LPU – 2

Introduction to Latent Fingerprints

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Crime Laboratory – Latent Fingerprint Unit	
Standard Operating Policy & Procedure Manual	
SOP # 2-1	Subject: Scientific Basis for Human Identification
Approved: David C. Schultz	Matthew Mathis

Discussion:

The fundamentals of the science of friction ridge individualization (identification) are ***permanence*** and ***individuality***. The comparison and individualization of two areas of friction ridge impressions are based on the examination of infinite combinations of ridge structure, individual ridge appearance, minutiae, spatial relationships, pores, and other details. There is no scientific basis for requiring that a minimum number of corresponding friction ridge details be present in two impressions in order to effect individualization. The study and application of Forensic Ridgeology is an applied science, based upon the foundation of biological uniqueness, permanence, and empirical validation through observation. Analysts draw their conclusions by following a specific scientific protocol (ACE-V). During the process analysts draw on the foundations of Biology, Chemistry, Genetics, Physics, Mathematics and Psychology.

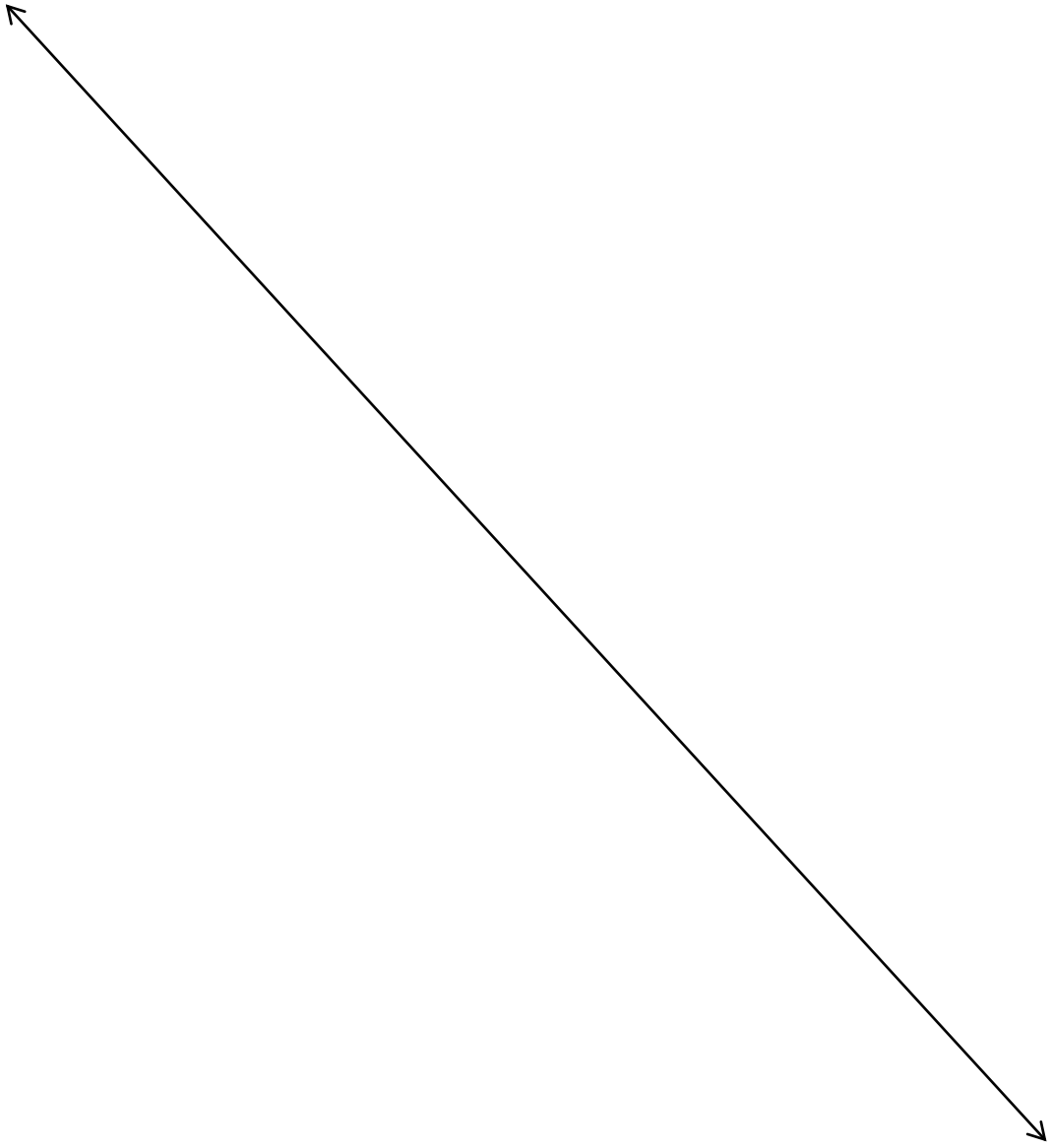
The basic foundation & fundamentals in the science of fingerprint identification are permanence and individuality

2-1-1 **Permanence:**

Fingerprint ridges are formed during the third to fourth month of fetal development. These ridges consist of individual characteristics called ridge endings, bifurcations, dots and many ridge shape variances. The unit relationship of individual characteristics does not naturally change throughout life, except for size, until decomposition after death. Unnatural changes to fingerprint ridges include deep cuts or injuries penetrating all layers of the epidermis and some diseases such as leprosy. Permanent scars, disease damage, and temporary changes such as paper cuts appear as jagged edges and sometimes "puckered" ridge detail in opposition to smooth flowing natural formations. Senile atrophy of friction skin due to old age causes the ridges to often almost flatten, causing fingerprints with many creases (creases are also unique but not always permanent) and poorly defined ridges.

2-1-2 **Individuality (Uniqueness):**

In the140 years that fingerprints have been routinely compared worldwide no two areas of friction skin on any two persons (including identical twins) have been found to contain the same individual characteristics in the same unit relationship. This means that in general, any area of friction skin will contain sufficient individual characteristics in a unique unit relationship to enable positive identification to a specific impression source. This has been validated by the billions of comparisons conducted worldwide over the past 100 years, and millions of electronic searches conducted by the federal IAFIS and 50 state AFIS systems. In all instances, no two areas of friction ridge skin from two different individuals has ever been found to be identical.



Crime Laboratory – Latent Fingerprint Unit	
Standard Operating Procedure Manual	
SOP # 2-2	Subject: Scientific Methodology
Approved: David C. Schultz	Matthew Mathis

ACE-V Methodology

Discussion
Friction ridge print examinations are conducted using the Analysis, Comparison, Evaluation and Verification (ACE-V) methodology, utilizing both qualitative and quantitative analysis. This process is applied regardless of the combination of print types (i.e., unknown versus known, known versus known, or unknown versus unknown).

2-2-1 **Analysis**
Analysis includes the assessment of a friction ridge print to determine its "value" by analyzing level one, level two, and, if present, level three detail, in addition to any other relevant information such as substrate, transfer medium, development method, deposition and lateral pressures, and anatomical orientation. The determination "of value" by the examiner indicates that sufficient reliable details are present in the print such that, when compared to another print, a conclusion of individualization or exclusion, can be reached. If the print lacks sufficient reliable details to reach a conclusion of individualization or exclusion, the print is determined to be of "no value." Distortion is not a discrepancy and is not a basis for exclusion. The analysis is conducted prior to and regardless of whether comparisons will be conducted.

During the Analysis phase the following information is used when available:

a. Determine if the print is of friction ridge skin
b. Substrate
c. Transfer medium
d. Development method
e. Deposition pressure
f. Lateral pressure
g. Preservation method
h. Anatomical orientation

2-2-1.a **Level one detail**
Can be used for pattern interpretation, can be used to determine anatomical source (i.e., finger, palm, foot, toe) and orientation, cannot be used to individualize

a. Overall ridge flow
b. General morphology (e.g., presence of incipient ridges, overall size, pattern interpretation)

2-2-1.b **Level two detail**

Used individually or in conjunction with level one detail to individualize or exclude the impression source.

a. Individual ridge path
b. Presence of ridge path deviation (e.g., ridge ending, bifurcation and dot)
c. Absence of ridge path deviation (e.g., continuous ridge)
d. Ridge path morphology (e.g., size and shape)

2-2-1.c **Level three detail**

Used in conjunction with level one and or level two detail to individualize or exclude the impression source.

a. Structure of individual ridges
b. Shape of the ridge
c. Relative pore position
d. Other specific friction skin morphology (i.e., secondary creases, ridge breaks, etc.)

Other features associated with friction ridge skin (e.g., creases, scars, warts, paper cuts, blisters)

a. May be permanent or temporary
b. May exist as level one, two and three detail
c. May be used in conjunction with friction ridge detail to individualize or exclude

2-2-2 **Comparison**

Comparison is the direct or side-by-side observation of friction ridge detail to determine whether the information in two prints is in agreement based upon detail, similarity, sequence, direction and spatial relationship.

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2-2-3 **Evaluation**

Evaluation is the formulation of a conclusion based upon completion of the analysis and comparison of friction ridge prints. All conclusions are reproducible.

Conclusions that can be reached:

a. Individualization (Identified)
b. Exclusion (Dissimilar)
c. Inconclusive (No Conclusion)

2-2-3.a **Individualization**

Individualization is the conclusion reached when an examiner determines two friction ridge prints are in agreement and that the friction ridge prints originated from the same source. When all level one, level two, and level three detail that are present, are in agreement, without any unexplainable dissimilarities, then individualization has been determined.

2-2-3.b **Exclusion**

Exclusion is the dissimilar conclusion reached when an examiner determines two friction ridge prints are not in agreement and that the friction ridge prints originated from different sources. The presence of a single unexplainable dissimilarity is sufficient to exclude an impression source.

2-2-3.c **Inconclusive**

An inconclusive decision occurs when an examiner is unable to individualize or exclude the source of a print because the corresponding areas of friction ridge detail are absent or unreliable.

Inconclusive evaluation results must not be construed as a statement of probability. Probable, possible or likely individualization (identification) conclusions are currently outside the acceptable limits of friction ridge identification science but are currently under research.

2-2-4 **Verification**

Verification or peer review is the independent application of the Analysis, Comparison and Evaluation methodology (ACE) to a friction ridge print by another qualified examiner. All individualizations must be verified.
The verification should not be conducted by an analyst that has been solicited for consultation regarding opinions or conclusions or by an analyst junior to the identifying analyst unless no other option exists.