	Missed individualizations

Tangen et al. (2011)

Table X. Tangen results

Experts		Ground truth	
		Exclusion[a]	**Individualization**
	Exclusion	CORRECT 99.32%	Erroneous exclusion 7.88%
Examiner	**Individualization**	Erroneous individualization 0.68%	CORRECT 92.12%
	Total	100%	100%
Novices			
	Exclusion	CORRECT 55.18%	Erroneous exclusion 25.45%
Examiner	**Individualization**	Erroneous individualization 44.82%	CORRECT 74.55%
	Total	100%	100%

▓	Missed exclusions
▓	Missed individualizations

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[a] Results reported here are for "similar" non-mate stimuli. The researchers also collected data on "non-similar" non-mate stimuli, which are not reported here.

Thompson et al. (2013)

Table X. Thompson et al. results

		Ground truth	
	Experts		
		Exclusion[a]	**Individualization**
Examiner	**Exclusion**	CORRECT 98%	Erroneous exclusion 28%
	Individualization	Erroneous individualization 2%	CORRECT 72%
	Total	100%	100%
	Intermediate trainee		
Examiner	**Exclusion**	CORRECT 97%	Erroneous exclusion 31%
	Individualization	Erroneous individualization 3%	CORRECT 69%
	Total	100%	100%
	New Trainee		
Examiner	**Exclusion**	CORRECT 73%	Erroneous exclusion 51%
	Individualization	Erroneous individualization 27%	CORRECT 49%
	Total	100%	100%
	Novices		
Examiner	**Exclusion**	CORRECT 43%	Erroneous exclusion 31%
	Individualization	Erroneous individualization 57%	CORRECT 69%
	Total	100%	100%

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[a] Results reported here are for "similar" non-mate stimuli. The researchers also collected data on "non-similar" non-mate stimuli, which are not reported here.

Dror *et al., For. Sci. Int'l* (2006)

Table X. Dror et al. results.

		Ground truth	
		Individualization	
Examiner	**Individualization**	CORRECT 20%	
	Exclusion	Erroneous exclusion 60%	
	Inconclusive	Non-consensus inconclusive 20%%	
	Total	100%	

	Missed individualizations

Dror *et al., J. For. Ident.* (2006)

Table X. Dror et al. (2006) results.

		Past Decision	
		Exclusion	**Individualization**
Examiner	**Exclusion**	CORRECT 96%	Erroneous exclusion 17%
	Individualization	Erroneous individualization 4%	CORRECT 79%
	Inconclusive	Non-consensus inconclusive 0%	Non-consensus inconclusive 4%
	Total	100%	100%

	Missed exclusions
	Missed individualizations

Final Matrix

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Type I-E Case

- Gene Bibbins was convicted of rape in 1987 in Baton Rouge. A finger mark was found at the crime scene. The latent print examiner, Annie Michelli, reported that the mark was "unidentifiable" (in SWGFAST's terms, "no value"). She also stated that this report had been "verified" by Sybil Guidry of the Louisiana State Crime Laboratory. Post-conviction investigation revealed that this was false: at the time of the original investigation Guidry reported that Bibbins was "excluded" as the source of the mark. Bibbins was also excluded as the source of DNA found at the crime scene and exonerated in 2003.
    - Bibbins v. City of Baton Rouge, 489 F.Supp. 2d 562 (M.D. Louisiana 2007); The Innocence Project, *Gene Bibbins* (n.d.), available at http://www.innocenceproject.org/cases-false-imprisonment/gene-bibbins.
    - Bibbins deprived of the "marginal probative value" of exclusion report.

Type I-E Case

- George Allen was convicted of murder in 1983 in St. Louis. Twenty-seven finger marks were recovered from the crime scene. The latent print examiner testified that the victim's boyfriend was the source of 19 of the marks, that a police officer who attended the crime scene was the source of one, and that the remaining 7 were of "no value." Post-conviction investigation revealed the this testimony was false—that the 7 marks were, in fact "of value." It also revealed that Allen, the victim, and the victim's boyfriend were excluded as the sources of the marks and that the marks had been compared to known sex offenders and searched through AFIS. Based on this AFIS search, latent print examiners reported that a handyman was the source of one of the seven marks. (The handyman had legitimate access to the crime scene and was excluded as a suspect in the murder.) Post-conviction DNA testing and newly discovered evidence exonerated Allen in 2012. The case illustrates the probative value of fingerprint evidence even in a case in which no mark was attributed to the defendant. As Allen argued in his *habeas* petition, it is one thing to tell a jury that all "identifiable" (or "of value") marks from the crime scene have been identified, suggesting that the perpetrator left no marks of value, and Allen could be that perpetrator. It is quite another thing to tell a jury that there are seven identifiable (or "of value") marks for which the defendant, victim, and the victim's boyfriend have been excluded as sources and that the source of these marks remains unknown, suggesting that some the perpetrator could be some as yet unknown third party. Allen was deprived of the marginal probative value of an "exclusion" report.
    - Allen v. Dormire, No. 11AC-CC00634 Writ of Habeas Corpus (Cir. Ct. Cole Cty. Mo. 2012); Maurice Possley, *George Allen, Jr.* (2013), National Registry of Exonerations, available at http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=4091.

Type II-C hypothetical case

- Abel is murdered. Baker and Charlie are both suspected of the murder because of informant statements. Baker is innocent. A mark is found at the crime scene. Neither Baker nor Charlie have a legitimate reason to be at the crime scene. The police latent print analyst reports that Baker is excluded as the source of the mark and that her comparison of the crime scene mark to Charlie's prints was "inconclusive." The prosecutor charges Baker because the informant statements against him are stronger. At trial, Baker mounts a third-party guilt defense that Charlie is the perpetrator. Baker is convicted.

- Upon post-conviction review, Baker's attorneys obtain the original evidence and have it reviewed by several independent latent print analysts. They all report that Charlie is the source of the mark. The "non-consensus inconclusive" report deprived Baker of highly probative evidence of third-party guilt and contributed to his wrongful conviction.

Type II-D Case

- Douglas Warney was convicted of murder in 1996 in Rochester, New York. Three finger marks were recovered from the scene. The victim, William Beason, was identified as the source of two. The source of the third mark was not identified. Post-conviction DNA testing excluded Warney as the source of DNA from the crime scene. A search of the DNA profile in the CODIS database yielded a report that Eldred Johnson, who was serving a sentence for another murder, was the source of the DNA profile. Latent print examiners compared the mark to Johnson's prints and concluded that he was the source of the unidentified mark. Warney was exonerated in 2006.
  - The Innocence Project, *Douglas Warney* (n.d.), available at http://www.innocenceproject.org/Content/Douglas_Warney.php; Warney v. People, No. 88/96 Motion to Vacate Conviction and Dismiss Indictment (Monroe Cty. Ct. N.Y. 2006).

Conclusions

- Less "error" than "underexploitation"
- All types of underexploitation can potentially contribute to wrongful convictions
- A common framework for latent print underutilization would be useful for moving the discussion forward