

Simultaneous Impressions



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Abstract

In December 2005, the Supreme Judicial Court of Massachusetts ruled that applying the ACE-V methodology to simultaneous impressions did not satisfy the requirements set forth in *Daubert*. This presentation will explore the hypothesis that an examiner can, after a thorough analysis, successfully determine that two or more latent impressions were most likely deposited at the same time.

Factual History

- September 26, 1993 – murder of Boston PD Detective John Mulligan
- Sgt. Foilb testified that four latent prints on driver's door window were made by Terry Patterson as he closed the door.
- Foilb explained that the location of the prints in relation to each other and the direction and manner in which they each streaked on the glass reinforced his belief that *they were left by multiple fingers of the same hand at the same time.*
- Foilb compared these latents to Patterson's inked prints and identified them as the #7, #8, #9, and #10 fingers.
- He further explained that none of the individual impressions met the locally accepted norm of eight points of similarity, but that because he had determined them to be simultaneous in nature, he could use the totality of the information present.

Supreme Judicial Court (SJC) ruling

- Overall, upheld ACE-V methodology and reliability of fingerprint evidence
- SWGFAST was recognized as the body setting guidelines and standards
- “verification” portion of ACE-V is not adequate peer review in the *Daubert* sense
- Error rate for single latent fingerprint individualizations is low, but no data exist for simultaneous impressions
- Application of ACE-V to simultaneous impressions does not satisfy a *Daubert* analysis

– Professor Andre Moenssens, The Weekly Detail #229, www.clpex.com, January 2, 2006

Disclaimer

- At this point, we are **not** specifically addressing the situation where none of the impressions stands alone.
- We are addressing the issue of simultaneity. If that condition can be demonstrated to exist, then an examiner should be able to use the information contained within the aggregate to effect an identification.
- If simultaneity cannot be supported, then you **must** treat each impression individually.

SWGFAST definition

Simultaneous Impression (SI) –

“Two or more friction ridge impressions from the same hand or foot deposited concurrently.”

Note: SWGFAST Glossary, ver. 2

What Does Ashbaugh Say?

- “When the prints are found to be in sequence in the opinion of the forensic identification specialist, the weight of unique details in both prints are accumulative in the aggregate toward individualization of the donor.”
- “An analysis of this nature is an advanced technique.”
- “...it may not be as easy to defend in court without a clear rationale derived from a structured analysis.”
 - Ashbaugh, David R. Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton, FL, 1999, p. 135.

What Does Cowger Say?

- “As a practical matter, such a group of prints may be considered a single print for comparison purposes.”
- “...even if the individual prints are inadequate for a conclusive determination of identity, the donor can be identified based upon a comparison of the entire group.”
- “Note that two persons may touch an object in such a manner that their prints will appear to constitute a group; caution must therefore be exercised in determining groups of prints for the purpose of search and comparison.”

– Cowger, James F. Friction Ridge Skin, Elsevier Science Publishing Co., Inc., 1983.

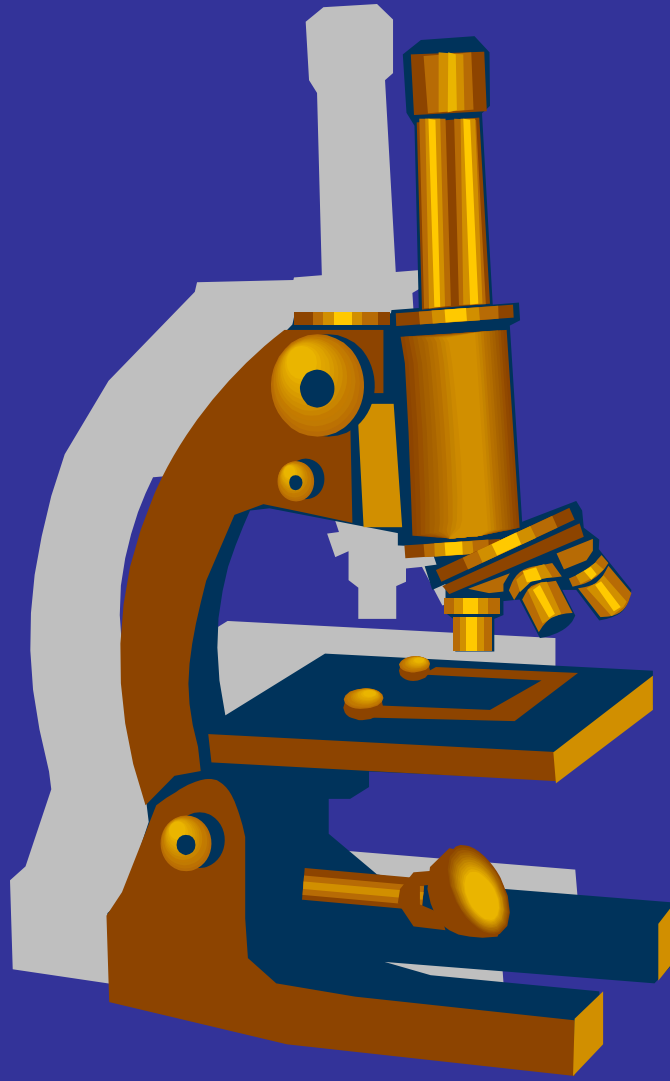
What Does Ostrowski Say?

- “...this is an advanced technique that should be utilized with the utmost scrutiny.”
- “...a complete scientific analysis of the latent impressions is needed before coming to the conclusion that a grouping of latent impressions are indeed simultaneous.”
- “They will be compared using the accumulative weight of the friction ridge detail in sequence for all of the impressions.”
 - Ostrowski, S. Simultaneous Impressions: Revisiting the Controversy, The Weekly Detail #13, www.clpex.com, November 5, 2001.

Initial Discussions

- Personal communication with David Ashbaugh addressing context of his comments cited in SJC decision
- Research would be simple, involving one substrate and one development medium
- Would target those trained in quantitative-qualitative analysis (non-numerical approach)

The Scientific Approach



Even Though the *Llera-Plaza* court...

- Concluded that the fingerprint discipline is not a science.
- Concluded that our journals don't qualify as peer-reviewed journals in the *Daubert* sense.
- Concluded ACE-V did not adequately satisfy the scientific criterion of testing.
 - Steele, L. The Defense Challenge to Fingerprints. *Crim. Law Bulletin* **2004**, 40(3), p. 227

The Question

Can two or more impressions be determined scientifically to have been deposited at the same time from a single donor?

Hypothesis

An examiner can, after a thorough analysis, successfully determine that two or more latent impressions were most likely deposited at the same time.

Other Expectations

- We expect to see a high level of confidence attached to the definitive conclusions of either simultaneity or non-simultaneity.
- We expect to see much lower confidence levels when examiners choose inconclusive.
- We expect there to be some key (perhaps common) deciding factors attributed to conclusions made at the highest level of confidence.

Counter-Hypotheses

- The alleged simultaneous impressions could involve more than one donor, and could be mistakenly considered to be truly simultaneous in nature.
- The alleged simultaneous impressions could have been left by a single donor during multiple touches (and could likewise be mistaken for simultaneous impressions).

Participant Demographics

- Consisted of 31 individuals (16 males and 15 females).
- 930 total examinations.
- Experience ranged from 1 – 28 years.
- Total experience was 350 years.
- Average experience level was just over 11 years.
- All stated they have been trained to competency.
- All stated they practice ACE-V.
- All have completed some training in quantitative-qualitative analysis.

Materials and Methods

- Substrate – flat glass
- Matrix – eccrine/sebaceous mixture
- Development medium – black powder
- Exercise consisted of thirty (30) impressions.
- Possible conclusions:
 - true cluster (simultaneous)
 - false cluster (not simultaneous)
 - inconclusive

Analysis Considerations

- Substrate
- Matrix
- Development medium
- Deposition pressure
- Lateral pressure
- Anatomical aspects
- Red flags
- Appearance of ridges/ridge systems
- Clarity/tolerance

Analysis Considerations - defined

- Substrate = surface
- Matrix = composition of print
- Development medium = processing technique
- Deposition pressure = vertical plane
- Lateral pressure = horizontal plane
- Anatomical aspects = area of friction ridge skin
- Red flags = areas of concern

SWGFAST Standard for Simultaneous Impression Examination

- Version 1.0, 12/05/08, www.swgfast.org
- SWGFAST believes these are complex examinations.
- This belief is in harmony with the majority of the latent print community.
- Therefore, the Standard deals initially – and heavily – with the Analysis phase.
- Improper analyses may be where the greatest potential for error lies, not just in the examination of simultaneous impressions, but also in the examination of single impressions.

Preamble

- *“Simultaneous impression examination is a complex application of ACE-V. Before conducting a forensic examination of a simultaneous impression, examiners shall have completed specialized training in the examination of latent print simultaneous impressions. This training should include successfully completing formal instruction, literature reading and testing to demonstrate competency. This training and testing may be conducted internally or externally.”*
- *“If a conclusion of individualization (identification), inconclusive or exclusion can be derived without invoking simultaneity, or if the issue of simultaneity itself is not relevant, then this standard may not apply.”*

Analysis Section

- *“An analysis of the impressions must occur before concluding simultaneity. The analysis shall include (1) the determination whether the friction ridge impressions are consistent with a simultaneous impression and (2) the determination whether each friction ridge impression within the simultaneous impression stands alone or must be compared in the aggregate.”*

Analysis Factors*

1. The object(s) upon which the friction ridge impressions exist
2. Orientation
3. Spatial relationship
4. Substrate
5. Friction ridge skin features and anatomical features
6. Processing technique and matrix
7. Distortion

*SWGFAST, Standard for Simultaneous Impression Examination, ver. 1.0, 12/5/08, www.swgfast.org

How am I going to compare these?

- Each impression stands alone for comparison purposes.
- One or more, but not all, impressions stand alone for comparison purposes.
- None of the impressions stand alone for comparison purposes and must therefore be compared in the aggregate. (e.g. *Patterson*)
- One, some or all of the impressions may provide spatial information only and are therefore no value for comparison purposes, but may perhaps be used to support or refute simultaneity.

Documentation of Simultaneous Impressions

- Case note documentation should reflect the ACE-V methodology as it applies to the SI examination.
- The case notes shall reflect the pertinent information gleaned from the analysis phase.
- This shall be documented by a photograph, lift, or legible copy with sufficient annotation in the written bench notes to permit another competent examiner to interpret what was done and allow replication of the analysis decision.
- Orientation, spatial relationship and anatomical features shall also be captured using an annotated photograph, lift, or legible copy.
- Consider establishing a policy for consistent annotation.

Simultaneous Research Worksheet

Latent #	<input type="checkbox"/> True Cluster	<input type="checkbox"/> False Cluster	<input type="checkbox"/> Inconclusive
Is normal anatomical position within tolerance?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Somewhat
Is the deposition pressure consistent for each impression in the cluster?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Somewhat
Is the degree of pressure distortion consistent for each impression in the cluster?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Somewhat
Please record your notes and reasons for your conclusion (field will expand as you type).			
<div style="border: 2px solid red; padding: 5px;"> What is your level of certainty regarding your conclusion? <input type="checkbox"/> Absolute—would report <input type="checkbox"/> High <input type="checkbox"/> Fair <input type="checkbox"/> Low—would not report </div>			
Are you trained to competency?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Years of experience:
Do you practice ACE-V?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female
Course(s) completed:			
<input type="checkbox"/> Ashbaugh's Forensic Ridgeology	<input type="checkbox"/> CARDPACT		
<input type="checkbox"/> other ACE-V/2QA training	<input type="checkbox"/> no training received in this area		

Results and Discussion

- Distribution of responses for each latent
- Distribution of responses for each examiner
- Discuss some concerns within the results table
- Will examine the error rate

Distribution

Latent #	True	False	Inconclusive	Actual	Subset
L-1	28	0	3	T	
L-2	19	6	6	T	
L-3	16	5	10	T	
L-4	7	13	11	F	A
L-5	16	4	11	T	
L-6	0	29	2	F	B
L-7	6	4	21	T	
L-8	17	4	10	T	
L-9	2	16	13	F	A
L-10	13	7	11	T	
L-11	26	1	4	T	
L-12	0	31	0	F	B
L-13	3	20	8	F	A
L-14	22	1	8	T	
L-15	3	13	15	F	A
L-16	1	23	7	F	B
L-17	23	2	6	T	
L-18	18	4	9	T	
L-19	18	2	11	T	
L-20	0	22	9	F	B
L-21	2	23	6	F	A
L-22	27	0	4	T	
L-23	11	6	14	T	
L-24	2	19	10	F	A
L-25	24	0	7	T	
L-26	25	2	4	T	
L-27	2	23	6	F	B
L-28	1	28	2	F	B
L-29	12	0	19	T	
L-30	14	12	5	T	
n=31					

Participant ID	Training	Years exp.	Sex	True	Conf.	False	Conf.	Inconclusive	Conf.	# Incorrect	Conf.	% Correct
PSSI-1	Ashbaugh	8	F	10	4	1	1	19	2.6	2	4	81.8
PSSI-2	Ashbaugh	6	M	18	3.9	10	3.8	2	1	2	3.5	92.8
PSSI-3	CARDPACT	5	F	16	2.9	5	3	9	1.5	3	2.7	85.7
PSSI-4	Ashbaugh	11	F	15	3.9	10	4	5	4	4	4	84
PSSI-5	other	7	F	15	3.1	8	3.3	7	2.3	0	NA	100
PSSI-6	other	2	F	12	3.8	12	3.7	6	4	4	3.5	83.3
PSSI-7	other	10.5	M	10	4	15	3.9	5	3	5	4	80
PSSI-8	other	6.5	M	14	3.5	13	3.8	3	3	3	3.3	88.9
PSSI-9	other	16	M	11	3.9	19	3.9	0	NA	7	3.7	76.7
PSSI-10	Ashbaugh/other	4	F	0	X	19	X	11	X	7	X	63.1
PSSI-11	Ashbaugh/other	20	M	17	3.6	9	3.4	4	2.8	0	NA	100
PSSI-12	Ashbaugh/other	25	M	0	NA	4	4	26	3.9	0	NA	100
PSSI-13	other	24	M	13	2.7	10	2.9	7	2.3	1	3	95.7
PSSI-14	other	20	F	11	3.9	8	3.8	11	2.6	0	NA	100
PSSI-15	other	9	F	14	3.1	4	2.8	12	2	2	3	88.9
PSSI-16	other	5	M	10	2.6	4	2.5	16	2	2	2.5	85.7
PSSI-17	other	4.5	F	13	3.6	9	3.4	8	1.9	0	NA	100
PSSI-18	Ashbaugh/other	28	F	7	3.3	11	2.5	12	2.2	1	2	94.4
PSSI-19	Ashbaugh/other	6.5	M	16	2.9	9	2.8	5	1	0	NA	100
PSSI-20	Ashbaugh/other	1	F	0	NA	2	1	28	1	0	NA	100
PSSI-21	CARDPACT	7	F	10	3.2	10	3	10	1.8	1	2	95
PSSI-22	other	26	M	10	3.6	17	3.6	3	3	5	3	81.5
PSSI-23	other	10	M	16	2.8	9	2.7	5	3	4	2.5	84
PSSI-24	other	5	M	21	3.1	9	2.8	0	NA	7	2.3	76.7
PSSI-25	Ash/other/CARD	10	F	12	3	12	3	6	2	1	3	95.8
PSSI-26	CARDPACT	4.5	M	6	3.7	23	3.2	1	X	11	2.5	62
PSSI-27	other	20	M	19	3	7	3	4	3	4	3	84.6
PSSI-28	other	25	M	11	2.8	11	3.2	8	2.1	1	3	95.4
PSSI-29	Ashbaugh/other	1.5	F	11	2.6	12	2.6	7	1.4	1	3	95.6
PSSI-30	Ash/other/CARD	9	F	11	4	15	3.7	4	1.8	3	3	88.5
PSSI-31	Ashbaugh/other	13	M	9	3.2	13	3.5	8	2.1	2	3	90.9
total		350		358		320		252		83		
mean		11.3			3.3		3.1		2.3		3	

L-1

SIMULTANEOUS



Analysis of L-1



- Normal anatomical position within tolerance
- Deposition pressure consistent among all impressions
- Degree of lateral pressure consistent for all impressions
- Similar signature of development medium
- Similar appearance of ridges and ridge systems
- Sequence has been maintained
- **Conclusion: True simultaneous**
- **T-F-I: 28-0-3**

Participant #PSSI-11

- Properly designated L-1 as a true cluster
- Is normal anatomical position within tolerance? YES
- Is the deposition pressure consistent for each impression in the cluster? YES
- Is the degree of pressure distortion (lateral pressure) consistent for each impression in the cluster? YES
- And now for the examination notes...

Participant #PSSI-11: L-1 notes

Please record your notes and reasons for your conclusion (**field will expand as you type**).

3 different latent impressions develop consistently with black powder and reveal deposition of anatomically oriented finger tips with matrix then diagonally distorted by movement of the fingers across the substrate toward a terminal deposit location, where fingerprints remain anatomically oriented as a middle finger and two flanking impressions (index,ring). The fingerprints each bear increased finger to surface attitude to the left of the central pattern area of the finger, and neither impression reveals any substantial ridge detail below the distal flexion crease. Each impression exhibits considerable pressure distortion within the central pattern area in that the ridges appear widened with some amount of matrix push (squeegee effect). Normal ridge/furrow width is found at the sides and platform ridges of each fingerprint. The 'occasional' features of finger creases are evident in each print, which is supportive of the cluster having been caused by a single person.

So, what do you think about his notes?

- Was the analysis phase performed correctly?
- Can a subsequent competent examiner see how the conclusion was drawn?
- Has the examiner maximized his accountability?
- Are the notes capable of being falsified?
- *Can you falsify them?*



L-14: 22-1-8



L-22: 27-0-4

Results – “True” Simultaneous

- True = 335
- False = 60
- Inconclusive = 163

- Participants were able to recognize a truly simultaneous impression 85% of the time when making a definitive determination.
- The percentage decreases to 60% if you consider ‘inconclusive’ responses erroneous.

Materials and Methods – Subset A

- Donor #1 deposits two or three prints simultaneously using any degree of pressure/movement they choose. This information is unknown to Donor #2.
- Donor #2 deposits a latent using the finger designated by me to correspond numerically to the deposit from Donor #1. In other words, if Donor #1 deposited fingers 7 and 8, then Donor #2 would be instructed to deposit finger 9.
- Donor #2 could visualize the deposits of Donor #1 and therefore was able to discern the orientations. Donor #2 tried to mimic the orientations, but had no knowledge of deposition pressure or distortions.
- These are all ‘false’ simultaneous impressions.



L-24: 2-19-10



Latent # L24	<input type="checkbox"/> True Cluster	<input checked="" type="checkbox"/> False Cluster	<input type="checkbox"/> Inconclusive
Is normal anatomical position within tolerance?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Somewhat
Is the deposition pressure consistent for each impression in the cluster?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Somewhat
Is the degree of pressure distortion consistent for each impression in the cluster?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Somewhat
Please record your notes and reasons for your conclusion (field will expand as you type). Print 'c' in this cluster (a-b-c) presents itself with decreased information below the distal flexion crease, and increased ridge structure contact in the 'tip' area. Print 'c' is also slightly out of normal anatomical relationship to the a-b prints. The trend (slope - inclination..) of the loop patterns in a-b is to the right - coupled with the anatomical relationship of the a-b prints would satisfy most examiners that the impressions are those of a right index and right ring finger. However, the 'c' print presents itself as a whorl with a clockwise trend in the ridge flow - more consistent with having been caused by a finger of the left hand, rather than a right hand. Sufficient doubt exists in this examiners opinion, that the impressions were caused simultaneously by the same touch of the same hand.			



L-9: 2-16-13

Analysis of L-9



- Normal anatomical position within tolerance
 - Marked difference in deposition pressure in far right impression
 - Different pressure distortions also present in far right impression
 - Different signature of development medium
-
- Conclusion: False simultaneous



L-15: 3-13-15

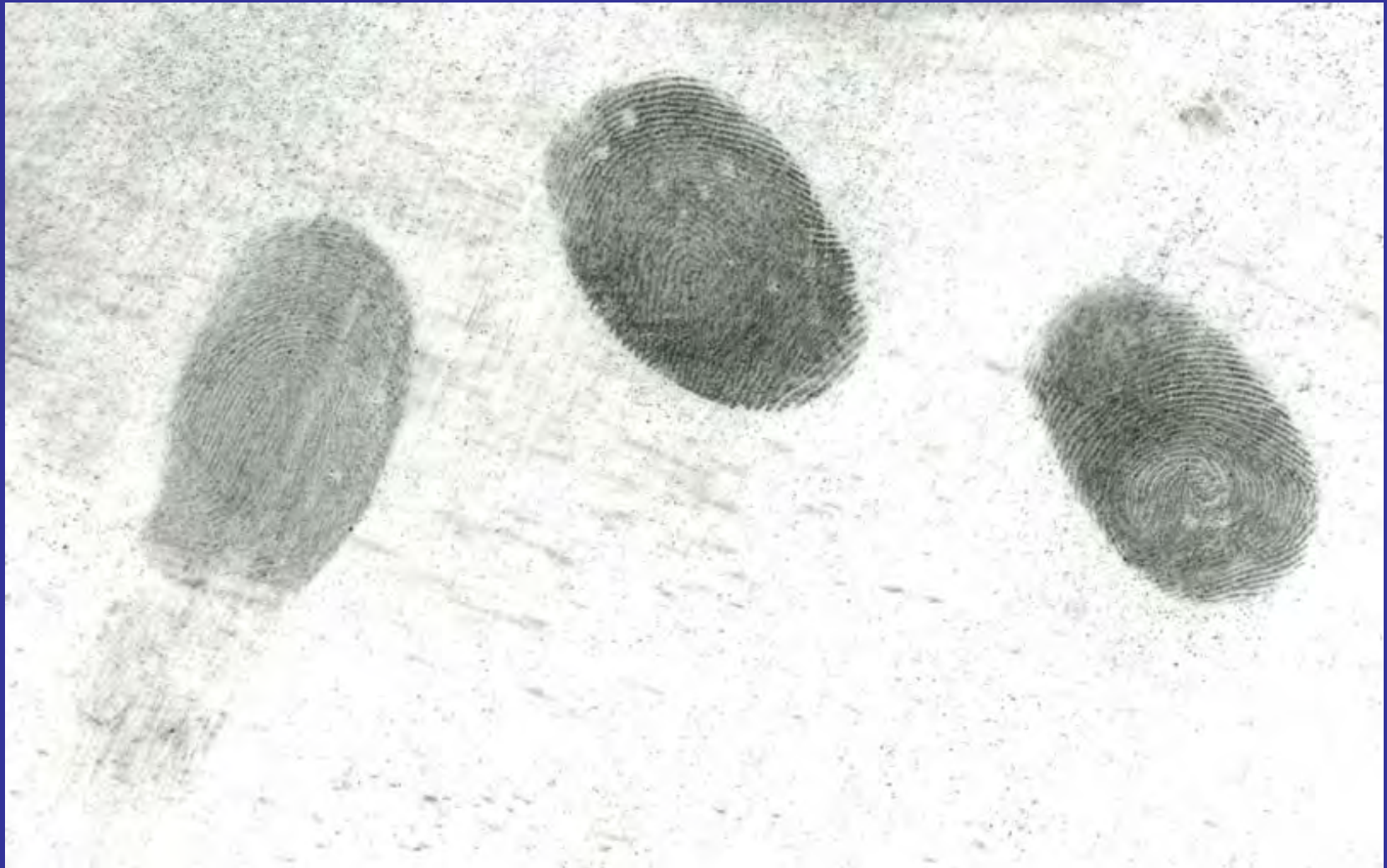
Results – Subset A

- True = 19
- False = 104
- Inconclusive = 63

- Even when Donor #2 knew the orientation, participants could recognize the false cluster just over 84% of the time when making a definitive determination. (104/123)
- This involves a deliberate attempt to mimic the orientations of the first donor!
- The percentage drops to 56% when you consider the inconclusive responses. (104/186)

Materials and Methods – Subset B

- Donor #1 deposits two or three prints simultaneously using any degree of pressure/movement they choose. This information is unknown to Donor #2.
- These latents are covered with paper so that the top of the paper is placed at the upper limit of the impressions. This ensures that Donor #2 does not know the orientation of the latents.
- Donor #2 deposits a latent using the finger designated by me to correspond numerically to the deposit from Donor #1. In other words, if Donor #1 deposited fingers 7 and 8, then Donor #2 would be instructed to deposit finger 9.
- Donor #2 had no knowledge of orientation, deposition pressure, distortions, or friction ridge area deposited.
- These are all 'false' simultaneous impressions.



L-6: 0-29-2



L-12: 0-31-0

Results – Subset B

- True = 4
- False = 156
- Inconclusive = 26

- Participants were correct 97% of the time when making a definitive determination. (156/160)
- We feel the parameters of this subset more closely mimic the dynamic environment of the crime scene.
- Subsequent donors would have no knowledge of orientation, deposition pressure, lateral pressure, or friction ridge area deposited.
- The percentage drops to 84% when you consider the inconclusive responses. (156/186)

The Difficult Ones

<u>Latent</u>	<u>Actual</u>	<u>Subset</u>	<u>T-F-I</u>
• L-4	False	A	7-13-11
• L-7	True	--	6-4-21
• L-23	True	--	11-6-14
• L-30	True	--	14-12-5



L-4: 7-13-11



L-30: 14-12-5

Comments on L-30

- This examiner stated normal anatomical position was somewhat within tolerance.
- Further stated that both deposition pressure and pressure distortion were within tolerance.
- Determination was inconclusive.
- “Three of the fingers and the two areas of palm are consistent with simultaneous. The finger to the left seems too far away from the others, ***although it may be within the physical limits of the hand.***”

Error Rate

- Looking at distribution of answers – percentages of true, false and inconclusive
- Inconclusive answers were not counted correct/incorrect
- Looking at the percentage of correct answers when a definitive conclusion was drawn
- Will examine the number of errors made at different levels of confidence

Error Rate

- Total number of errors = 83
- Errors at 'Absolute' confidence level = 21
- Errors at 'High' confidence level = 38
- Errors at 'Fair' confidence level = 17
- Errors at 'Low' confidence level = 0
- *Note: 1 examiner made 7 errors with no confidence levels marked*

Error Rate

- Total number of errors = 83
- Total number of conclusive answers = 678
- $(83/678) (100) = 12.2\%$
- Overall, when making a definitive determination, participants were correct nearly 88% of the time.
- If you opt to consider inconclusive responses as errors, the percentage drops to 64%.

Conclusions

- Examiners can successfully apply this technique most of the time.
- They can provide scientific rationale for their conclusions.
- Higher levels of confidence are attached to definitive determinations.
- Lower levels are attached to inconclusive determinations.
- Even when Donor #2 knew the orientations, participants could recognize the “false” cluster approx. 84 % of the time (Subset A).
- For Subset B, they were right 97% of the time. We feel the parameters of this subset more closely mimic the dynamic environment of the crime scene.
- In the absence of an outright conspiracy (and a very good one, at that), competent examiners should be able to recognize a “false” cluster as such with a high degree of confidence.
- ***Overall, more training is needed on this subject!!!***

Shortcomings of Study

- Limited sample size
- Limitation to those trained in 2QA – can be opened to any examiner.
- Most impressions were high in quantity/quality of information – we can address this in future studies.
- Only one substrate used – we acknowledge that different substrates need to be evaluated.

Comments from #PSSI-11

“The worksheet was helpful in that I found it ‘forced the issue’ of my decisions to some extent. I was at first uncomfortable with the concept of ‘absolutely would report’. It wasn’t until I reviewed each of my conclusions that I found I wanted to go this ‘extra mile’ with my determinations. When I realistically looked at the totality of information in each print, I then became more confident and in many cases went to the ‘absolutely would report’ option. I suppose I was struggling with the fact that I would, in the past, ‘report’ an observation that a print grouping ‘appeared to have been three impressions simultaneously deposited.. (much like I would report a reddish-brown stain as ‘having the appearance of dried blood)..’ with a High level of confidence that I could explain my personal rationale behind this. In my mind, why would I ‘corner’ myself by using the term ‘absolute’? Maybe it’s just fear of some lawyer taking that word and showing that at some time I had been wrong. In any case, *I think your objective is to show that when presented with a ‘true cluster’, a Friction Ridge Analyst trained to competency can recognize it as such, and when presented with a ‘false cluster’ that too can be determined with justification, and that there are some cases which somehow fall in the middle and that a prudent examiner will proceed in a cautious way with those.*”

Exercise 1



Substrate: Foam packing material

Development: Black magnetic powder

Exercise 2



Substrate: ceramic bowl

Development: black magnetic powder

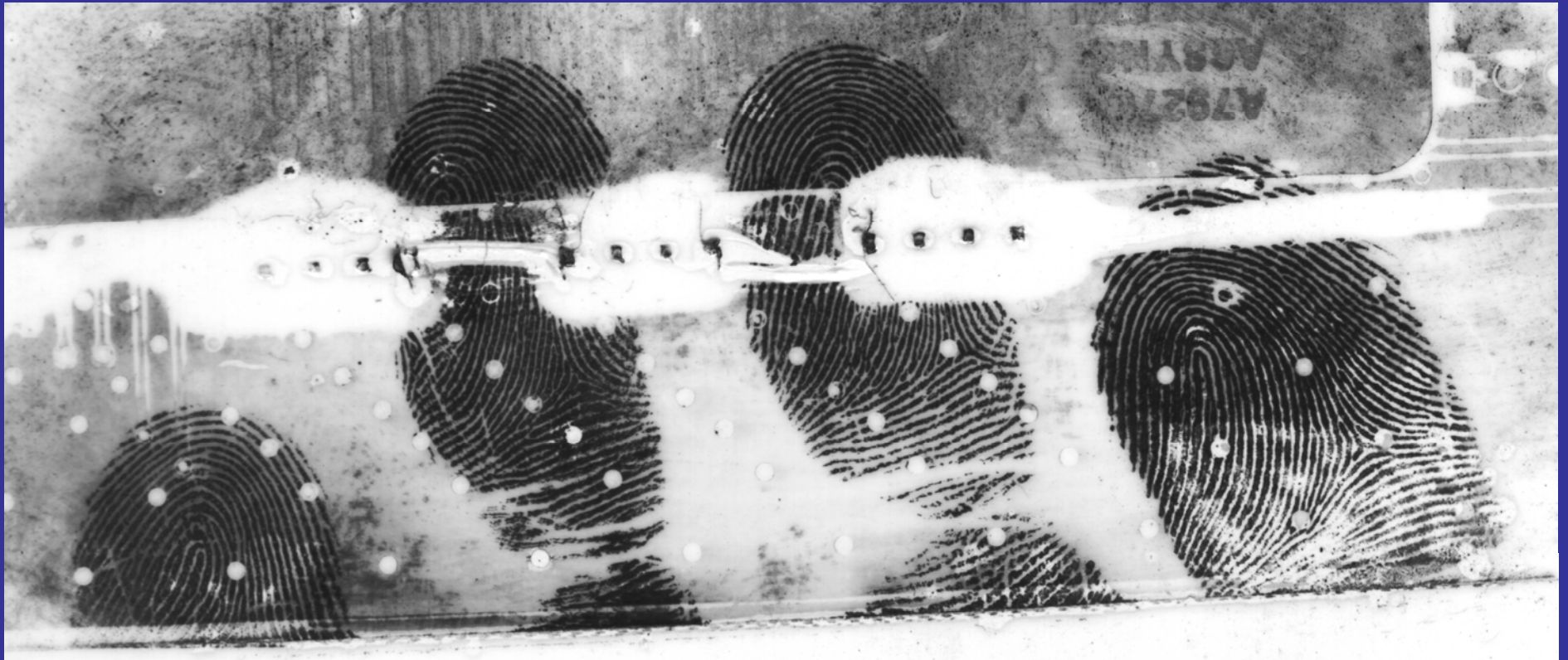


Exercise 3

Substrate: ceramic tile

Dev.: black magnetic powder

Exercise 4



Substrate: circuit board

Development: black magnetic powder

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