LATENT PRINT SECTION TRAINING MANUAL

January 2026

Contents

Introduction

This manual consists of a guide for training a Forensic Scientist in latent print analysis. The trainee's Supervisor or the Technical Lead will assess any previous training and experience and will adjust the timeline as appropriate for each trainee. Modification of the training program may be appropriate and demonstrating competency may be all that is required where previous or formal training is documented; this process may happen with approval by the technical lead and supervisor.

The actual pace of instruction will vary based on a variety of circumstances. The following estimated timeline indicates the general order and timing of module completion. The lessons contained within Module 1 will be completed throughout the duration of the training program.

MM1		MM2		MM3		
Months 1-4			Months 5-8			
Mod 2 – Friction Ridge Skin	Mod 3 – Embry/Partial	Mod – 4 Bio	Mod 6 – Prox/Med Phal	Mod 7 – Palms	Mod 8 – Feet	
		Mod 5 – CFRE	Mod 9 – Empirical observations and Research			

MM4		MM5			
Months 9-11		Months 12-15			
Mod 10 - Features	Mod 11 - Examination				Mod 15 - Supervised Comparison cases
	Mod 12 - Performance Studies	Mod 13 - Human Factors / QA	Mod 14 - Testimony		
				Mod 16 - LP Processing	

Months 16-18
Mod 15 - Supervised Comparison cases
Mod 17 - Supervised Processing cases

The learning outcomes (listed within each lesson) reflect the level of comprehension the trainee is expected to achieve for each topic – both what the trainee should know and what the trainee should be able to do. For this document, four levels of comprehension are defined and color coded: Remember, Understand, Demonstrate, and Integrate.

Remember – Learning outcomes at the "Remember" level require/recommend the trainee to retrieve the relevant information from long-term memory. Learning outcomes for this level of comprehension contain the following keywords: define, identify, indicate, list, recall, recite, and recognize.

Understand – Learning outcomes at the "Understand" level require/recommend the trainee to construct meaning from the information presented. Learning outcomes for this level of comprehension contain the following keywords: describe, discuss, explain, and summarize.

Demonstrate – Learning outcomes at the "Demonstrate" level require/recommend the trainee to understand the overall structure and purpose of the information they have learned and apply this information in novel circumstances. Learning outcomes for this level of comprehension contain the following keywords: apply, articulate, assign, categorize, check, collect, communicate, compare, contrast, declare, demonstrate, detect, determine, display, distinguish, document, exclude, exploit, follow, include, indicate, interpret, maintain, operate, prepare, respond, search, and select.

Integrate – Learning outcomes at the "Integrate" level require/recommend the trainee to assimilate information from multiple sources to predict arguments, evaluate strengths and weaknesses, and justify opinions. Learning outcomes for this level of comprehension contain the following keywords: assess, consider, debate, evaluate, formulate, predict, relate, support, and weigh.

The training programs consists of several different instructional methods including workshops, lectures, literature reviews, discussion groups, and observations. A set amount of observation hours are not required; however, the trainee is expected to spend time with analysts, observing the variety of tasks required of forensic scientists. Although the trainer is primarily responsible for the training program, it is expected that a variety of instructors will also take part in the training program. Literature reviews include materials that supplement other instructional methods; the trainee will work with their trainer to determine which ones must be read in their entirety and which may be used for reference.

The trainee will maintain a training record consisting of notebooks (for notes on workshops, lectures, literature reviews, observations, and discussion groups), practical exercises, and competency tests. Certificates of completion of formal training in lieu of any part of this training program will also be retained in the training record.

Training is progressive and continuously builds on and reinforces prior learning. Deficiencies on any of the training sections may occur during the training and will be addressed before proceeding to the next topic. It is expected that these deficiencies be openly and promptly discussed among the trainee, trainer, Technical Lead, and Supervisor.

Training assessments consist of practical exercises, quizzes, essays, presentations, and moot court. This manual indicates which assessments are graded and what is required for passing the assessments. The trainee must demonstrate the successful completion of the training plan by passing all graded assessments. Should the trainee not pass a graded assessment, a critical review of the training will be performed by the relevant parties (supervisor, trainer, technical lead, and trainee) to determine the appropriate course of action. Upon successful completion of training modules, competency tests, or the final training plan, a request by the trainer shall be submitted through the chain of command for approval to perform work in those areas where competency has been demonstrated.

Module 1   Introduction to the Laboratory and the Training Program

Lesson 1.1   Introduction

The WSP Latent Prints functional area operates as an interconnected piece of the WSP Crime Laboratory Division (CLD) and of the agency as a whole. This lesson will introduce the structure and operations of the CLD within the WSP Forensic Laboratory Services Bureau (FLSB) as well as the training program to the trainee. It will also include all WSP new employee requirements as necessary.

Learning Outcomes

1.1.1 The trainee will be able to describe the expectations of the training program.

1.1.2 The trainee will be able to explain the general operation of the laboratory.

Instructional Methods

Lectures

Lecture 1 – Introduction

This lecture will introduce the organizational structure of the FLSB, chain of command, organization of the laboratory, security and confidentiality, and quality assurance measures.

Date Completed	Trainee Initials	Trainer Initials

Lecture 2 – New Employee Orientation

If necessary, the trainee will complete the new employee orientation modules on the WSP training division iWSP website as required by the New Employee Orientation Supervisor Checklist.

Date Completed	Trainee Initials	Trainer Initials

Lecture 3 – Training Manual

This lecture will cover the structure of the training manual, expected timeline, and requirements for passing the training program.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- WSP Quality Operations Manual, Chapters 1, 2, 5, 6.
- Laboratory Local Policies.

Date Completed	Trainee Initials

Assessments and Performance Expectations

See Lesson 1.2

Lesson 1.2   Laboratory Safety

Laboratory safety is critical to the mission. This lesson introduces the policies, procedures, and precautions that support a safe work environment.

Learning Outcomes

1.2.1 The trainee will be able to describe general laboratory safety procedures.

1.2.2 The trainee will be able to recognize and demonstrate proper use of personal protective equipment (PPE).

1.2.3 The trainee will be able to explain proper disposal procedures for used PPE, reagents, sharps, glass, and biohazard materials.

Instructional Methods

Lecture – Laboratory Safety

This lecture will introduce the trainee to general laboratory procedures, lab-specific safety procedures, and disposal procedures.

Date Completed	Trainee Initials	Trainer Initials

Workshop – PPE
This workshop will introduce the proper use of personal protective equipment.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- WSP CLD Quality Operations Manual, Chapters 23 and 24
- WSP CLD Safety Manual (must be read in entirety)
- WSP Safety and Wellness Manual (must be read in entirety)

Date Completed	Trainee Initials

Assessments & Performance Expectations

Quiz – Introduction and Safety

Learning outcomes 1.1.1, 1.1.2, 1.2.1-1.2.3.

Date Completed	Trainee Initials	Trainer Initials

Lesson 1.3   Ethics

The reliability of laboratory activities is rooted in the personal and professional ethics of laboratory personnel. While laboratory procedures have been established to ensure best practices, it is the adherence to ethical principles that form the foundation upon which forensic science reports and testimony are built.

Learning Outcomes

1.3.1 The trainee will be able to describe ethics and how it relates to forensic service providers and personnel.

Instructional Methods

Lecture – Ethics

This lecture will introduce ethics in public service including the ANAB Guiding Principles for Professional Responsibility for Forensic Service Providers and Forensic Personnel.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- ANAB Guiding Principles for Professional Responsibility for Forensic Service Providers and Forensic Personnel

Date Completed	Trainee Initials

Assessments & Performance Expectations

Essay – Ethics
The learning outcome from Lesson 1.3.

Write an essay explaining the ethical responsibility of a forensic scientist. This essay will be less than one page long.

Expectations for Passing: This essay must adequately address the learning outcome from Lesson 1.3. Additionally:

- The trainee organized the content in a logical manner.
- The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 1.4   Bias

Many studies have been conducted to understand the effects of bias on the cognitive process. Many types of bias have been identified that can impact decision-making throughout any examination. Forensic scientists must be aware of potential sources of bias and must make steps to mitigate the impact.

Learning Outcomes

1.4.1 The trainee will be able to explain various types of bias.

1.4.2 The trainee will be able to explain how quality assurance practices reduce the risk of bias.

Instructional Methods

Lecture – Bias

This lecture will cover bias, its relevance to forensic science, and steps to mitigate the impact on the forensic scientist.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Cooper, Glinda S. and Meterko, Vanessa *Cognitive Bias Research in Forensic Science: A Systematic Review* Forensic Science International, volume 297, April 2019 pp 35-46.
- Kassin, Dror, Kukucka *The Forensic Confirmation Bias: Problems, Perspectives, and Proposed Solutions* Journal of Applied Research in Memory and Cognition; March 2013 pp 42-52.

Date Completed	Trainee Initials

Assessments & Performance Expectations

Essay – Bias

All learning outcomes from Lesson 1.4.

Write an essay explaining the various types of bias and how quality assurance practices reduce its risk. This essay will be less than two pages long.

Expectations for Passing: This essay must adequately address all learning outcomes from Lesson 1.4. Additionally:

- The trainee organized the content in a logical manner.
- The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 1.5   Control of Evidence

The integrity of evidence is critical to the legal process. The WSP CLD maintains a Laboratory Information Management System (LIMS) intended to track the chain of custody of all items of evidence received and examined in the laboratory. Proper use of LIMS is critical to maintain the chain of custody. Additional procedures ensure the proper receipt, storage, handling, and security of the evidence to ensure customers that the integrity of the evidence has been maintained.

Learning Outcomes

1.5.1 The trainee will be able to operate the Laboratory Information Management System (LIMS).

1.5.2 The trainee will demonstrate they are able to securely receive, store, and transfer evidence while maintaining the chain of custody.

Instructional Methods

Workshop – LIMS

This workshop will introduce the trainee to the Laboratory Information Management System (LIMS), including receiving and releasing cases, itemizing evidence, and maintaining chain of custody.

Date Completed	Trainee Initials	Trainer Initials

Practice
The trainee will shadow a Property and Evidence Custodian entering and releasing cases and transferring evidence as needed.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- WSP CLD Quality Operations Manual, Chapter 11
- WSP Forensic Services Guide

Date Completed	Trainee Initials

Assessment and Performance Expectations

Graded Practical – Itemizing Evidence

Learning outcome 1.5.1.

- Itemize evidence

Expectations for Passing: Successfully complete the above task

Date Passed	Trainee Initials	Trainer Initials

Graded Practical – Receiving, Transferring, and Releasing Evidence

Learning outcome 1.5.2.

- Receiving a case submitted to the lab.
- Performing a secure transfer from the evidence vault to a Forensic Scientist.
- Releasing evidence to a customer (in person or parcel carrier).

Expectations for Passing: Successfully complete the tasks.

Date Passed	Trainee Initials	Trainer Initials

Module 2   Friction Ridge Skin and Impressions

Lesson 2.1   Features on the Surface of the Friction Ridge Skin

In order to understand what is seen in a friction ridge impression, we must first study the surface of the skin. This lesson explores the common friction ridge features found on healthy friction ridge skin. This exploration includes the robustness of the features (three-dimensional attributes) and the expected reproducibility (recordability) of those features when the skin contacts a surface. These features include: ridges, furrows, patterns, cores, deltas, regular creases, irregular creases, wrinkles, and incipient ridges.

Learning Outcomes

2.1.1 The trainee will be able to indicate pattern regions in the friction ridge skin, including cores and deltas.

2.1.2 The trainee will be able to identify the regular creases in the friction ridge skin of the hands and feet.

2.1.3 The trainee will be able to predict how regular creases should record when the skin contacts a surface.

2.1.4 The trainee will be able to identify ridges and furrows in the friction ridge skin.

2.1.5 The trainee will be able to predict how ridges and furrows should record when the skin contacts a surface.

2.1.6 The trainee will be able to identify incipient ridges in the friction ridge skin.

2.1.7 The trainee will be able to describe factors that affect the reproducibility of incipient ridges when the skin contacts a surface.

2.1.8 The trainee will be able to identify irregular creases and wrinkles in the friction ridge skin.

2.1.9 The trainee will be able to describe factors that affect the reproducibility of irregular creases and wrinkles when the skin contacts a surface.

Instructional Methods

Workshop – The Skin's Surface

This workshop will introduce the trainee to the typical surface features of the friction ridge skin and aspects of their three-dimensional nature that affect the recording of these features. The trainee will identify the features of the friction ridge skin in photographs of hands and feet. This workshop will cover all learning outcomes in Lesson 2.1.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

See Lesson 2.3

Lesson 2.2   Categorization and Use of Features on the Surface of the Friction Ridge Skin

The larger features of the friction ridge skin are often most helpful for figuring out which part of the hand or foot touched a surface and left an impression. These are called the macroscopic features of the skin and include shape, regular creases, irregular creases, patterns, and ridge flows. The smaller features of the friction ridge skin are most helpful for determining who left a particular print. These smaller features include ridges, minutiae, and incipient ridges. This lesson introduces the categorization of features as macroscopic and microscopic, the attributes of each feature, and the significance of the macroscopic and microscopic features during the examination process.

Learning Outcomes

2.2.1 The trainee will be able to list the macroscopic features of the friction ridge skin.

2.2.2 The trainee will be able to list the microscopic features of the friction ridge skin.

2.2.3 The trainee will be able to explain why macroscopic features can be used to establish the anatomical region and distal orientation of hands and feet.

2.2.4 The trainee will be able to explain why macroscopic features of the hands and feet can be used to include or exclude subjects from an unknown (questioned) print.

2.2.5 The trainee will be able to explain why microscopic features of the hands and feet can be used to include or exclude subjects from an unknown (questioned) print.

Instructional Methods

Workshop – Search Diagnosticity and Source Diagnosticity of Friction Ridge Features

This workshop will introduce the attributes of the various features of the friction ridge skin and their usefulness assigning search parameters, excluding potential donors, and including potential donors. This workshop will introduce which features tend to be shared in the human population and which features tend to show more variation from one donor to another. The trainee will mark up macroscopic features in ten (10) exemplar hand impressions and ten (10) exemplar foot impressions. The trainee and trainer will discuss how these features and their relationships can be used to include or exclude a potential donor. This workshop will cover all learning outcomes in Lesson 2.2.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- White, A. *Features of the Friction Ridge Skin: Attributes, Diagnosticity, and Limitations*. JFI 72(1): 33-128, 2022
- Champod, Christophe, et al. Fingerprints and Other Ridge Skin Impressions. (2nd Edition) CRC Press, New York, 2016, Chapter 1

Date Completed	Trainee Initials

Assessments and Performance Expectations

See Lesson 2.3

Lesson 2.3   General Anatomy of the Friction Ridge Skin

The anatomical structure of the skin permits stability to the features, especially after adolescence and before middle-age. The stability of the features permits the ability to track the identity of the person over time. This lesson reviews the general anatomy of the friction ridge skin to include the following concepts: epidermis, dermis, basement membrane, hypodermis, primary ridges, secondary ridges, keratin, keratinocyte, melanocyte, leukocyte, dermal papilla, sweat glands and Merkel cells.

Learning Outcomes

2.3.1 The trainee will be able to identify the epidermis, dermis, and hypodermis of the friction ridge skin.

2.3.2 The trainee will be able to describe the primary functions of the epidermis, dermis, and hypodermis.

2.3.3 The trainee will be able to identify primary and secondary ridges of the friction ridge skin.

2.3.4 The trainee will be able to explain the relationship between the primary ridges and the surface ridges.

2.3.5 The trainee will be able to explain the relationship between the secondary ridges and the surface furrows.

2.3.6 The trainee will be able to explain the significance of the dermal papilla as a support structure for the skin.

2.3.7 The trainee will be able to explain the significance of the basement membrane as an attachment site between the epidermis and dermis.

2.3.8 The trainee will be able to describe the general structure and function of sweat glands in the friction ridge skin.

2.3.9 The trainee will be able to list the main cell types found in the epidermis of the friction ridge skin and the primary function of each cell type.

2.3.10 The trainee will be able to describe keratin and explain the importance of keratin distribution in the friction ridge skin.

2.3.11 The trainee will be able to support the theory of persistency of the arrangements of the mature friction ridge features with the physical connections within the friction ridge skin that stabilize the positions of the features in friction ridge skin.

Instructional Methods

Lecture – General Anatomy of Friction Ridge Skin

This lecture reviews the general anatomy of the friction ridge skin, how the anatomy contributes to the stability of the ridges and furrows in the friction ridge skin, and why persistency of the friction ridge skin has been important for civil and criminal applications. This lecture will cover all learning outcomes in Lesson 2.3.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Maceo, Alice. *Chapter 2 – Anatomy and Physiology of Adult Friction Ridge Skin.* Fingerprint Sourcebook. National Institute of Justice, 2011
- Champod, Christophe, et al. Fingerprints and Other Ridge Skin Impressions. (2nd Edition) CRC Press, New York, 2016, Chapter 1

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion group regarding the general anatomy of the skin and how it contributes to the persistency of the friction ridge skin.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Quiz – Anatomy and Features of the Friction Ridge Skin

All learning outcomes from Lessons 2.1 and 2.2 and learning outcomes 2.3.1 – 2.3.10.

Date Completed	Trainee Initials	Trainer Initials

Essay – Anatomy of the Friction Ridge Skin

Learning outcome 2.3.11

Answer the following two questions in less than two pages: Why are the arrangements of the mature ridges generally persistent through middle adulthood? Why is this important?

Expectations for Passing:

a) The trainee introduced the concept of persistency and its importance in the use of friction ridge impressions.
b) The trainee adequately described the general structure of the friction ridge skin.
c) The trainee adequately supported the concept of persistency using the anatomical connections within the friction ridge skin.
d) The trainee did not over-state the persistent nature of the friction ridge skin.
e) The trainee organized the content in a logical manner.
f) The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 2.4   Methods of Collecting Exemplar Prints –Basic

The manner in which exemplar prints are collected affect their appearance and usefulness when comparing friction ridge impressions. Exemplars are not always exemplary! This lesson reviews the methods used for the collection of exemplar prints from intact friction ridge skin and the challenges and limitations associated with each method. This lesson will also review common distortions seen in inked prints in order to prepare the trainee for comparison exercises.

Learning Outcomes

2.4.1 The trainee will be able to recognize the different methods of collecting exemplar prints (e.g. ink, lifters, and digital capture).

2.4.2 The trainee will be able to describe the basic process for each method of collecting exemplar prints for fingers, palms, and feet.

2.4.3 The trainee will be able to describe the typical sources of distortion for each method (e.g. over-inking, under-inking, too much pressure, too little pressure, overlays/double touches, slippage, smearing, and stitching errors, digital artifacts).

Instructional Methods

Workshop – Recording the Friction Ridge Skin

The workshop will introduce the various methods for intentionally recording the friction ridge skin and types of distortion related to the recording process. In preparation for comparison exercises, the trainee will recreate the following issues related to inked impressions: over-inking, under-inking, too much pressure, too little pressure, overlays/double touches, slippage, and smearing. The trainee will discuss their results with a trainer. This workshop will cover all learning outcomes in Lesson 2.4.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

See Lesson 2.5 (Presentation)

Lesson 2.5   Full Exemplar Fingerprints

This lesson includes the exploration of fully rolled exemplar fingerprints and the comparison of rolled fingerprints. The exploration of the rolled exemplar fingerprints includes the macroscopic features, microscopic features, and the significance of the features. The comparisons contain different rolled recordings of the fingers (not duplicates of the same rolled fingerprint).

Learning Outcomes

2.5.1 The trainee will be able to describe the size and shape (outline) of rolled fingerprints.

2.5.2 The trainee will be able to identify cores, deltas, and flexion creases in rolled fingerprints.

2.5.3 The trainee will be able to assign pattern type, including sub-class, to rolled fingerprints.

2.5.4 The trainee will be able to describe the different ridge counts present in rolled fingerprints (e.g. core to delta, core to flexion crease, and delta to flexion crease).

2.5.5 The trainee will be able to assign inner, outer, and meet tracings in whorls.

2.5.6 The trainee will be able to predict left/right handedness of rolled fingerprints based on pattern, ridge flows, and tracings and appropriately assign uncertainty to the prediction.

2.5.7 The trainee will be able to describe the purpose, content, and organization of a typical tenprint record.

2.5.8 The trainee will be able to recognize the distal orientation of rolled fingerprints using shape, ridge flows, cores, deltas, and creases.

2.5.9 The trainee will be able to compare rolled impressions of the fingers, declare a match or non-match, and articulate the basis of the match or non-match (e.g. similarities or differences in patterns, ridge counts, crease shape, scars, and ridge arrangements).

2.5.10 The trainee will be able to discuss variations in appearance (differences) between rolled fingerprints from the same source.

2.5.11 The trainee will be able to discuss coincidental similarities in appearance between rolled fingerprints from different sources.

Instructional Methods

Workshop - Fingerprints

This workshop will introduce the features of fingerprints, including concepts from classification. The trainees will mark-up enlarged fingerprints and discuss relationship of deltas, cores, and creases. In addition, the workshop will introduce comparison strategies and tie in concepts from Lesson 2.4 regarding distortion factors in exemplar prints. This workshop will cover all learning outcomes in Lesson 2.5.

Date Completed	Trainee Initials	Trainer Initials

Practice 1 – Pattern Recognition

Identify the fingerprint patterns on thirty (30) tenprint cards (300 fingers). The trainee will place an asterisk next to any radial loops, outer tracing whorls on left hands, and inner tracing whorls on right hands to highlight the most likely digits where unexpected loop and whorl sub-classes occur.

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Fingerprint Matching

The following matching exercises include five pairs of rolled impressions of the same fingers. The rolled impressions are not duplicates – they are different rolled recordings of the same finger. These exercises are organized by pattern type. These exercises introduce variation in appearance of rolled impressions from the same source skin, reinforce distal orientation of fingerprints, and the use of macroscopic and microscopic features to exclude or include possible mates.

Fingerprint Matching #1 - Mixed Patterns

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #2 - Right Loops

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #3 - Left Loops

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #4 - Inner Tracing Central Pocket Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #5 - Outer Tracing Central Pocket Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #6 - Inner Tracing Plain Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #7 - Outer Tracing Plain Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #8 - Inner Tracing Double Loop Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #9 - Outer Tracing Double Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #10 - Accidental Whorls

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Matching #11 - Arches

Date Completed	Trainee Initials	Trainer Initials

Practice 3 – Basic Fingerprint Searching 20:50

After successful completion of the matching exercises, which develop the ability to assess correspondence, the next exercises promote efficient search strategies using macroscopic features of fully rolled fingerprints. In each exercise, 20 questioned prints are searched against 50 tenprint cards. These exercises reinforce distal orientation and handedness expectations for fingerprints. These exercises also introduce different source conclusions (not all search fingerprints can be located) to reinforce deliberate comparisons. The same set of 50 tenprint records is used for each exercise. The questioned prints are different recordings of the fingers recorded in the tenprint records.

Fingerprint Set #1 (20:50) – All questioned prints can be located.

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Set #2 (20:50) – All questioned prints can be located.

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Set #3 (20:50) – Five (5) questioned prints *cannot* be located.

Date Completed	Trainee Initials	Trainer Initials

Fingerprint Set #4 (20:50) – Less than ten (10) questioned prints *cannot* be located.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Cowger, James. Friction Ridge Skin: Comparison and Identification, CRC Press, Ann Arbor, 1993, Chapter 3.
- Federal Bureau of Investigation. The Science of Fingerprints. U.S. DOJ, U.S. Government Printing Office, 1979, Chapters II and III.

Date Completed	Trainee Initials

Assessments and Performance Expectations

Graded Practical – Pattern Interpretation

Learning outcomes 2.5.3 and 2.5.6

Assign the fingerprint pattern type and expected handedness of the patterns on 20 fingerprints.

Expectations for Passing: 18/20 correct pattern assignments and 18/20 correct hand assignments.

Date Passed	Trainee Initials	Trainer Initials

Graded Practical – Basic Fingerprint Comparisons

Learning outcome 2.5.9

Fingerprint 20:50 – Less than ten (10) search prints *cannot* be located.

Expectations for Passing: No erroneous same source conclusions and no more than 2 erroneous different source conclusions.

Date Passed	Trainee Initials	Trainer Initials

Presentation – Basic Fingerprint Comparisons

Learning outcomes 2.4.3, 2.5.2-2.5.5, 2.5.7, and 2.5.9-2.5.11.

The trainee will present one same source conclusion from the Fingerprint 20:50 comparison exercises to their peers.

Expectations for Passing:

a) The trainee adequately introduced themselves and their background (name, title, formal education, and any previous relevant job experience)
b) The trainee adequately summarized what they have learned thus far in the training program.
c) The trainee adequately described the three-dimensional features in the friction ridge skin and how these features translate to impressions.
d) The trainee adequately described a tenprint record.
e) The trainee adequately described the macroscopic features in the questioned print that they used to search through the exemplars.
f) The trainee adequately described how candidates were excluded based on macroscopic features.
g) The trainee adequately described one example of a candidate finger that was initially included based on macroscopic features, but then excluded based on microscopic features.
h) The trainee adequately discussed the macroscopic and microscopic features supporting the same source conclusion.
i) The trainee adequately discussed sources of variation in appearance between the questioned print and the mated print in the tenprint record.

j)   The presentation was logical (order of the topics and transitions between topics) and cohesive (stayed on message).

Date Passed	Trainee Initials	Trainer Initials

Module 3   Classification, Development and Comparison of Friction Ridge Detail

Lesson 3.1   Introduction to Fingerprint Classification Systems

This lesson includes the developers and basic elements of the following classification systems: Johannes Purkinje's nine pattern classification, Syllabic System (Henry Faulds), Bertillon System of Anthropometry (Alphonse Bertillon), Tripartite Fingerprint Classification System (Francis Galton), Argentinian Fingerprint Classification System (Juan Vucetich), Henry Classification System (Azizul Haque, Chandra Bose and Edward Richard Henry), and National Crime Information Center (NCIC) Classification System (Federal Bureau of Investigation).

Learning Outcomes

3.1.1 The trainee will be able to recall the developers and basic elements of the classification systems listed in this lesson.

3.1.2 The trainee will be able to discuss the significance and relationships of the classification systems listed in this lesson.

3.1.3 The trainee will be able to consider the challenges with developing and implementing classification systems.

Instructional Methods

Lecture – Fingerprint Classification Systems

This lecture will review the history of the listed classification systems, AFIS/ABIS technology, and their impact on each other. This lecture will cover all learning outcomes in Lesson 3.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Federal Bureau of Investigation. The Science of Fingerprints. U.S. DOJ, U.S. Government Printing Office, 1979. Chapters II and III
- Hutchins, Laura. *Chapter 5 – Systems of Friction Ridge Classification.* Fingerprint Sourcebook. National Institute of Justice, 2011

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – Fingerprint Classification Systems

All learning outcomes for Lesson 3.1.

Date Completed	Trainee Initials	Trainer Initials

Lesson 3.2   Embryological Development of the Hands and Feet

The embryological development of the hands and feet establish the growth stresses on the skin. These growth stresses are generally shared in the population, which results in the macroscopic features that examiners use to determine if they are looking at a hand or foot impression. This lesson reviews the basic embryological development of the hands and feet to include: development of the hand and foot paddles, formation of the digits, formation of the volar pads, and the formation of the flexion creases.

Learning Outcomes

3.2.1 The trainee will be able to recite the sequence and timing of the embryological formation of the hand and foot paddles.

3.2.2 The trainee will be able to recite the process of the formation of the digits on the hands and feet.

3.2.3 The trainee will be able to define "volar pads" and identify the standard volar pad locations in the hands and feet.

3.2.4 The trainee will be able to recite the sequence and timing of volar pad formation on the hands and feet.

3.2.5 The trainee will be able to recite the sequence and timing of volar pad regression on the hands and feet.

3.2.6 The trainee will be able to recite the sequence and timing of flexion crease formation on the hands and feet.

3.2.7 The trainee will be able to explain how the overall development of the hands and feet, volar pads, and flexion creases impart variable growth stresses across the volar surfaces.

Instructional Methods

See Lesson 3.4

Assessments and Performance Expectations

See Lesson 3.4

Lesson 3.3   Embryological Development of the Friction Ridge Skin

The embryological development of the friction ridge skin is guided by several influences that allow for intense variation in many of the microscopic features of the skin. This intense variation during formation of these features establishes the ability to use these features to identify a person. This lesson reviews the morphogenesis of the fiction ridges and furrows and the impact of variable growth stresses on the ridge flows and patterns found on the friction ridge skin.

Learning Outcomes

3.3.1 The trainee will be able to describe the morphogenesis of the primary ridges including the patterning of the capillary beds and free nerve endings in the dermis and the organization of the Merkel cells into bands in the epidermis prior to primary ridge formation.

3.3.2 The trainee will be able to recite the sequence of regional development of the primary ridges in the friction ridge skin.

3.3.3 The trainee will be able to assess the relationships between the volar pads and timing of primary ridge development with different pattern types and different ridge counts.

3.3.4 The trainee will be able to assess the relationships between major ridges flows in the friction ridge skin with the overall hand and foot growth and presence of flexion creases.

3.3.5 The trainee will be able to explain the development of additional primary ridges and minutia as the primary ridges proliferate across the surface of the developing friction ridge skin.

3.3.6 The trainee will be able to recite the sequence of regional development of the secondary ridges in the friction ridge skin.

3.3.7 The trainee will be able to describe the maturation of the surface ridges, furrows, and sweat glands.

3.3.8 The trainee will be able to describe the causes of dysplasia during ridge formation.

Instructional Methods

See Lesson 3.4

Assessments and Performance Expectations

See Lesson 3.4

Lesson 3.4   Developmental Noise, Developmental Stability, and Fluctuating Asymmetry

The growth and development of the hands, feet, and friction ridge skin features are influenced by a blend of forces that culminate in the variation of the macroscopic and microscopic features within the population. This lesson reviews the impact of developmental stability, fluctuating asymmetry, and developmental noise on the embryological growth of the hands, feet, and friction ridge skin.

Learning Outcomes

3.4.1 The trainee will be able to define genotype and phenotype.

3.4.2 The trainee will be able to explain the differences between genotype and phenotype.

3.4.3 The trainee should be able to explain ontogenetic variability.

3.4.4 The trainee should be able to explain inherent developmental variation.

3.4.5 The trainee should be able to explain developmental stability and developmental noise.

3.4.6 The trainee should be able to explain the relationship between inherent developmental variation and developmental noise.

3.4.7 The trainee should be able to explain the impact of genotype, environment, and developmental noise on a phenotype.

3.4.8 The trainee should be able to explain fluctuating asymmetry.

3.4.9 The trainee should be able to describe the relationship between fluctuating asymmetry and developmental noise.

3.4.10 The trainee should be able to relate observed similarities in patterns and ridge counts on the opposite fingers of the same person with the concept of developmental stability.

3.4.11 The trainee should be able to relate observed differences in patterns and ridge counts on the opposite fingers of the same person with the concepts of fluctuating asymmetry and developmental noise.

3.4.12 The trainee will be able to support the discriminating power of the arrangements of the mature friction ridge features to include articulation of the concepts of inherent developmental variation, fluctuating asymmetry, and developmental noise.

Instructional Methods

Lecture – Embryological Development

This lecture will review the embryological development of the hands, feet, and friction ridge skin. This lecture will discuss variation in the macroscopic and microscopic features of the friction ridge skin within the human population and the expected contributions of developmental stability, developmental noise, and fluctuating asymmetry during their formation. This lecture will cover all learning outcomes in Lessons 3.2, 3.3, and 3.4.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

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- Stevens, C.; Carey, J.; Shah, M.; Bagley, G. Development of Human Palmar and Digital Flexion Creases. *Journal of Pediatrics* 1988 *33* (1), 128-132.
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- Wertheim, Kasey. *Chapter 3 – Embryology and Morphology of Friction Ridge Skin.* Fingerprint Sourcebook. National Institute of Justice, 2011
- Wolpert, L. Arms and the Man: The Problem of Symmetric Growth. *PLoS Biology* 2010 *8* (9), e1000477.

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion group regarding the embryological development of the hands, feet, and friction ridge skin, and the expected distribution of the macroscopic and microscopic features of the friction ridge skin within the human population based on the contributions of developmental stability and developmental noise.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Quiz – Embryological Development

Learning outcomes 3.2.1 – 3.2.6; 3.3.1 – 3.3.8; and 3.4.1 – 3.4.9.

Date Completed	Trainee Initials	Trainer Initials

Essay – Embryological Development

All learning outcomes for Lessons 3.2, 3.3 and 3.4.

Write an essay explaining why shape, ridge flows, and patterns are shared in the human population, while clusters of ridges and minutiae tend to show incredible variation in the population. This essay will be less than five pages long.

Expectations for Passing: This essay must adequately address all learning outcomes from Lessons 3.2, 3.3, and 3.4. Additionally:

- The trainee organized the content in a logical manner.
- The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 3.5   Partial Exemplar Fingerprints

In casework, fingerprints recovered from crime scenes or items of evidence will not look like rolled impressions. Latent prints often look more like plain impressions (and sometimes less). This lesson includes the exploration of clear, partial inked fingerprints and the comparison of partial inked fingerprints to rolled exemplar fingerprints. The goal here is to mimic the decreased diversity and quantity of features in partial friction ridge impressions from the distal portions of the fingers and thumbs. The partial fingerprints bear limited focal points (e.g. core is visible, but not the delta), reflect natural touches of a surface, and meet suitability criteria.

Learning Outcomes

3.5.1 The trainee will be able to describe the size and shape (outline) of partial fingerprints.

3.5.2 The trainee will be able to predict the distal orientation of partial fingerprints, consider the uncertainty of the prediction, and support the decision.

3.5.3 The trainee will be able to predict left/right handedness of partial fingerprints, consider the uncertainty of the prediction, and support the decision.

3.5.4 The trainee will be able to select effective target data in partial fingerprints.

3.5.5 The trainee will be able to compare partial fingerprints to rolled fingerprints and exploit the diagnostic macroscopic and microscopic information to include or exclude possible candidates.

3.5.6 The trainee will be able to evaluate the similarities and differences (variations in appearance) between fingerprints from the same source.

3.5.7 The trainee will be able to evaluate differences and coincidental similarities between fingerprints from different sources.

3.5.8 The trainee will be able to support conclusions with the appropriate weighting of macroscopic information and microscopic information.

Instructional Methods

Workshop – Partial Exemplar Fingerprints

This workshop will introduce partial impressions of the distal segments of the fingers and the challenges associated with assigning search parameters and searching for fingerprints that do not contain the quantity and diversity of features as a rolled fingerprint. This workshop will cover all learning outcomes in Lesson 3.5.

Date Completed	Trainee Initials	Trainer Initials

Practice – Partial Exemplar Fingerprints 36:12

These exercises include the comparison of 36 partial inked fingerprints (questioned prints) to 12 sets of rolled exemplar fingerprints. These exercises reinforce distal orientation and handedness expectations for fingerprints. These exercises also reinforce different source conclusions (not all questioned fingerprints can be located). The questioned prints are not duplicates of the rolled or plain impressions on the tenprint records (different recordings of the fingers).

Partial Fingerprint 36:12 #1 – All questioned prints can be located. Each tenprint record is concluded to be same source at least once.

Date Completed	Trainee Initials	Trainer Initials

Partial Fingerprint 36:12 #2 – All questioned prints can be located. Each tenprint record is concluded to be same source at least once.

Date Completed	Trainee Initials	Trainer Initials

Partial Fingerprint 36:12 #3 – All questioned prints can be located. *Not all tenprint records will be included in a same source conclusion.*

Date Completed	Trainee Initials	Trainer Initials

Partial Fingerprint 36:12 #4 – Five (5) questioned prints *cannot* be located. *Not all tenprint records will be included in a same source conclusion.*

Date Completed	Trainee Initials	Trainer Initials

Partial Fingerprint 36:12 #5 – Less than five (5) questioned prints *cannot* be located. *Not all tenprint records will be included in a same source conclusion.*

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Graded Practical – Partial Fingerprints

Learning outcomes 3.5.2 – 3.5.8.

Partial Fingerprint 36:12 – Less than five (5) questioned prints *cannot* be located. *Not all tenprint records will be included in a same source conclusion.*

Expectations for Passing: No erroneous same source conclusions and no more than 1 erroneous different source conclusions.

Date Completed	Trainee Initials	Trainer Initials

Presentation – Partial Fingerprints

Learning outcomes 2.3.11, 3.4.12 and 3.5.1, 3.5.6, and 3.5.8.

The trainee will present one same source conclusion from the Partial Fingerprint 36:12 comparison exercises to their peers.

Expectations for Passing:

a) The trainee adequately introduced themselves and their background (name, title, formal education, and any previous relevant job experience)
b) The trainee adequately summarized what they have learned thus far in the training program.

c) The trainee must describe how the macroscopic features (shape, patterns, deltas, ridge flows, or creases) were used to establish orientation and most likely handedness for the questioned print

d) The trainee adequately described the macroscopic features and target features in the questioned print that they used to search through the exemplars.

e) The trainee adequately discussed the macroscopic and microscopic features supporting the same source conclusion.

f) The trainee adequately discussed sources of variation in appearance between the questioned print and the mated print in the tenprint record.

g) The trainee adequately explained why the arrangement of the mature ridges and furrows in the skin are not expected to have changed significantly between the recording of the questioned print and the recording of the exemplar print (why the mature ridges are persistent – 3 slides max for this topic)

h) The trainee adequately explained why combinations of features can be used to distinguish one region of friction ridge skin from another (why there is such variation in the population – 6 slides max for this topic)

i) The presentation was logical (order of the topics and transitions between topics) and cohesive (stayed on message).

Date Passed	Trainee Initials	Trainer Initials

Lesson 3.6   Tip and Side Exemplar Fingerprints

The most challenging partial fingerprints are those that only contain the extreme tips or sides of the finger. This lesson introduces clear, fragmentary inked fingerprints from the tips and sides of the fingers and the comparison of fragmentary fingerprints to rolled exemplar fingerprints. The fragmentary fingerprints contained limited or no focal points, reflect natural touches of a surface, and meet suitability criteria.

Learning Outcomes

3.6.1 The trainee should be able to describe the size and shape (outline) of fragmentary fingerprints.

3.6.2 The trainee will be able to predict the distal orientation of fragmentary fingerprints, consider the uncertainty of the prediction, and support the decision.

3.6.3 The trainee will be able to predict left/right handedness of fragmentary fingerprints, consider the uncertainty of the prediction, and support the decision.

3.6.4 The trainee will be able to select effective target data in fragmentary fingerprints.

3.6.5 The trainee will be able to compare fragmentary fingerprints to rolled fingerprints and exploit the diagnostic macroscopic and microscopic information to include or exclude possible candidates.

3.6.6 The trainee will be able to determine when additional exemplars are required to complete a comparison.

3.6.7 The trainee will be able to evaluate the similarities and differences (variations in appearance) between fingerprints from the same source.

3.6.8 The trainee will be able to evaluate differences and coincidental similarities between fingerprints from different sources.

3.6.9 The trainee will be able to support the conclusion with the appropriate weighting of macroscopic information and microscopic information.

Instructional Methods

Workshop – Tip and Side Exemplar Fingerprints

This workshop will introduce tips and sides of the distal segments of the fingers and the challenges associated with assigning search parameters (e.g. estimating proximity to a core or delta) and searching for fingerprints that contain one or fewer landmarks to tether the search. During this workshop, the trainee will also compare "standard" rolled fingerprints to "Complete Friction Ridge Exemplar" fingerprints to evaluate how much of the finger is not recorded in a standard rolled impression and the impact of the angle of contact on the shape of the impression and the curvature of the ridge flows. The trainee will also be shown examples of tips and sides that contain sufficient corresponding region, insufficient corresponding region, and no corresponding region with a rolled impression of the same finger. Challenges with making a complete comparison will be discussed. This workshop will cover all learning outcomes in Lesson 3.6.

Date Completed	Trainee Initials	Trainer Initials

Practice – Fragmentary Fingerprints 10:5

These exercises include the comparison of 10 tips and sides of exemplar fingerprints (questioned prints) to 5 sets of rolled exemplar fingerprints. These exercises reinforce distal orientation and handedness expectations for fingerprints. These exercises also reinforce different source conclusions (not all questioned fingerprints can be located) and introduce incomplete comparisons decisions based on the need for additional exemplar prints. The questioned prints are not duplicates of the rolled or plain impressions on the tenprint records (different recordings of the fingers).

Fragmentary Fingerprint 10:5 #1 – All questioned prints can be located with sufficient correspondence.

Date Completed	Trainee Initials	Trainer Initials

Fragmentary Fingerprint 10:5 #2 – All questioned prints can be located with sufficient correspondence.

Date Completed	Trainee Initials	Trainer Initials

Fragmentary Fingerprint 10:5 #3 – All impressions can be located; however, three (3) do not contain sufficient correspondence with the provided subjects and the appropriate conclusion is "incomplete, additional exemplars are necessary for further comparison".

Date Completed	Trainee Initials	Trainer Initials

Fragmentary Fingerprint 10:5 #4 – Two (2) of questioned prints do not belong to the subjects provided but contain an anchor point and can be concluded as strong evidence for different source to all subjects.

Date Completed	Trainee Initials	Trainer Initials

Fragmentary Fingerprint 10:5 #5 – Four (4) of the questioned prints *cannot* be located. Two of these four contain an anchor point and can be concluded as strong evidence for different source to all subjects. Two of these impressions came from the subjects provided but contain no correspondence and the appropriate conclusion is incomplete.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

<u>Presentation – Fragmentary Fingerprints</u>

All learning outcomes for Lesson 3.6.

The trainee will present one strong evidence for different source and one incomplete comparison which includes correspondence from the Fragmentary Fingerprint 10:5 comparison exercises to their peers.

Expectations for Passing:

a) The trainee adequately introduced themselves and their background (name, title, formal education, and any previous relevant job experience).
b) The trainee adequately summarized what they have learned thus far in the training program.
c) The trainee adequately described how the macroscopic features were used to establish orientation and most likely handedness for the questioned prints.
d) The trainee adequately described the macroscopic features and target features in the questioned prints that they used to search through the exemplars.
e) The trainee adequately discussed the macroscopic or microscopic features supporting the strong evidence for different source conclusion.

f) The trainee adequately discussed the macroscopic or microscopic features supporting the incomplete comparison that included correspondence.

g) The trainee adequately discussed sources of variation in appearance between the questioned print and the corresponding tenprint record for the incomplete comparison.

h) The presentation was logical (order of the topics and transitions between topics) and cohesive (stayed on message).

Date Passed	Trainee Initials	Trainer Initials

Module 4   Biological Considerations

Lesson 4.1   General Physiology of the Friction Ridge Skin

The physiology of the skin also supports the stability for the friction ridge features. This lesson reviews the general physiological processes within the friction ridge skin to include the following concepts: keratinocyte mitosis, transient amplifying cells, layers of the epidermis, differentiation of the keratinocytes, and regulation of cell mitosis.

Learning Outcomes

4.1.1 The trainee will be able to identify the five layers of the epidermis in the friction ridge skin.

4.1.2 The trainee will be able to describe the sequence of changes that take place as keratinocytes differentiate.

4.1.3 The trainee will be able to discuss the importance of the transient amplifying cells in maintaining the three-dimensional height of the surface ridges.

4.1.4 The trainee will be able to explain the major pathways for regulating basal keratinocyte mitosis.

4.1.5 The trainee will be able to support the theory of persistency of the arrangements of the mature friction ridge features. This should include the ability to describe the physiological processes within the friction ridge skin that regulate basal keratinocyte mitosis and stabilize the robustness of the features.

Instructional Methods

See Lesson 4.4

Assessments and Performance Expectations

See Lesson 4.4

Lesson 4.2   Wound Healing in the Friction Ridge Skin

The healing process can cause some unexpected changes, either temporary or permanent, in the features of the friction ridge skin. This lesson reviews the skin's response to an injury, the appearance of healing skin, the formation of scars, and the appearance of scars.

Learning Outcomes

4.2.1 The trainee will be able to summarize the basic process of wound healing in the skin.

4.2.2 The trainee will be able to explain the possible outcomes of healing skin (e.g. no scar, visible scar, or invisible scar) and why these different outcomes arise.

4.2.3 The trainee will be able to identify healing skin in impressions of friction ridge skin.

4.2.4 The trainee will be able to describe the attributes that support the determination of actively healing skin.

4.2.5 The trainee will be able to discuss the expected reproducibility of the attributes of healing friction ridge skin.

4.2.6 The trainee will be able to identify scars in impressions of friction ridge skin.

4.2.7 The trainee will be able to describe the attributes that support the assignment of "scar" to the feature.

4.2.8 The trainee will be able to compare impressions taken from the same friction ridge skin pre-scar and post-scar.

4.2.9 The trainee will be able to assess the changes in arrangements of the mature friction ridge features in pre-scar and post-scar impressions of the friction ridge skin.

Instructional Methods

See Lesson 4.4

Assessments and Performance Expectations

See Lesson 4.4

Lesson 4.3   Aging in the Friction Ridge Skin

While the friction ridge skin is certainly resilient from adolescence to middle age, it is not immune from the effects of growth and aging. This lesson reviews the expected changes that take place in the friction ridge skin as a person grows to adulthood and as an adult reaches later decades of life.

Learning Outcomes

4.3.1 The trainee will be able to describe why foot and hand growth during adolescence disproportionately increases the length and width friction ridges and furrows.

4.3.2 The trainee will be able to recognize the three common characteristics of impressions of late age friction ridge skin: flattened ridges, increased number of wrinkles, and increased prominence of incipient ridges.

4.3.3 The trainee will be able to explain why ridges tend to flatten in late-age friction ridge skin.

4.3.4 The trainee will be able to explain why wrinkles tend to increase in number in late-age friction ridge skin.

4.3.5 The trainee will be able to explain why incipient ridges tend to become more prominent in late-age friction ridge skin.

4.3.6 The trainee will be able to compare impressions taken from the same friction ridge skin decades apart.

4.3.7 The trainee will be able to assess the changes that have occurred with age in friction ridge impressions taken decades apart.

Instructional Methods

See Lesson 4.4

Assessments and Performance Expectations

See Lesson 4.4

Lesson 4.4   Common Disorders of the Friction Ridge Skin

The friction ridge skin is also prone to atypical development and the effects of disease. This lesson will introduce common disorders of the friction ridge skin including: psoriasis, epidermal warts, and smoothing of friction ridges due to chemotherapy drug administration.

Learning Outcomes

4.4.1 The trainee will be able to identify psoriasis in impressions of friction ridge skin.

4.4.2 The trainee will be able to describe the attributes that support the determination of psoriasis.

4.4.3 The trainee will be able to discuss the expected reproducibility of the attributes of psoriasis in impressions of the friction ridge skin.

4.4.4 The trainee will be able to identify warts in impressions of friction ridge skin.

4.4.5 The trainee will be able to describe the attributes that support the assignment of "wart" to a feature.

4.4.6 The trainee will be able to discuss the expected reproducibility of the attributes of warts in impressions of the friction ridge skin.

4.4.7 The trainee will be able to identify the presence of smoothed friction ridge skin and discuss the new feature set present in the skin (e.g. wrinkles or the changes to the ridges).

4.4.8 The trainee will compare impressions taken from the same friction ridge skin: 1) pre-wart and post-wart and 2) at different moments before, after, or during psoriasis.

Instructional Methods

Lecture – Physiology, Wound Healing, Aging, and Common Disorders of the Friction Ridge Skin

This lecture will introduce the physiology of the friction ridge skin and the limitations of the persistency of the friction ridge skin due to growth/aging, injury, and common diseases. This lecture will cover all learning outcomes in Lessons 4.1, 4.2, 4.3 and 4.4.

Date Completed	Trainee Initials	Trainer Initials

Practice 1 - Recognizing Changes Associated with the Skin

The trainee will label changes associated with the skin (i.e. warts, psoriasis, actively healing skin, and scars in friction ridge impressions).

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Comparing Before and After

The trainee will compare impressions from before and after scar formation, aging, and disorders and discuss the differences with a trainer.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Drahansky, M.; Dolezel, M.; Urbanek, J.; Brezinova, E.; Kim, T. Influence of Skin Diseases on Fingerprint Recognition. *Journal of Biomedicine and Biotechnology* 2012, 626148. DOI: 10.1155/2012/626148.

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- Maceo, Alice. *Chapter 2 – Anatomy and Physiology of Adult Friction Ridge Skin.* Fingerprint Sourcebook. National Institute of Justice, 2011
- Okajima, M. Dermal and Epidermal Structures of the Volar Skin. *Birth Defects: Original Article Series* 1979 *XV* (6), 179-198.
- Stayrook, Steven. Back to Basics: Dactylography. *Journal of Forensic Identification* 2005 *55* (5) 678.
- Stücker, M.; Geil, M.; Kyeck, S.; Hoffman, K.; Röchling, A.; Memmel, U.; Altmeyer, P. Interpapillary Lines – The Variable Part of the Fingerprint. *Journal of Forensic Science* 2001 *46* (4), 857-861.
- Yoon, S.; Feng, J.; Jain, A. Altered Fingerprints: Analysis and Detection. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 2012 *34* (3), 451-464. DOI: 10.1109/TPAMI.2011.161.
- White, A. *Features of the Friction Ridge Skin: Attributes, Diagnosticity, and Limitations*. JFI 72(1): 33-128, 2022

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a group discussion regarding the role of physiology maintaining the friction ridge skin and changes that can take place in the features of the friction ridge skin.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Quiz – Physiology, Wound Healing, Aging, and Common Disorders of the Friction Ridge Skin

Learning outcomes 4.1.1 – 4.1.4; 4.2.1 – 4.2.7; 4.3.1 – 4.3.5; and 4.4.1 – 4.4.7.

Date Completed	Trainee Initials	Trainer Initials

Graded Practical - Wound Healing, Aging, and Common Disorders of the Friction Ridge Skin
Learning outcomes 4.2.8, 4.3.6, and 4.4.8.

The trainee will identify biological issues in fingerprints and complete a matching practical (10 pairs) that includes impressions before, during, or after changes to the skin (i.e. wound healing, aging, warts, or psoriasis).

Expectations for Passing: No erroneous matches and no more than 3 unmatched prints.

Date Passed	Trainee Initials	Trainer Initials

Essay – Persistency, Physiology, Wound Healing, and Aging of the Friction Ridge Skin

Learning outcomes 2.3.11, 4.1.5, 4.2.9, and 4.3.7.

Answer the following question in less than three pages: What can cause changes to the friction ridge skin and why do these changes occur?

Expectations for Passing:

a) The trainee adequately introduced the concept of persistency using the anatomical connections and physiological processes within the friction ridge skin.
b) The trainee did not over-state the persistent nature of the friction ridge skin.
c) The trainee adequately described the process of wound healing and the possible changes within the patterns, ridge flows, ridges, and minutiae in the friction ridge skin.
d) The trainee adequately described the aging process and expected changes in the ridges, furrows, and incipient ridges of the friction ridge skin.
e) The trainee adequately described warts and psoriasis and the effects of each on the ridges and furrows of the friction ridge skin
f) The trainee organized the content in a logical manner.
g) The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Module 5   Complete Friction Ridge Exemplars

Lesson 5.1   Introduction to Exemplar Prints

The comparison of partial impressions of the friction ridge skin requires adequate recordings of exemplar impressions. This lesson will review the reasons for collecting exemplar prints and the importance of collecting legible and complete exemplars of the friction ridge skin.

Learning Outcomes

5.1.1 The trainee will be able to explain why friction ridge exemplars are obtained.

5.1.2 The trainee will be able to explain the importance of taking clear and complete recordings of the friction ridge skin.

5.1.3 The trainee will be able to explain the differences between standard recordings of the fingers and palms and complete friction ridge exemplars (major case prints).

5.1.4 The trainee will be able to evaluate exemplar prints for completeness and clarity.

Instructional Methods

See Lesson 5.2

Assessments and Performance Expectations

See Lesson 5.2

Lesson 5.2   Methods of Collecting Exemplar Prints – Advanced

This lesson includes the methods used for the collection of exemplar prints from intact friction ridge skin and the challenges and limitations associated with each method.

Learning Outcomes

5.2.1 The trainee will be able to determine when exemplar prints should not be used for comparison (e.g. poor resolution).

5.2.2 Trainee will be able to list the necessary documentation when obtaining exemplar prints.

5.2.3 The trainee will be able to collect complete friction ridge exemplars (major case prints) of the fingers, palms, and feet using the Handiprint system, tape and powder, and inking.

Instructional Methods

Workshop – Collecting Friction Ridge Exemplars

This workshop will demonstrate the proper recording and documentation for friction ridge exemplars. This workshop will also review the differences between standard exemplar prints and complete friction ridge exemplars and compare poor quality versus good quality exemplars. This workshop will cover all learning outcomes in Lessons 5.1 and 5.2.

Date Completed	Trainee Initials	Trainer Initials

Practice – Collecting Exemplars

The trainee will record standard finger and palm exemplars and complete friction ridge exemplars from three (3) individuals; each of the three methods (one Handiprint, one ink, and one tape) must be used once. On a copy of the exemplars, the trainee will highlight low clarity or partially recorded regions that could have been recorded better and discuss improvement strategies with a trainer.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Cutro, B.T. *Chapter 4 – Recording Living and Post-Mortem Friction Ridge Exemplars.* Fingerprint Sourcebook. National Institute of Justice, 2011
- Cowger, James. Friction Ridge Skin: Comparison and Identification, CRC Press, Ann Arbor, 1993, Chapter 2
- Latent Print Technical Manual, Chapter 10

Date Completed	Trainee Initials

Assessments and Performance Expectations

Graded Practical – Collecting Exemplars

All learning outcomes for Lessons 5.1 and 5.2.

The trainee will record a standard tenprint card, rolled palms, and complete friction ridge exemplars from one (1) individual. The trainee should choose the method, or methods, they think will best complete the task, given the condition of the hands they are recording. On a copy of the exemplars, the trainee will highlight low clarity or partially recorded regions that could have been recorded better.

Expectations for Passing: The exemplars contain all the anticipated elements of complete exemplars and areas that could have been recorded better have been highlighted.

Date Passed	Trainee Initials	Trainer Initials

Lesson 5.3   Collecting Exemplar Prints Under Special Circumstances

The collection of exemplar prints from the deceased can pose special problems. This lesson will review methods used to collect exemplar prints from deceased and degraded friction ridge skin and the challenges and limitations associated with each method.

Learning Outcomes

5.3.1 The trainee will be able to describe the basic process for each method of collecting exemplar prints from deceased subjects with intact friction ridge skin.

5.3.2 The trainee will be able to describe the types of distortion expected in exemplar prints from deceased subjects with intact friction ridge skin.

5.3.3 The trainee will be able to collect exemplar prints from deceased subjects with intact friction ridge skin.

5.3.4 The trainee will be able to describe how to collect exemplar prints from friction ridge skin in the following conditions: decomposed, macerated, desiccated, and charred.

5.3.5 The trainee will be able to describe the types of distortion expected in exemplar prints from friction ridge skin in the following conditions: decomposed, macerated, desiccated, and charred.

Instructional Methods

Workshop – Collecting Exemplars from the Deceased

This workshop will describe and demonstrate, if available, the techniques for recording exemplar prints from deceased with intact skin, decomposed skin, macerated skin, desiccated skin, and charred skin. This workshop will also discuss and demonstrate distortion issues related to each condition. This workshop will cover all learning outcomes in Lesson 5.3.

Date Completed	Trainee Initials	Trainer Initials

Practice – Collecting Exemplars from the Deceased

If available during the first 12 months of training, the trainee will collect exemplars from two (2) deceased individuals and review with a trainer.

Date Completed	Trainee Initials	Trainer Initials

Module 6   Introduction to Proximal and Medial Phalange Prints

Lesson 6.1   Full Exemplar Proximal and Medial Phalange Prints

The lower portions of the fingers can present challenges during comparison due to the lack of cores and deltas. This lesson will explore full exemplar impressions of the proximal and medial portions of the fingers and thumbs and the comparison of full inked impressions of the proximal or medial portions of the fingers and thumbs. This exploration includes the macroscopic features, microscopic features, and the significance of these features. The comparisons include different full exemplar recordings of the proximal or medial portions of the fingers (not duplicates of the same rolled impression).

Learning Outcomes

6.1.1 The trainee should be able to describe the size and shape (outline) of rolled impressions of the proximal and medial phalanges.

6.1.2 The trainee will be able to identify major ridge flows in rolled impressions of the proximal and medial phalanges.

6.1.3 The trainee will be able to identify the flexion creases and secondary creases in rolled impressions of the proximal and medial phalanges.

6.1.4 The trainee will be able to recognize the distal orientation of rolled impressions of the proximal and medial phalanges.

6.1.5 The trainee will be able to differentiate between impressions of the proximal phalange and the medial phalange.

6.1.6 The trainee will be able to describe the challenges associated with assigning distal orientation and distinguishing proximal phalange from medial phalange.

6.1.7 The trainee will be able to compare rolled impressions of the proximal and medial phalanges, declare a match or non-match, and articulate the basis for the match or non-match (e.g. similarities or differences in ridge flows, crease shape, scars, and ridge arrangements)

6.1.8 The trainee will be able to discuss the variation in appearance (differences) between rolled proximal and medial phalange impressions from the same source.

6.1.9 The trainee will be able to discuss coincidental similarities in appearance between rolled proximal and medial phalange impressions from different sources.

Instructional Methods

Lecture – Friction Ridge Skin of the Proximal and Medial Phalanges

This lecture will introduce the macroscopic features and microscopic features of the lower phalanges and the usefulness of these features for establishing search parameters and establishing source. This lecture will cover all learning outcomes in Lesson 6.1.

Date Completed	Trainee Initials	Trainer Initials

Practice – Lower Phalanges Matching 10:5

The trainee will compare ten (10) fully rolled impressions of proximal or medial phalanges to five (5) sets of complete friction ridge exemplars.

Date Completed	Trainee Initials	Trainer Initials

Lesson 6.2   Partial Exemplar Proximal and Medial Phalange Prints

The lower portions of the fingers present more challenging comparisons, especially when complete friction ridge exemplars are not available. This lesson introduces partial inked exemplars of the proximal or medial portions of the fingers or thumbs and the comparison of these to standard fingerprint and palm print records. The partial impressions reflect natural touches of a surface and meet the suitability criteria.

Learning Outcomes

6.2.1 The trainee should be able to describe the size and shape (outline) of partial impressions of the proximal and medial phalanges.

6.2.2 The trainee will be able to predict the distal orientation of partial impressions of the proximal and medial phalanges, consider the uncertainty of the prediction, and support the decision.

6.2.3 The trainee will be able to predict left/right handedness of partial impressions of the proximal and medial phalanges, consider the uncertainty of the prediction, and support the decision.

6.2.4 The trainee will be able to select effective target data in partial impressions of the proximal and medial phalanges.

6.2.5 The trainee will be able to compare partial impressions of the proximal and medial phalanges to rolled impressions of the proximal and medial phalanges and exploit the diagnostic macroscopic and microscopic information to include or exclude possible candidates.

6.2.6 The trainee will be able to determine when additional exemplars are required to complete a comparison.

6.2.7 The trainee will be able to evaluate the similarities and differences (variations in appearance) between proximal and medial phalange prints from the same source.

6.2.8 The trainee will be able to evaluate the differences and coincidental similarities between proximal and medial phalange prints from different sources.

6.2.9 The trainee will be able to support the conclusion with the appropriate weighting of macroscopic information and microscopic information.

Instructional Methods

Workshop – Partial Lower Phalanges Exemplars

This workshop will discuss the challenges associated with partial recording of the lower portions of the fingers and thumb. During this workshop, the trainee will also compare how the lower portions of the fingers and thumbs are often recorded in "standard" tenprint and palm print cards and compare these to "Complete Friction Ridge Exemplars". The trainee will also be shown examples of proximal and medial phalange impressions that contain sufficient corresponding region, insufficient corresponding region, and no corresponding region with a rolled impressions of the same finger in the complete friction ridge exemplars. Challenges with making a complete comparison will be discussed. This workshop will cover all learning outcomes in Lesson 6.2.

Date Completed	Trainee Initials	Trainer Initials

Practice – Partial Lower Phalanges 10:5

These exercises include the comparison of 10 proximal or medial phalange impressions (questioned prints) to 5 standard fingerprint and palm print records. These exercises introduce incomplete comparison decisions based on the need for additional exemplar prints as well as inconclusive comparison decisions based on the quality of the latent impression. The questioned prints are not duplicates of the rolled or plain impressions on the tenprint or palm print records (different recordings of the fingers).

Partial Lower Phalanges 10:5 #1 – All questioned prints can be located with sufficient correspondence.

Date Completed	Trainee Initials	Trainer Initials

Partial Lower Phalanges 10:5 #2 – All questioned prints can be located with sufficient correspondence.

Date Completed	Trainee Initials	Trainer Initials

Partial Lower Phalanges 10:5 #3 – All impressions can be located; however, three (3) do not contain sufficient correspondence with the provided subjects and the appropriate conclusion is "incomplete, additional exemplars are necessary for further comparison".

Date Completed	Trainee Initials	Trainer Initials

Fragmentary Lower Phalanges 10:5 #4 – Four (4) of the questioned prints will not be associated with a same source conclusion. Two of these will not have a mated source and the correct responses are either inconclusive or incomplete. Two of these impressions came from the subjects provided but do not contain sufficient correspondence with the provided subjects and the appropriate conclusion is incomplete.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Presentation – Lower Phalanges of the Fingers

Learning outcomes 6.2.1 – 6.2.6.

The trainee will present one incomplete without correspondence and one incomplete comparison which includes correspondence from the Partial Lower Phalange 10:5 comparison exercises to their peers.

Expectations for Passing:

a) The trainee adequately introduced themselves and their background (name, title, formal education, and any previous relevant job experience).
b) The trainee adequately summarized what they have learned thus far in the training program.
c) The trainee adequately described how the macroscopic features were used to establish orientation and most likely handedness for the questioned prints.
d) The trainee adequately described the macroscopic features and target features in the questioned prints that they used to search through the exemplars.
e) The trainee adequately discussed the results of the comparisons.
f) The trainee adequately supported the request for additional exemplar impressions.
g) The presentation was logical (order of the topics and transitions between topics) and cohesive (stayed on message).

Date Passed	Trainee Initials	Trainer Initials

Module 7   Introduction to Palm Prints

Lesson 7.1   *Full Exemplar Palm Prints*

Partial palm impressions are frequently recovered from crime scenes or items of evidence. Palms display a myriad of features across their volar surface. This lesson explores exemplar recordings of the palms. This exploration includes the macroscopic features, microscopic features, and the significance of these features.

Learning Outcomes

7.1.1 The trainee should be able to identify the interdigital, thenar and hypothenar regions of left and right palms.

7.1.2 The trainee should be able to describe size and shape (outline) of full palm prints.

7.1.3 The trainee will be able to distinguish left palms from right palms.

7.1.4 The trainee should be able to recall the frequency of arch, loop, whorl, column, and vestige patterns in each region of the palm.

7.1.5 The trainee should be able to describe the common positions and shapes of the deltas in each region of the palm.

7.1.6 The trainee should be able to describe the range of variation in the number and positions of deltas in each region of the palm.

7.1.7 The trainee should be able to describe the relationship of deltas and patterns in each region of the palm.

7.1.8 The trainee will be able to describe the major ridge flows commonly associated with each region of the palm.

7.1.9 The trainee will be able to describe the location, orientation, and densities of the flexion creases and irregular creases typically associated with each region of the palm.

Instructional Methods

Workshop – Palm Prints

This workshop introduces the regions of the palms and their distinguishing characteristics. This workshop will review the key findings from the literature listed below and demonstrate how to complete the practice exercise below. This workshop will cover all learning outcomes in Lesson 7.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Ashbaugh, David. Quantitative-Qualitative Friction Ridge Analysis, CRC Press, New York 1999, Chapter VIII
- Cowger, James. Friction Ridge Skin: Comparison and Identification, CRC Press, Ann Arbor, 1993, Chapter 3
- Cummins, Harold and Midlo, Charles. Fingerprints, Palms, and Soles: An Introduction to Dermatoglyphics (3rd Edition). Research Publishing Company, South Berlin, MA, 1976
- Maceo, Alice, et al. *Palm Prints*. Encyclopedia of Forensic Science. (2nd Edition) Elsevier, 2013
- Ray, Eric. *Frequency of Patterns in Palms*. JFI 62(6): 568-587, 2012
- Park., J.; Shin, D.; Jung, W.; Chung, M. Improved Analysis of Palm Creases. *Anatomy & Cell Biology* 2010 *43* (2), 169-177. DOI: 10.5115/acd.2010.43.2.169.

Date Completed	Trainee Initials

Practice – Features of Palms

The trainee will highlight patterns, deltas, ridge flows, regular flexion creases, and irregular flexion creases on 10 pairs of palm exemplars.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Quiz – Open Book

All learning outcomes for Lesson 7.1.

Date Completed	Trainee Initials	Trainer Initials

Lesson 7.2   Partial Exemplar Palm Prints

The trainee will begin to learn comparison strategies for partial palm prints by comparing partial inked palm prints to full recordings of the palms. This lesson introduces partial palm prints that reflect natural touches of a surface and meet the suitability criteria, as well as the comparison of these partial palm prints to palm exemplars. The goals of these exercises are to: 1) reinforce palm orientation skills and marking; 2) introduce variability in appearance of palm impressions; 3) reinforce efficient search parameters and target data selection; 4) reinforce inconclusive results; and 5) reinforce recognition of incomplete exemplars. The trainee will be graded on their ability to orient the palm prints, determine anatomical region, and associate the correct person to the palm prints.

Learning Outcomes

7.2.1 The trainee should be able to describe the typical size and shape of impressions from each region of the palm.

7.2.2 The trainee will be able to predict the palm sub-region(s) of partial palm prints, consider the uncertainty of the prediction, and support the decision.

7.2.3 The trainee will be able to predict left/right handedness of partial palm prints, consider the uncertainty of the prediction, and support the decision.

7.2.4 The trainee will be able to predict the distal orientation of partial palm prints, consider the uncertainty of the prediction, and support the decision.

7.2.5 The trainee will be able to select effective target data in partial palm prints.

7.2.6 The trainee will be able to compare partial palm prints to full palm prints and exploit the diagnostic macroscopic and microscopic information to include or exclude possible candidates.

7.2.7 The trainee will be able to determine when additional exemplars are required to complete a comparison.

7.2.8 The trainee will be able to evaluate the similarities and differences (variations in appearance) between palm prints from the same source.

7.2.9 The trainee will be able to evaluate the differences and coincidental similarities between palm prints from different sources.

7.2.10 The trainee will be able to support the conclusion with the appropriate weighting of macroscopic information and microscopic information.

Instructional Methods

A series of workshops and practice exercises will cover all learning outcomes in Lesson 7.2.

Workshop – Partial Palm Print Comparison

This workshop focuses on assigning search parameters and the comparison of partial inked prints from the interdigital region, hypothenar region, and thenar region.

Date Completed	Trainee Initials	Trainer Initials

Practice 1 – Palm Matching 20:40

Palm Matching Set #1 (20:40)

The trainee will compare 20 questioned interdigital prints to 40 standard palm records, all questioned prints can be located. The first 10 questioned prints are oriented "up", the remaining 10 must be oriented by the trainee.

Date Completed	Trainee Initials	Trainer Initials

Palm Matching Set #2 (20:40)

The trainee will compare 20 questioned hypothenar prints to 40 standard palm records, all questioned prints can be located. The first 10 questioned prints are oriented "up", the remaining 10 must be oriented by the trainee.

Date Completed	Trainee Initials	Trainer Initials

Palm Matching Set #3 (20:40)

The trainee will compare 20 questioned thenar prints to 40 standard palm records, all questioned prints can be located. The first 10 questioned prints are oriented "up", the remaining 10 must be oriented by the trainee.

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Palm Matching 30:50

Palm Matching Set #1 (30:50)

The trainee will compare 30 questioned palm prints to 50 standard palm records, all questioned prints can be located. Prior to searching the 30 questioned prints, the trainee will assign palm sub-region(s), distal orientation, and handedness to the questioned prints. After review with a trainer, the trainee will complete the comparisons.

Date Completed	Trainee Initials	Trainer Initials

Palm Matching Set #2 (30:50)

The trainee will compare 30 questioned palm prints to 50 standard palm records. Less than 5 of the questioned prints *cannot* be located in the palm exemplars. Prior to searching the 30 questioned prints, the trainee will assign palm sub-region(s), distal orientation, and handedness to the questioned prints. After review with a trainer, the trainee will complete the comparisons.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Graded Practical – Partial Exemplar Palm Prints

All learning outcomes for Lesson 7.2

Comparison of 12 partial palm prints to 36 palm exemplars. Less than 3 of the questioned prints cannot be located in the exemplar palm prints and different source is the correct conclusion. The trainee must assign orientation and sub-regions(s) for each questioned print prior to searching. These search parameters will be graded prior to exemplars being provided to the trainee.

Expectations for Passing:

- Eighty percent (80%) of the palms must have proper orientation
- Eighty percent (80%) of the palms must have correct anatomical regions noted
- No more than 2 missed associations
- No false same source conclusions

Date Passed	Trainee Initials	Trainer Initials

Module 8   Introduction to Footprints

Lesson 8.1   Full Exemplar Footprints

Partial foot impressions are occasionally recovered from crime scenes or items of evidence. Feet also display a myriad of features across their volar surface. This lesson explores full exemplar recordings of the feet. This exploration includes the macroscopic features, microscopic features, and the significance of these features.

Learning Outcomes

8.1.1 The trainee will be able to identify the toes, hallucal, interdigital, thenar (proximal and distal), hypothenar (proximal and distal) and calcar regions of left and right feet.

8.1.2 The trainee should be able to describe size and shape (outline) of full footprints.

8.1.3 The trainee will be able to distinguish left feet from right feet.

8.1.4 The trainee should be able to recall the frequency of arch, loop, whorl, column, and vestige patterns in each region of the foot.

8.1.5 The trainee should be able to describe the common positions of the deltas in each region of the foot.

8.1.6 The trainee should be able to describe the range of variation in the number and positions of deltas in each region of the foot.

8.1.7 The trainee should be able to describe the relationship of deltas and patterns in each region of the foot.

8.1.8 The trainee will be able to describe the major ridge flows commonly associated with each region of the foot.

8.1.9 The trainee will be able to describe the location, orientation, and densities of the flexion creases and secondary creases typically associated with each region of the foot.

Workshop – Footprints

This workshop introduces the regions of the feet and toes and their distinguishing characteristics. This workshop will review the key findings from the literature listed below and demonstrate how to complete the practice exercises below. This workshop will cover all learning outcomes in Lesson 8.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Cowger, James. Friction Ridge Skin: Comparison and Identification, CRC Press, Ann Arbor, 1993, Chapter 3
- Fox, K.; Plato, C. Toe and Plantar Dermatoglyphics in Adult American Caucasians. *American Journal of Physical Anthropology* 1987 *74* (1), 55-64.
- Cummins, H. and C. Midlo. *Fingerprints, Palms, and Soles: An Introduction to Dermatoglyphics*. 1976, 3rd Edition. Research Publishing Company, South Berlin, MA, 1976
- Johnson, David. *The Friction Ridges of the Feet*. Encyclopedia of Forensic Science. (2nd Edition) Elsevier, 2013

Date Completed	Trainee Initials

<u>Practice – Features of Footprints</u>

The trainee will highlight patterns, deltas, ridge flows, regular flexion creases, and irregular flexion creases on 10 pairs of feet.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

<u>Quiz – Open Book – Footprints</u>

All learning outcomes for Lesson 8.1.

Date Completed	Trainee Initials	Trainer Initials

Lesson 8.2   Partial Exemplar Footprints

As with palms, footprints recovered from crime scenes or items of evidence are often partial. This lesson will include the comparison of partial inked footprints to full recordings of the feet. The partial footprints reflect natural touches of a surface and meet the suitability criteria.

Learning Outcomes

8.2.1 The trainee should be able to describe the typical size and shape of impressions from each region of the foot.

8.2.2 The trainee will be able to predict the foot sub-region(s) of partial footprints, consider the uncertainty of the prediction, and support the decision.

8.2.3 The trainee will be able to predict left/right determinations of partial footprints, consider uncertainty of the prediction, and support the decision.

8.2.4 The trainee will be able to predict the distal orientation of partial footprints, consider the uncertainty of the prediction, and support the decision.

8.2.5 The trainee will be able to distinguish partial palm prints from partial footprints and appropriately assign uncertainty to the determination of palm or foot.

8.2.6 The trainee will be able to select effective target data in partial footprints.

8.2.7 The trainee will be able to compare partial footprints to full footprints and exploit the diagnostic macroscopic and microscopic information to include or exclude possible candidates.

8.2.8 The trainee will be able to determine when additional exemplars are required to complete a comparison.

8.2.9 The trainee will be able to evaluate the similarities and differences (variations in appearance) between footprints from the same source.

8.2.10 The trainee will be able to evaluate the differences and coincidental similarities between footprints from different sources.

8.2.11 The trainee will be able to support the conclusion with the appropriate weighting of macroscopic information and microscopic information.

Instructional Methods

Workshop – Partial Footprint Exemplars

This workshop will introduce strategies for assigning search parameters and challenges associated with distinguishing palm impressions from foot impressions. This workshop will cover all learning outcomes for Lesson 8.2.

Date Completed	Trainee Initials	Trainer Initials

Practice – Footprint Matching

Comparison of 15 partial foot impression to twenty (20) sets of exemplar feet.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Graded Practical – Foot Exemplars

All learning outcomes for Lesson 8.2.

Comparison of 12 partial footprints to 18 sets of feet exemplars. Less than 3 of the questioned prints cannot be located in the exemplar footprints and different source is the correct conclusion. The trainee must assign orientation and sub-regions(s) for each questioned print prior to searching. These search parameters will be graded prior to exemplars being provided to the trainee.

Expectations for Passing:

- Eighty percent (80%) of the feet must have proper orientation.
- Eighty percent (80%) of the feet must have correct anatomical regions noted.
- No more than 2 missed associations.
- No false same source conclusions.

Date Passed	Trainee Initials	Trainer Initials

Module 9   Empirical Observations and Research

Lesson 9.1   History

The use of friction ridge impressions as a means of identification dates back centuries and is nearly ubiquitous around the world. This lesson reviews early historical observations regarding the use of friction ridge impressions, including the earliest uses in Asia, Europe, and the United States.

Learning Outcomes

9.1.1 The trainee will be able to recall the circumstances of the earliest known uses of friction ridge impressions as a means of identification in China, Japan, and India.

9.1.2 The trainee will be able to list the following pioneering practitioners and their contributions to the use of friction ridge impressions: Alphonse Bertillon, Edmond Locard, William Hershel, Azizul Haque, Chandra Bose, Edward Richard Henry, Juan Vucetich, Henry DeForest, Mary Holland, Harold Cummins, John Dondero, Roy Huber and David Ashbaugh.

9.1.3 The trainee will be able to recall the basic circumstances of the following historical events that further established the use of friction ridge impressions as a means of identification: 1904 World's Fair, Will/William West Case, The Belper Committee, The Troupe Committee, and the establishment of the FBI Identification Division.

9.1.4 The trainee will be able to support the current use of friction ridge impressions as a means of personal identification in civil and criminal applications with the history of empirical observations.

Instructional Methods

Lecture – Historical Use of Friction Ridge Impressions

This lecture summarizes the early history of the use of friction ridge impressions as a means of identification. This lecture will also discuss the impact of the development of ABIS on empirical knowledge and the discovery of close non-matches. This lecture will discuss properly qualified statements regarding the history of empirical observations to support the use of friction ridge impressions as a means of identification. This lecture will cover all learning outcomes in Lesson 9.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Ashbaugh, David. Quantitative-Qualitative Friction Ridge Analysis, CRC Press, New York 1999, Chapter II
- Barnes, Jeffrey. *Chapter 1 – History*. Fingerprint Sourcebook. National Institute of Justice, 2011
- Galton, F. Finger Prints 1892
- Interpol. Part 2: Detailing the Method Using Common Terminology and Through the Definition and Application of Shared Principles Interpol European. *Expert Group on Fingerprint Identification II – IEEGFI II* 2004

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – History

Learning outcomes 9.1.1 – 9.1.3

Date Completed	Trainee Initials	Trainer Initials

Lesson 9.2   Professional Organizations

The International Association for Identification (IAI) began over 100 years ago and has continued to be the main professional organization for friction ridge examiners in the United States. Today, the IAI is joined by other working groups and professional bodies that, together, guide the discipline. This lesson reviews empirical observations and opinions published by the IAI and the relevance of Organization of Scientific Area Committees (OSAC) and AAFS Standards Board (ASB) to the friction ridge discipline.

Learning Outcomes

9.2.1 The trainee will be able to recall the purpose and findings of the IAI Standardization Committee.

9.2.2 The trainee will be able to recall the purpose and findings of the IAI Standardization II Committee.

9.2.3 The trainee will be able to recall the IAI's opinion on requiring a pre-determined number of features for the identification of a friction ridge impression.

9.2.4 The trainee will be able to summarize the progression of the IAI's opinion on probabilistic testimony and the use of statistical models.

9.2.5 The trainee will be able to recall the purpose and scope of the OSAC.

9.2.6 The trainee will be able to recall the purpose and scope of the ASB.

Instructional Methods

Lecture – Professional Organizations

This lecture will introduce the IAI committees and resolutions listed below to provide historical context. This lecture will also discuss the purpose and structure of OSAC and ASB. This lecture will cover all learning outcomes in Lesson 9.2

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- International Association for Identification. *Standardization Committee Report*, 1973
- International Association for Identification. *Resolution VII*, 1979
- International Association for Identification. *Standardization II Committee Report*, 2010
- International Association for Identification. *Resolution 2010-18*, 2010
- International Association for Identification. *Position Statement on Conclusions, Qualified Opinions, and Probability Modeling*, February 5, 2017

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – Professional Organizations

All learning outcomes for Lesson 9.2

Date Completed	Trainee Initials	Trainer Initials

Lesson 9.3　　　Twin Fingerprints

Monozygotic twins offer an opportunity to assess the similarities that can occur when two people share their DNA and environmental conditions. Twin fingerprints have been known to sow confusion for both examiners and biometrics verification systems. This lesson reviews significant findings regarding patterns, ridge counts, and minutiae from published research concerning friction ridge impressions from twins.

Learning Outcomes

9.3.1 The trainee will be able to recall the percentage of monozygotic twins, dizygotic twins, and unrelated individuals that share the same pattern on the same finger.

9.3.2 The trainee will be able to compare different study designs and articulate reasons for variation in the findings with respect to the percentage of monozygotic twins, dizygotic twins, and unrelated individuals that share the same pattern on the same finger.

9.3.3 The trainee will be able to recall the percentage of monozygotic twins, dizygotic twins, and unrelated individuals that share the same ridge count on the same finger.

9.3.4 The trainee will be able to compare different study designs and articulate reasons for variation in the findings with respect to the percentage of monozygotic twins, dizygotic twins, and unrelated individuals that share the same ridge count on the same finger.

9.3.5 The trainee will be able to discuss the overall findings of the similarities and differences in minutia between monozygotic twins and non-twins.

9.3.6 The trainee will be able to explain the following concepts from biometric studies: False Acceptance Rate, False Rejection Rate, and Equal Error Rate.

9.3.7 The trainee will be able to describe the impact of twins on the False Acceptance Rate, False Rejection Rate, and Equal Error Rate in some biometric applications.

9.3.8 The trainee will be able to support the observed similarities in patterns and ridge counts on the same fingers of monozygotic twins with the concept of developmental stability.

9.3.9 The trainee will be able to support the observed differences in patterns and ridge counts on the same fingers of monozygotic twins with the concept of developmental noise.

9.3.10 The trainee will be able to support the use of friction ridge impressions as a means of personal identification in civil and criminal applications with findings from published twin research.

Instructional Methods

Lecture – Fingerprints of Twins

This lecture will introduce the data from twin studies and illustrate the level of commonality and differences among twins. These studies have been performed in a number of arenas: early genetic studies, forensic studies, and biometric algorithm performance. This lecture will cover all learning outcomes in Lesson 9.3.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Holt, S. *The Genetics of Dermal Ridges.* Charles Thomas Publisher: Illinois, 1968. All chapters.
- Tao, X.; Chen, X.; Yang, X; Tian, J. Fingerprint Recognition with Identical Twin Fingerprints. *PLoS ONE* 2021 *7* (4), e35704. DOI: 10.1371/journal.pone0035704.
- Lin, C.H.; Liu, J.; Osterburg, J.; Nicol, J. Fingerprint Comparison I: Similarity of Fingerprints. *Journal of Forensic Science* 1982 *27* (2), 290-304.

- Colletto, G.; Kolya, M.; Zimberknopf, S. Diagnosis of Twin Zygosity by Dermatoglyphic Index. *Brazilian Journal of Genetics* 1987 *X* (2), 289-299.
- Pechenkina, E.; Benfer, Jr., R; Vershoubskaya, G.; Kozlov, A. Genetic and Environmental Influence on the Asymmetry of Dermatoglyphic Traits. *American Journal of Physical Anthropology* 2000 *11* (4), 531-543.
- Wong, A.; Gottesman, I; Petronis, A. Phenotypic Differences in Genetically Identical Organisms: The Epigenetic Perspective. *Human Molecular Genetics* 2005 *14* (1), R11-R18. DOI: 10.1093/hmg/ddi116.
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- Plato, C.; Wertelecki, W.; Schwartz, J. Normal and Abberant Palmar Crease in Twins and Siblings. *Acta Geneticae Medicae et Gemellologiae* 1976 *24* (1), 174-176 DOI: 10.1017/S0001566000014070.
- Pandey, A.; Sharma, A. Formulation of Longitudinal Flexion Creases: Validation of Inheritance, Twin Diagnosis and Ethnic Variation. *International Journal of Science and Research* 2016 5 (4) 2296-2300.
- Pandey, A.; Sharma, A. Formulation of Transverse Flexion Creases: Validation of Inheritance, Twin Diagnosis and Ethnic Variation*. Journal of Humanities and Social Science* 2016 *21* (5), 41-49.
- Kong, A.; Zhang, D.; Lu, G. A Study of Identical Twins' Palmprints for Personal Identification. *Pattern Recognition* 2016 *39* (11) 2149-2156. DOI: 10.1016/j.patcog.2006.04.035.

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion group regarding twins and their dual impact on examiner performance and biometric systems and their support for the use of friction ridge impressions as a means of identification.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations
Quiz – Twin Fingerprints

Learning outcomes 9.3.1 – 9.3.7

Date Completed	Trainee Initials	Trainer Initials

Essay – Twin Fingerprints

Learning outcomes 9.3.8 – 9.3.10

Answer the following questions in less than three pages:

1) How do developmental stability, developmental noise, and fluctuating asymmetry support the observations made in the twin studies?
2) How do twin studies support the use of friction ridge impressions as a means of personal identification?

Expectations for Passing:

a) The trainee adequately described monozygotic and dizygotic twins.
b) The trainee adequately summarized findings regarding patterns and ridge counts from twin research.
c) The trainee adequately explained why developmental stability predicts commonality in patterns and ridge counts in the fingerprints of twins.
d) The trainee adequately explained why developmental noise and fluctuating asymmetry predicts some variation in patterns and ridge counts in the fingerprints of twins and a greater variation in ridge arrangements.
e) The trainee adequately supported the use of friction ridge impressions as a means of identification without overstating the findings of twin research.
f) The trainee organized the content in a logical manner.
g) The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 9.4   Fingerprint Pattern Distribution and Fingerprint Minutiae Distribution

Introduction

Friction ridge examiners in the United States and many other countries are often asked why there is not a specific minutiae (point) standard for making an identification. This lesson will review published research on the distribution of patterns and minutiae in fingerprints and illuminate why the dependent nature of minutiae does not support a point standard from a scientific viewpoint.

Learning Outcomes

9.4.1 The trainee will be able to describe the variation in pattern frequency by finger.

9.4.2 The trainee will be able to describe the variation in ridge count by finger.

9.4.3 The trainee will be able to describe the variation in minutiae count by finger.

9.4.4 The trainee will be able to describe the variation in minutiae count by pattern.

9.4.5 The trainee will be able to describe the variation in minutiae count by sex.

9.4.6 The trainee will be able to describe the diversity of minutiae type by finger.

9.4.7 The trainee will be able to describe the regional density of minutiae in fingerprints.

9.4.8 The trainee will be able to describe how pattern influences minutiae direction.

9.4.9 The trainee will be able to support the International Association for Identification's stance that there is no scientifically valid minimum feature count necessary to support an identification using findings from published fingerprint pattern and minutiae studies.

Instructional Methods

Lecture – Fingerprint Pattern and Minutiae Distribution

This lecture will review published research and data on the distribution of the patterns and minutiae in fingerprints and discuss why there is no scientific basis for a point minimum when making an identification. This lecture will cover all learning outcomes in Lesson 9.4.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Champod, C.; Lennard, C.; Margot, P.; Stoilovic, M. *Fingerprints and Other Ridge Skin Impressions*, Second Edition. CRC Press: New York, 2016. Chapter 2, 33-126; Appendix A, 347-357; Appendix B, 359-363.
- Gutiérrez-Redomero, E.; Alonso-Rodríguez, C.; Hernández-Hurtado, L.; Rodríguez-Villalba, J. Distribution of the Minutiae in the Fingerprints of a Sample of the Spanish Population. *Forensic Science International* 2011 *208*, 79-90. DOI: 10.1016/j.forsciint.2010.11.006.
- Interpol. Part 2: Detailing the Method Using Common Terminology and Through the Definition and Application of Shared Principles Interpol European. *Expert Group on Fingerprint Identification II – IEEGFI II* 2004.
- Kondeková, M.; Benus, R.; Masnicová, S.; Svábová, P. Distribution of the Minutiae in Hypothenar Palm Prints in Slovak Adults: Indication for Personal Identification. *Journal of Forensic Science* 2020 *65* (4), 1303-1309. DOI: 10.111/1556-40299.
- Rivaldería, N.; Gutiérrez-Redomero, E., Distribution of the Minutiae in Palm Prints: Topological and Sexual Variability. *Journal of Forensic Science* 2020 *66* (1), 135-148. DOI: 10.111/1556-4029.14583.

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion group regarding pattern and minutiae distribution studies and their links to embryology, history, and the IAI position statements.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Quiz – Fingerprint Pattern and Minutiae Distribution

Learning outcomes 9.4.1 – 9.4.8

Date Completed	Trainee Initials	Trainer Initials

Essay – Fingerprint Pattern and Minutiae Distribution

Learning outcome 9.4.9

Answer the following questions in less than four pages:

1) How does the embryological development of the friction ridges support the findings of the minutiae distribution studies?
2) How do minutiae distribution studies support the International Association for Identification's stance that there is no scientifically valid minimum feature count necessary to support an identification?

Expectations for Passing:

a) The trainee adequately summarized the findings from pattern distribution studies.
b) The trainee adequately summarized findings from minutiae distribution studies and described minutiae dependences.
c) The trainee adequately explained the link between the embryological development of patterns and ridge flows and pattern force minutiae.
d) The trainee adequately explained how minutiae distribution studies support the International Association for Identification's stance that there is no scientifically valid minimum feature count necessary to support an identification.
e) The trainee organized the content in a logical manner.
f) The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 9.5   Statistics and Fingerprint Probability Models

Statisticians and researchers have been trying to develop reliable statistical models for friction ridge impressions for over 100 years, but the complex dependencies of minutiae make a stable model elusive. This lesson will review probability and statistics theory as necessary to support the learning outcomes for this topic. This lesson will also introduce published fingerprint statistical models.

Learning Outcomes

9.5.1 The trainee will be able to define the following descriptive statistics terms: variable, data, mean, median, mode, range, standard deviation, probability (subjective and objective or empirical and classical), propositions and competing propositions, frequency distributions, and statistics.

9.5.2 The trainee will be able to recognize displays that illustrate the central tendency (e.g. mean, median, mode, etc.) and variability of descriptive data (e.g. standard deviation, range etc.).

9.5.3 The trainee will be able to explain the following concepts from probability theory: axioms of mathematical probability; definition of probability function; definition of conditional probability; transposition of a conditional probability; differences between a likelihood and a probability; relationship between probabilities and odds; and components of the odds for of Bayes' rule for binary variables (prior probability, likelihood ratio, posterior probability) and their relationship.

9.5.4 The trainee will be able to discuss the differences and relationship between descriptive and inferential statistics.

9.5.5 The trainee will be able to recognize the following concepts from inferential statistics: probability distribution and its parameters; difference between population parameters and sample statistics; methods to estimate a population proportion from a sample statistic; and measurement error (including bias and random error), sampling error, and modeling error.

9.5.6 The trainee will be able to distinguish between probability estimates calculated using an appropriate model and subjective estimates based upon observations interpreted using the examiner's experience.

9.5.7 The trainee will be able to recognize examples of descriptive statistics and inferential statistics in fingerprint models.

9.5.8 The trainee will be able to recall the basic premise of fingerprint models that calculate a probability of random correspondence.

9.5.9 The trainee will be able to recall the basic premise of fingerprint models that calculate a likelihood ratio.

9.5.10 The trainee will be able to recognize the probability of random correspondence approach and the likelihood ratio approach in fingerprint models.

9.5.11 The trainee will be able to recognize the following conditional probabilities with respect to the results of fingerprint statistical modeling: sensitivity, specificity, false positive rate, false negative rate, positive predictive value, negative predictive value, false positive discovery rate, and false negative discovery rate.

9.5.12 The trainee will be able to evaluate the general strengths and limitations of fingerprint statistical models.

9.5.13 The trainee will be able to support the International Association for Identification's stance that there is no scientifically valid minimum feature count necessary to support an identification using findings from published articles describing fingerprint statistical models.

9.5.14 The trainee will be able to support the use of friction ridge impressions as a means of personal identification in civil and criminal applications using findings from published articles describing fingerprint statistical models.

Instructional Methods

Lectures

Lecture 1 – Review of Probability and Statistics

This lecture will introduce basic concepts in probability and statistics. This lecture will cover learning outcomes 9.5.1 – 9.5.6.

Date Completed	Trainee Initials	Trainer Initials

Lecture 2 – Fingerprint Statistical Models

This lecture will introduce concepts specific to fingerprint statistical models. This lesson will cover learning outcomes 9.5.7 – 9.5.14.

Date Completed	Trainee Initials	Trainer Initials

Literature/Resource Review

- Abraham, Joshua et.al. *Modern statistical models for forensic fingerprint examinations: A critical review*. FSI 232 (2013) 131-150
- Art of The Problem. Conditional Probability Explained Visually (Bayes Theorem Formula). YouTube https://www.youtube.com/watch?v=Zxm4Xxvzohk
- Downey, Allen. Learning to Love Bayesian Statistics. YouTube https://www.youtube.com/watch?v=R6d-AbkhBQ8
- Champod, Christophe et al. Fingerprints and Other Ridge Skin Impressions. CRC Press, New York, 2016. Chapter 2
- European Network of Forensic Science Institutes (ENFSI) Guideline for Evaluative Reporting in Forensic Science, 2015.
- Kahn Academy. Probability Explained; Independent and Dependent Events; Probability and Statistics. You Tube https://www.youtube.com/watch?v=uzkc-qNVoOk
- Langenburg, Glenn. NIJ Fingerprint Sourcebook Chapter 14 Scientific Research Supporting the Foundations of Friction Ridge Examinations 2011
- Neumann, Cedric et.al. *Quantifying the weight of evidence from a forensic fingerprint comparison: A new paradigm.* J. R. Statist. Soc. A 175 (2012) Part 2 371-415
- Neumann, Cedric et.al. Operational benefits and challenges of the use of fingerprint statistical models: A field study. FSI 212 (2011) 32-46
- Neumann, Cedric et.al. *Quantifying the weight of fingerprint evidence through the spatial relationships, directions, and types of minutiae observed on fingermarks*. FSI 248 (2015) 154- 171
- Neumann, Cedric. *Statistics and Probabilities as a Means to Support Fingerprint Examination*. Advances in Fingerprint Technology, 3rd Edition, CRC Press, New York 2013 – Chapter 15
- Shaneyfeld, Terry. What are Likelihood Ratios and How are They Used. YouTube https://www.youtube.com/watch?v=TzPvCSFZUSQ
- Stoney, David. *Measurement of Fingerprint Individuality*. Advances in Fingerprint Technology, 2nd Edition, CRC Press, New York 2001 - Chapter 9
- Swofford, H. et al. "A method for the statistical interpretation of friction ridge skin impressions evidence: Method development and validation." *Forensic Science International*. 2018. 287. 113- 126

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion regarding the learning outcomes in this lesson.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Quiz – Open Book – Statistics and Fingerprint Probability Models

Learning outcomes 9.5.1 – 9.5.11

Date Completed	Trainee Initials	Trainer Initials

Presentation – Statistics and Fingerprint Probability Models

Learning outcomes 9.5.12 – 9.5.14

The trainee will create and deliver a presentation explaining the potential value of fingerprint statistical models, but why the WSP Crime Laboratory does not currently use a statistical model for casework friction ridge examinations.

Expectations for Passing:

a) The trainee adequately introduced themselves and their background.
b) The trainee adequately introduced the general PRC and LR strategies of fingerprint statistical models.
c) The trainee adequately supported the International Association for Identification's stance that there is no scientifically valid minimum feature count necessary to support an identification using findings from published articles describing fingerprint statistical models.
d) The trainee adequately supported the use of friction ridge impressions as a means of personal identification in civil and criminal applications using findings from published articles describing fingerprint statistical models.
e) The trainee adequately introduced the strengths and limitations of fingerprint statistical models.
f) The trainee adequately explained why the WSP Crime Laboratory is not currently using a statistical model in casework.

Date Completed	Trainee Initials	Trainer Initials

Module 10   Feature Detection

Lesson 10.1   Introduction to Digital Imaging

The documentation and processing of latent prints requires knowledge of our digital imaging software. This lesson will include instruction on the use of the software, basic digital imaging concepts, and approved digital processing techniques and tools.

Learning Outcomes

10.1.1 The trainee will be able to explain the following concepts and the relationships between them: image resolution, file compression, image size, and file types.

10.1.2 The trainee will be able to select the appropriate methods to digitally process friction ridge impressions.

10.1.3 The trainee will be able to select the appropriate tools for documenting friction ridge impressions.

10.1.4 The trainee will be able to follow procedures for saving images of friction ridge impressions.

Instructional Methods

Workshop & Practice #1 – Basic Photoshop

This workshop will cover the basic Photoshop functions necessary to annotate the images for the exercises in this section. The workshop will include: setting up the workspace, opening files, navigating Photoshop menus, file types, resolution, file compression, image size, save as to create a copy, the concept of layers, creating layers, changing the opacity of layers, paint tool, selecting colors, erasure tool, undo, history, zoom, rotating images, and saving files with layers. This training will include practice on images of latent prints recovered with black powder.

Date Completed	Trainee Initials	Trainer Initials

Workshop & Practice #2 - Advanced Photoshop

This workshop will cover advanced Photoshop processing techniques that can be performed on latent print images to enhance the visibility of the friction ridge detail. The workshop will include: adjustment layers, appropriate filters, selection tools, canvas, color space, histograms, pattern removal tools, destructive and non-destructive image processing, matching image resolution and physical size (for charting), use of guides, and creating contact sheets. This training will include practice on actual latent images.

Date Completed	Trainee Initials	Trainer Initials

Literature/Resource Review

- Chavez, Conrad. Adobe Photoshop Classroom in a Book (2023 Release). Adobe Press, 2022.
- London, Barbara, et al. Photography, 12th Edition. Pearson, 2016, Chapters 8-10.
- London, Barbara, et al. A Short Course in Photography: Digital, 4th Edition. Pearson, 2018, Chapter 5.
- Long, Ben. Complete Digital Photography, 9th Edition. CDP, 2018, pages 252-266 and 308-365.
- Peterson, Bryan. Understanding Close-Up Photography: Creative Close Encounters with or Without a Macro Lens. Amphoto Books, 2009, pages 12-18.
- Redsicker, David R. Forensic Photography, 2nd Edition. CRC Press, New York, 2000, Chapter 10.
- Robinson, Edward. Crime Scene Photography, 3rd Edition. Elsevier, 2016, Chapters 7 and 10-12.
- Russ, John C. Forensic Uses of Digital Imaging. CRC Press, New York, 2021, Chapters 1-3.

Date Completed	Trainee Initials

Assessments and Performance Expectations

Graded Practical – Digital Imaging

The trainee will demonstrate proper digital imaging practices on four latent prints exhibiting low contrast or color interference (pass/fail).

Date Passed	Trainee Initials	Trainer Initials

Lesson 10.2   Visual Interpretation of Ridge Detail in Latent Prints: Residue

The residue on the surface of the friction ridge skin can range in its composition, and some of these variables can be deduced by the appearance of the ridges and furrows. This lesson will introduce the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: the types of residues commonly found on the friction ridge skin (sebaceous secretions, eccrine sweat, combined sebaceous and eccrine sweat, and blood); variations in the distribution of residue on the skin; and the deposition of the residue onto surfaces.

Learning Outcomes

10.2.1 The trainee should be able to recognize the effects various residues can have on the appearance of latent prints.

10.2.2 The trainee should be able to describe potential variations in the distribution of residue on the surface of the skin.

10.2.3 The trainee should be able to explain how the residue is deposited to a surface and how the distribution of the residue impacts the manner in which the residue is deposited.

10.2.4 The trainee should be able to predict the appearance of the contact regions (e.g. tops of the ridges) and non-contact regions (e.g. furrows, creases, and wrinkles) of the skin given the different ways the residue can be distributed on the surface of the skin.

Instructional Methods

Workshop & Practice – Residue on the Friction Ridge Skin & Ridge Tracing

The workshop will introduce the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: the types of residues commonly found on the friction ridge skin; variations in the distribution of residue on the skin; and the deposition of the residue onto surfaces. During the workshop, latents will be created with different types of residues. The workshop will cover all learning outcomes in Lesson 10.2.

For practice, trace the ridges and mark the minutiae in ground truth latent samples (processed with black powder) containing different types of residues (oil-based residue; water-based residue; and mixed) and different distributions of the residue within the skin (light and heavy). Trace the ridges in ground truth blood print samples. The trainee is expected to use the known print to help interpret the ridge paths and minutiae in the latent print. The trainee will discuss the reliability of the features marked and distortion interpretation with the trainer.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

See Lesson 10.5

Assessments and Performance Expectations

See Lesson 10.5

Lesson 10.3   Visual Interpretation of Ridge Detail in Latent Prints: Contact

The manner in which the friction ridge skin contacts a surface can create variation in the appearance of the features. This lesson will review the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: variations in deposition pressure when the skin contacts surface; movement of the skin on the surface and the redistribution of residue onto a surface; changes in deposition pressure as the skin moves on the surface; and combined residue and touch factors.

Learning Outcomes

10.3.1 The trainee should be able to recognize global deposition pressure based on the size and shape of impressions and the nature of the surface touched.

10.3.2 The trainee should be able to recognize local variations in deposition pressure within one contact with the surface (i.e., within one impression) based on the ridge and furrow dimensions.

10.3.3 The trainee should be able to explain localized deposition pressures within one contact of the surface due to the anatomy of the hand or foot and the nature of the surface touched.

10.3.4 The trainee should be able to predict the variation in appearance of the ridges and furrows throughout an impression due to localized deposition pressures and variations in residue distribution on the skin.

10.3.5 The trainee should be able to define the following terms related to skin contact with a surface: stick region, incipient slip, and gross slip.

10.3.6 The trainee will be able to describe the visual cues that indicate the skin moved laterally (shearing stress) or twisted (torque) on porous and non-porous surfaces.

10.3.7 The trainee should be able to describe how the residue is redistributed on the surface when the skin experiences incipient slip or gross slip.

10.3.8 The trainee should be able to predict the variation in the appearance of the ridges and furrows throughout an impression due to the redistribution of the residue on the surface during incipient slip or gross slip.

10.3.9 The trainee will be able to describe the visual cues (e.g., misaligned ridges and furrows) that indicate the skin changed pressure during an incipient slip or gross slip.

10.3.10 The trainee will be able to describe the visual cues that skin made multiple contacts with a surface (e.g., interference patterns).

<u>Workshop & Practice – Contact of the Friction Ridge Skin, Distortion, and Ridge Tracing</u>

The workshop will introduce the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: variations in deposition pressure when the skin contacts surface; movement of the skin on the surface and the redistribution of residue onto a surface; changes in deposition pressure as the skin moves on the surface; and combined residue and touch factors. During the workshop, latents will be created with different deposition pressures and movement. The workshop will cover all learning outcomes in Lesson 10.3.

For practice, identify the primary contact distortion and trace the ridges and mark the minutiae in ground truth latent samples (processed with black powder) containing different contact issues. The trainee is expected to recognize the dominant contact distortion, use appropriate terminology explaining the distortion to the trainer, and use the known print to help interpret the ridge paths and minutiae in the latent print. The trainee will discuss the reliability of the features marked and distortion interpretation with the trainer.

Date Completed	Trainee Initials	Trainer Initials

<u>Literature Review</u>

See Lesson 10.5

Assessments and Performance Expectations

See Lesson 10.5

Lesson 10.4   Visual Interpretation of Ridge Detail in Latent Prints: Surfaces

Introduction

People touch all manner of surfaces during their daily lives. Some of these surfaces can create challenges in the comparison and evaluation phases of the examination by creating unexpected variations in the macroscopic and microscopic features. This lesson will review the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: deformation of the friction ridge skin with commonly touched surfaces (e.g. flat versus curved surfaces); the interaction of friction ridge skin residue with commonly touched surfaces; the introduction of background noise by textured surfaces; the introduction of background noise by surface contaminants; the interaction of latent print residue with surface contaminants; and combined residue, touch and surface factors.

Learning Outcomes

10.4.1 The trainee will be able to explain how the shape of surfaces touched can affect the appearance of friction ridge impressions (e.g., flat and contoured surfaces).

10.4.2 The trainee will be able to explain how the firmness of surfaces touched can affect the appearance of friction ridge impressions.

10.4.3 The trainee will be able to explain how the texture of surfaces touched can affect the appearance of friction ridge impressions.

10.4.4 The trainee will be able to explain how interactions of latent print residues with typical surfaces can affect the appearance of friction ridge impressions.

10.4.5 The trainee will be able to explain how interactions of latent print residues with surface contaminants can affect the appearance of friction ridge impressions.

10.4.6 The trainee will be able to explain how the displacement or removal of surface contaminants by the skin can affect the appearance of friction ridge impressions.

Instructional Methods

Workshop & Practice – Effects of the Surface Touched by the Friction Ridge Skin, Distortion, and Ridge Tracing

The workshop will introduce the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: deformation of the friction ridge skin with commonly touched surfaces (e.g., flat versus curved surfaces); the interaction of friction ridge skin residue with commonly touched surfaces; the introduction of background noise by textured surfaces; the introduction of background noise by surface contaminants; the interaction of latent print residue with surface contaminants; and combined residue, touch and surface factors. The workshop will cover all learning outcomes in Lesson 10.4.

For practice, identify the primary surface distortion and trace the ridges and mark the minutiae in ground truth latent samples (processed with black powder) containing different surface distortion issues. The trainee is expected to recognize combined distortion factors, use appropriate terminology explaining the distortion to the trainer, and use the known print to help interpret the ridge paths and minutiae in the latent print. The trainee will discuss the reliability of the features marked and distortion interpretation with the trainer.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

See Lesson 10.5

Assessments and Performance Expectations

See Lesson 10.5

Lesson 10.5   Visual Interpretation of Ridge Detail in Latent Prints: Processing Technique

Latent prints are recovered through a myriad of development techniques. This lesson will review the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: the reaction of the processing technique to the latent print residue; the reaction of the processing technique to surface contaminants; the recovery method (e.g., type of photography or lifting); sequential processing; and combined residue, touch, surface, and processing factors.

Learning Outcomes

10.5.1 The trainee will be able to describe the general use of each processing technique used by WSPCLD or submitting agencies.

10.5.2 The trainee will be able to recognize friction ridge impressions developed with different processing techniques.

10.5.3 The trainee will be able to explain how interactions of the processing technique with surface contaminants can affect the appearance of friction ridge impressions.

10.5.4 The trainee will be able to explain how time and environmental conditions (from the time the impression was deposited to when it was recovered) can affect the appearance of friction ridge impressions.

10.5.5 The trainee will be able to explain how the methods used to recover impressions can affect the appearance of friction ridge impressions.

Instructional Methods

Lecture - Introduction to Latent Processing Techniques

This lecture will introduce the following basic latent print development techniques: powder, cyanoacrylate, fluorescent dye stains, fluorescent cyanoacrylate, diazafluorenone, and ninhydrin. For each method, the lecture will cover the types of surfaces the method is used on, the latent print component targeted, and the typical appearance of developed ridge detail.

Date Completed	Trainee Initials	Trainer Initials

Workshop & Practice – Effects of Processing Techniques on Friction Ridge Impressions, Development Techniques, and Ridge Tracing

The workshop will introduce the visual effects of the following on the appearance of macroscopic and microscopic features in friction ridge impressions: the reaction of the processing technique to the latent print residue; the reaction of the processing technique to surface contaminants; the preservation method (e.g., type of photography or lifting); sequential processing; and combined residue, touch, surface, and processing factors. The workshop will cover all learning outcomes in Lesson 10.5.

For practice, identify the development technique, dominant color of the ridges, and trace the ridges and mark the minutiae in ground truth latent samples (processed with reagents **except** black powder). The trainee is expected to recognize combined distortion factors, use appropriate terminology explaining the distortion to the trainer, and use the known print to help interpret the ridge paths and minutiae in the latent print. The trainee will discuss the reliability of the features marked and distortion interpretation with the trainer.

Date Completed	Trainee Initials	Trainer Initials

<u>Literature Review</u>

- Fingermark Visualization Manual, Section 2, Home Office, 2014
- Champod, Christophe et al. Fingerprints and Other Ridge Skin Impressions, 2nd Edition. CRC Press, 2016, Chapter 3
- Cowger, James. Friction Ridge Skin: Comparison and Identification, CRC Press, 1993, Chapter 7

Date Completed	Trainee Initials

Assessments and Performance Expectations

<u>Graded Practical – Visual Interpretation of Ridge Detail in Latent Prints: Residue, Contact, Surfaces, and Processing Techniques</u>

All learning outcomes for Lessons 10.2 – 10.5.

The trainee will be provided ten latent prints exhibiting a mix of ground truth distortions. The trainee must provide reasonable interpretations of distortions present in the latent prints and accurately mark minutiae.

Expectations for Passing: 80% of the obvious minutiae (as determined by consensus of experienced examiners) are marked and no more than 2 false minutiae are marked.

Date Passed	Trainee Initials	Trainer Initials

Module 11   Examination Method – Casework Practices

Lesson 11.1   Introduction to Logic and Reasoning

Providing conclusions to a friction ridge examination requires critical thinking. Critical thinking is based on logic and reasoning skills acquired during the training process. This lesson will introduce logic and reasoning as it pertains to the examination of friction ridge impressions. The main goal of this lesson is for the trainee to think about how they think.

Learning Outcomes

11.1.1 The trainee will be able to explain how inferences are formed using deductive, inductive, and abductive logic.

11.1.2 The trainee will be able to describe circumstances in which deductive, inductive, and abductive logic are utilized to make inferences.

11.1.3 The trainee will be able to evaluate the strengths and limitations of the different forms of logic used to make inferences.

11.1.4 The trainee will be able to debate the benefits and limitations of reporting discrete examination conclusions.

11.1.5 The trainee will be able to debate the benefits and limitations of reporting continuous statistical conclusions (posterior probabilities, likelihood ratio, Bayes factor, and conditional match probability).

11.1.6 The trainee will be able to recognize fallacies of logic, faulty reasoning, circular reasoning, transposing the conditional, prosecutor's fallacy, and appeal to authority.

Instructional Methods

Lecture – Logic and Reasoning

The lecture will introduce concepts in logic and reasoning and how these concepts apply to decision-making in friction ridge examinations. This lecture will cover all learning outcomes in Lesson 11.1.

Date Completed	Trainee Initials	Trainer Initials

Discussion Group

The trainee will participate in a discussion regarding the benefits and limitations of reporting discrete examination conclusions and the benefits and limitations of reporting continuous statistical conclusions (posterior probabilities, likelihood ratio, Bayes factor, and conditional match probability).

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Literature Review

- Biedermann, A., Bozza S., and Taroni, F. "Decision theoretic properties of forensic identification: Underlying logic and argumentative implications." 2008. Pages 177, 120-132. *Forensic Science International.*
- Vanderkolk, J. Forensic Comparative Science. 2009. Elsevier Academic Press, London, Chapter 6.

- Holyoak, Keith and Morrison, Robert eds. The Cambridge Handbook of Thinking and Reasoning. Cambridge University Press, 2005, Chapters 1, 5, 8-13, and 29.

Date Completed	Trainee Initials

Lesson 11.2   Analysis

The decision to retain a print for comparison is one of the most critical decision points during the examination of friction ridge impressions. The decision is hard to learn because there is no explicit process and it depends on the set of features present in any given impression which can be somewhat influenced by human factors. This lesson will review the process for detecting macroscopic and microscopic features, thresholds for suitability decisions, documentation of suitable friction ridge impressions, establishment of search parameters (anatomical region, distal orientation and associated uncertainties), documentation of search parameters, and detection of forged or fabricated prints.

Learning Outcomes

11.2.1 The trainee will be able to detect the macroscopic and microscopic information in friction ridge impressions under various combinations of: residue, contact, surface, and processing technique.

11.2.2 The trainee will be able to predict the range of variation in appearance of macroscopic and microscopic information (also known as "tolerance") among friction ridge impressions from the same source under various combinations of: residue, contact, surface, processing technique, and exemplar recording technique.

11.2.3 The trainee will be able to evaluate how false minutiae could be created by factors associated with residue, contact, surface, and processing technique.

11.2.4 The trainee will be able to indicate debatable minutiae.

11.2.5 The trainee will be able to categorize friction ridge impressions as "suitable" or "not suitable" for comparison based on the significance of the information in the impression (macroscopic and microscopic) and the requirements of the Latent Prints Technical Manual.

11.2.6 The trainee will be able to support "suitable" and "not suitable" decisions per the requirements of the Latent Prints Technical Manual.

11.2.7 The trainee will be able to explain the reasons friction ridge impressions may display debatable suitability.

11.2.8 The trainee will be able to document suitability decisions and consultations.

11.2.9 The trainee will be able to predict the anatomical region(s) represented in friction ridge impressions, consider the uncertainty of the prediction, and support the decision.

11.2.10 The trainee will be able to predict the distal orientation of friction ridge impressions, consider the uncertainty of the prediction, and support the decision.

11.2.11 The trainee will be able to document anatomical region, distal orientation, and associated uncertainties.

11.2.12 The trainee will be able to categorize friction ridge impressions as "suitable" or "not suitable" for ABIS (Automated Biometric Identification System) searches based on the information in the impression (macroscopic and microscopic).

11.2.13 The trainee will be able to support ABIS "suitable" and "not suitable" decisions.

11.2.14 The trainee will be able to document ABIS suitability decisions per FSP requirements.

11.2.15 The trainee will be able to recognize common methods of forged or fabricated friction ridge impressions.

Instructional Methods

Lecture – Analysis

This lecture will introduce the process for detecting macroscopic and microscopic features, thresholds for suitability decisions, thresholds for database entry, documentation of suitable friction ridge impressions, use of color-coded analysis markups, establishment of search parameters (anatomical region, distal orientation and associated uncertainties), documentation of search parameters, and detection of forged or fabricated prints. This lecture will cover all learning outcomes in Lesson 11.2 and will review key findings from the literature listed below.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Latent Prints Technical Manual, Sections 7.0-7.3.1 and 7.4.1.
- Langenburg, G. *A Critical Analysis and Study of the ACE-V Process*. 2012. University of Lausanne PhD Thesis.
- Hicklin, A. *Improving the Rigor of the Latent Print Examination Process*. University of Lausanne PhD Thesis, 2017.
- Champod, Christophe, et al. Fingerprints and Other Ridge Skin Impressions. (2nd Edition) CRC Press, New York, 2016.
- Eldridge, Heidi – "Understanding, Expanding, and Predicting the Suitability Decision in Friction Ridge Analysis" 2020 Volume 314 *Forensic Science International.*
- Wertheim, Pat. Detection of forged and fabricated latent prints. JFI 44(6): 652-681, 1994.

Date Completed	Trainee Initials

Workshops

Workshop 1 – Search Parameters

This workshop will demonstrate the assignment of search parameters to latent prints from the various regions of the friction ridge skin. This workshop will describe factors and feature combinations that should elevate or reduce certainty in search parameters. The trainee will annotate search parameters and indicate uncertainty following the guidelines presented.

Date Completed	Trainee Initials	Trainer Initials

Workshop 2 – Suitability and Complexity

This workshop will demonstrate the application of the suitability criteria to latent prints from various regions of the friction ridge skin. Clearly suitable and clearly unsuitable prints will be demonstrated, followed by borderline or complex latent prints that may cause disagreements among examiners. Topics include: ambiguous anatomical regions, absence of anchors, absence of distances between anchors, lack of robust ridges, poor contrast, overlays and double taps, tonal transitions, discontinuous ridge detail, poor ratio of good:bad surface area, low minutia count, and low specificity of available detail. The trainee will annotate complexity factors on latent print images and articulate reasonable causes of poor-quality ridge detail and the appearance of false friction ridge detail in impressions.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations
Graded Practical – Suitability and Complexity

Learning outcomes 11.2.1 – 11.2.6, 11.2.8, and 11.2.12

The trainee will demonstrate the ability to determine the suitability of latent prints and recognize factors associated with complex latent prints. Twenty-five (25) latent prints will be assessed as to suitability for comparison and complexity. Color coded analysis markups will be used to document all of value decisions.

Expectations for Passing:

Suitable for Comparison

- No more than 3 suitable prints *not* marked for comparison.
- No more than 3 unsuitable prints marked for comparison.

Complexity

- No more than 3 complex prints marked as non-complex.
- No more than 3 non-complex prints marked as complex.
- Valid explanations for complexity in those latent prints indicated as complex.

Date Passed	Trainee Initials	Trainer Initials

Lesson 11.3   Comparison

The comparison process bridges the Analysis and Evaluation phases of ACE. Many examination errors are due to establishing poor search parameters or not recognizing variation in appearance of two impression from the same source skin. This lesson will include the selection of target data in the questioned friction ridge impression, the process for searching target data through exemplar prints, and the side-by-side comparison of a questioned and exemplar print.

Learning Outcomes

11.3.1 The trainee will be able to select effective target data in the questioned friction ridge impression.

11.3.2 The trainee will be able to search target data in questioned friction ridge impressions through exemplar friction ridge impressions and exploit the diagnostic macroscopic and microscopic information to include or exclude possible candidates.

11.3.3 The trainee will be able to determine when additional exemplars are required to complete a comparison.

11.3.4 The trainee will be able to compare (side-by-side) questioned and exemplar friction ridge impressions and detect similarities and differences in the diagnostic macroscopic and microscopic information.

11.3.5 The trainee will be able to weigh the similarities and differences between impressions from the same source.

11.3.6 The trainee will be able to weigh the similarities and differences between impressions from different sources.

11.3.7 The trainee will be able to document comparisons according to the Latent Prints Technical Manual.

Instructional Methods

Workshop – Quest for Close Non-Matches

The trainee will search six to eight minutiae from regions of 30 ground truth latent prints through the WIN's ABIS database to find close non-matches. The trainee will print any candidate with six (6) or more paired minutiae for discussion with a trainer.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Latent Prints Technical Manual, Sections 7.3.2 and 7.4.2

Assessments and Performance Expectations

See Comparison Competency Test in Lesson 11.4

Lesson 11.4   Evaluation

At the end of the comparison stage, examiners must formulate a conclusion. Sometimes this conclusion is straight-forward, other times in involves a great deal of interpretation and reflection. This lesson describes the inferential process and thresholds for rendering source conclusions as required by the Latent Prints Technical Manual.

Learning Outcomes

11.4.1 The trainee will be able to formulate appropriate source conclusions.

11.4.2 The trainee will be able to support source conclusions with the appropriate weighing of macroscopic information and microscopic information.

11.4.3 The trainee will be able to predict which comparisons may result in debatable conclusions and require consultation with colleagues.

11.4.4 The trainee will be able to explain the reasons comparisons may result in debatable conclusions.

11.4.5 The trainee will be able to document source conclusions and consultations per the Latent Prints Technical Manual.

Instructional Methods

Practice – Comparison Cases
The goals of these 15 training cases are to: 1) introduce typical casework comparison case evidence; 2) introduce victim exemplar prints; 3) reinforce casework documentation; 4) introduce live-scan exemplars; 5) reinforce search parameters; 6) reinforce thresholds for suitability and recognition of complexity levels; 7) reinforce thresholds for conclusions; 8) reinforce recognition of incomplete exemplars; 9) reinforce WSPCLD policies and procedures; and 10) introduce use of the ADAMS for comparison cases. Color coded analysis markups will be used to document all of value decisions. If a latent print is considered "complex" the trainee will indicate the reason(s). All same source conclusions will include a comparison markup according to the Latent Prints Technical Manual. The trainee will be working closely with a trainer to successfully complete these cases.

Note to trainer: Mentoring will be occurring real time as the trainee progresses through these cases. While mentoring and corrections are expected to take place in real time, any recurring deficiencies noted during these exercises will be discussed with the trainee and reported to the Supervisor. The goal here is for the trainee to assemble a case file that is ready for technical review.

The trainee will complete the proper case documentation, assemble case files, and issue reports (these cases will be entered as training cases in LIMS).

Case #	Trainee (initials and completion date)	Trainer (initials and review date)
1		
2		
3		
4		
5		
6		
7		

8		
9		
10		
11		
12		
13		
14		
15		

Literature Review

- Latent Prints Technical Manual, Sections 7.3.3 and 7.4.3

Assessments and Performance Expectations

Comparison Competency Test

The trainee will complete a competency test that permits the trainee to handle latent print lift cards and submitted images and begin Supervised Comparison Casework (note: Testimony Competency and ABIS Competency must also be completed before starting Supervised Comparison Casework).

A test case will be assigned as the competency test.

Expectations for Passing:

- No more than one suitable print not marked.
- No more than one non-suitable print marked.
- No erroneous strong evidence for same source conclusions.
- No more than one false inclusion.
- No more than one false inconclusive conclusion.
- No more than one false incomplete conclusion.
- No more than one missed strong evidence for same source conclusion.
- No more than one erroneous strong evidence for different source conclusion.
- Proper analysis of impressions with notes supporting the conclusions rendered.

Date Passed	Trainee Initials	Trainer Initials

Lesson 11.5   ABIS Exemplar Image Acquisition

A critical tool in the latent print unit for providing investigative leads on cases is the Automated Biometric Identification System (ABIS). This lesson will introduce the processes associated with the image capture of friction ridge exemplars in ABIS.

Learning Outcomes

11.5.1 The trainee will be able to describe the types of friction ridge recordings captured by ABIS (e.g. rolled, flat, simultaneous, palm, and supplemental impressions).

11.5.2 The trainee will be able to describe the methods of friction ridge capture by ABIS (e.g. livescan or hard card scanned into the system).

11.5.3 The trainee will be able to explain point of capture variables (e.g. condition of the friction ridge skin, condition of the platen, rolling speed, ink volume, and movement).

11.5.4 The trainee will be able to explain control measures needed to achieve quality friction ridge images (e.g. scan resolution, compression rate, equipment maintenance, and calibration).

11.5.5 The trainee will be able to describe procedures for addressing amputations and temporary injuries.

Instructional Methods

See Lesson 11.6

Assessments and Performance Expectations

See Lesson 11.6

Lesson 11.6   Function and Use of ABIS and NGI

Introduction

This lesson will include an introduction to functionality, interoperability, and the general use of ABIS and NGI.

Learning Outcomes

11.6.1 The trainee should be able to explain the processes related to acquisition, classification, search, storage, retrieval, comparisons, and reporting of database searches.

11.6.2 The trainee will be able to describe composite records and multi-incident systems.

11.6.3 The trainee will be able to describe the friction ridge search criteria (e.g. designation of finger or palm search and designation of specific fingers or palm regions).

11.6.4 The trainee should be able to explain the system controls that ensure completeness, image quality, and data integrity.

11.6.5 The trainee will be able to recall practices detailed in NEC documents.

11.6.6 The trainee will be able to describe tolerance for image rotation.

11.6.7 The trainee will be able to explain factors related to searching and matching minutiae (e.g. minutiae extraction, minutiae matching, minutiae placement, minutiae rotation, and ridge counts between minutiae).

11.6.8 The trainee should be able to describe ANSI NIST record types (Type-1, Type-2, Type-4, Type-9, Type-13, Type-14, Type-15) and their importance for database interoperability.

11.6.9 The trainee should be able to explain the significance of the range of candidate scores, threshold scoring, candidate list, and candidate list scores.

11.6.10 The trainee should be able to describe the search capabilities of ABIS and NGI (e.g. latent to latent, latent to exemplar, exemplar to latent, and tenprint to tenprint).

11.6.11 The trainee should be able to explain the "lights out" process of searching in ABIS.

11.6.12 The trainee will be able to list the database search progression options and procedures (e.g. state, regional, national).

11.6.13 The trainee will be able to explain the benefits and risks of using search parameters to limit database penetration (e.g. finger position, sex, pattern classification and referencing race, offense, and geographical location).

11.6.14 The trainee will be able to describe database search result outcomes (e.g. ranked order, unique identifier, and finger or palm position).

11.6.15 The trainee should be able to explain image properties and compression issues associated with database searches (e.g. potential loss of quality due to compression of images, monitor resolution, and capture resolution).

11.6.16 The trainee will be able to explain printer technology limitations and the quality degradation of printed images compared to digital images (on screen) and original lift cards.

11.6.17 The trainee will be able to explain the manual encoding and automatic encoding process.

11.6.18 The trainee will be able to demonstrate their ability to use IBW to perform searches, compare candidates, select "Hit" or "No Hit," retrieve exemplars, and document their searches according to the Latent Prints Technical Manual.

Instructional Methods

Lecture – Function and Use of ABIS and NGI

This lecture will introduce processes associated with the image capture of friction ridge impressions, database functionality, database interoperability, and the general use of available databases. This lecture will cover all learning outcomes in Lesson 11.5 as well as learning outcomes 11.6.1, 11.6.2, and 11.6.4-11.6.17.

Date Completed	Trainee Initials	Trainer Initials

Workshop – Use of IBW and Archive

This workshop will demonstrate how to use the various applications within IBW to perform searches, compare candidates, select "Hit" or "No Hit," retrieve exemplars, and document the searches. It will also demonstrate the use of Archive. This workshop will cover learning outcomes 11.6.3 and 11.6.18.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- NEC WIN Best Practices for Latent Examiners.
- NEC WIN 3.0 Connecting Bitlocker Encrypted USB Drive to VDI desktop.
- NEC IBW Latent Quick Reference.
- NEC Archive Quick Reference.
- Latent Prints Technical Manual, Chapter 9.
- ANSI/NIST-ITL 1-2011 Update: 2015, *Data Format for the Interchange of Fingerprint & other Biometric Information, NIST Special Publication 500-290e3*, National Institute of Standards and Technology, Washington, DC, 2015.
- Busey, T., et al. *The relation between sensitivity, similar non-matches and database size in fingerprint database searches*. Law, Probability, and Risk (2014) 13, 151-168.
- Criminal Justice Information Services, *Electronic Biometric Transmission Specification (EBTS)*, version 10.0, Federal Bureau of Investigation, Clarksburg, WV, 2013.
- Chapman, Will, et al. *Latent Interoperability Transmission Specification, NIST Special Publication 1152*, National Institute of Standards and Technology, Washington, DC, 2013.
- Chapman, Will, et al. *Markup Instructions for Extended Friction Ridge Features, NIST Special Publication 1151*, National Institute of Standards and Technology, Washington, DC, 2013.
- Moses, Ken. *Chapter 6 – Automated Fingerprint Identification System (AFIS).* The Fingerprint Sourcebook. National Institute of Justice, 2011.

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – Function and Use of ABIS & NGI

All learning outcomes for Lesson 11.5 and learning outcomes 11.6.1-11.6.17.

Date Completed	Trainee Initials	Trainer Initials

Graded Practical – Database Searching

The trainee will be observed searching both a palm and finger in ABIS through both WIN and the FBI.

Expectations for Passing: The trainee must meet learning outcome 11.6.18 and obtain a hit on their searches.

Date Completed	Trainee Initials	Trainer Initials

ABIS Competency Test

The trainee will complete a competency test that permits the trainee to search casework impressions in ABIS and begin Supervised Casework (note: Testimony Competency and Comparison Competency must also be completed before starting Supervised Casework).

Five (5) test impressions (to include three fingers and two palms) will be assigned as the competency test. At least one impression will not hit in the database.

Expectations for Passing:

- Impressions acquired correctly.
- Correct editing of impressions.
- Hit candidate, if applicable, located within the top 10 candidates.
- Obtain the exemplars for any hit candidate generated.
- Document the searches according to the Latent Print Technical Procedures Manual.

Date Passed	Trainee Initials	Trainer Initials

Module 12   Performance Studies

Lesson 12.1   Introduction to Error Rate Calculations and Confidence Intervals

In order to understand the results of performance testing, the trainee must understand concepts related to error rates. This lesson will provide an overview of error rate testing, methods and limitations of calculating error rates, and the application of confidence intervals to error rates. Additionally, this lesson will include the concepts of foundational validity and validity as applied with respect to pattern evidence.

Learning Outcomes

12.1.1 The trainee will be able to define the following concepts related to error rate testing: accuracy, reproducibility, repeatability, and reliability.

12.1.2 The trainee should be able to recognize the following conditional probabilities with respect to the results of error rate testing: sensitivity, specificity, false positive rate, false negative rate, positive predictive value, negative predictive value, false positive discovery rate, and false negative discovery rate.

12.1.3 The trainee will be able to recite the application of confidence intervals to the results of error rate testing.

12.1.4 The trainee will be able to recite the significance of confidence intervals as they pertain to error rate testing.

12.1.5 The trainee will be able to explain "foundational validity" and "validity as applied" as discussed in the 2016 President's Council of Advisor's on Science and Technology (PCAST) report, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature Comparison Methods.

Instructional Methods

Lecture – Error Rate Calculations and Confidence Intervals

This lecture will introduce an overview of error rate testing, methods and limitations of calculating error rates, and the application of confidence intervals to error rates. Additionally, this lesson will include the concepts of foundational validity and validity as applied with respect to pattern evidence. This lecture will cover all learning outcomes in Lesson 12.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Executive Office of the President, President's Council of Advisor's on Science and Technology (PCAST), Panel on Forensic Science. *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature Comparison Methods*. 2016.
- Wilkinson, D. et al. "Expert Fingerprint Testimony Post-PCAST – A Canadian Case Study." *Journal of Forensic Identification*. 2018. 86(3).

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – Error Rate Calculations and Confidence Intervals

All learning outcomes for Lesson 12.1.

Date Completed	Trainee Initials	Trainer Initials

Lesson 12.2   Expert versus Novice Studies

This lesson will review the results, significance and limitations of published research evaluating the differences between the performance of novices and trained friction ridge examiners (experts).

Learning Outcomes

12.2.1 The trainee will be able to explain the differences novices and experts display during the analysis of friction ridge impressions.

12.2.2 The trainee will be able to explain the differences novices and experts display during the comparison of friction ridge impressions.

12.2.3 The trainee will be able to explain the differences novices and experts display during the evaluation of friction ridge impressions.

12.2.4 The trainee will be able to evaluate the strengths and limitations of the studies comparing novices to experts.

12.2.5 The trainee will be able to assess the value of training for the examination of friction ridge impressions.

12.2.6 The trainee will be able to support the use of trained examiners for rendering of source conclusions for friction ridge impressions with findings from the novice versus expert studies.

Instructional Methods

Lecture – Experts versus Novices

This lecture will introduce the results, significance and limitations of published research evaluating the differences between the performance of novices and trained friction ridge examiners. This lecture will cover all learning outcomes in Lesson 12.2.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Busey, T. and J. Vanderkolk. *Behavioral and electrophysical evidence for configural processing in fingerprint experts*. Vision Research, 2005.
- Busey, T. and F. Parada. "The nature of expertise in fingerprint examiners." *Psychonomic Bulletin & Review*. 2010 17(2): 155-160.
- Busey, T., et al. "Consistency and variability among latent print examiners as revealed by eye tracking methodologies." *Journal of Forensic Identification*. 2011.
- Tangen, J. et al. *Identifying fingerprint expertise*. Association for Psychological Science. 2011.
- Busey, T.; Nikolov, D.; Yu, C.; Emerick, B.; Vanderkolk, J. Characterizing Human Expertise Using Computational Metrics of Feature Diagnosticity in a Pattern Matching Task. *Cognitive Science* 2017 *41* (7), 1716-1759. DOI: 10.111/cogs.12452.
- Growns, B.; and Martire, K. Forensic Feature-Comparison Expertise: Statistical Learning Facilitates Visual Comparison Performance. *Journal of Experimental Psychology: Applied* 2020 26 (3), 493-506. DOI: 10.1037/xap0000266.

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion group regarding expert versus novice studies.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Essay – Expert versus Novice Studies

Learning outcomes 12.2.1 – 12.2.3 and 12.2.5 – 12.2.6

Answer the following question in less than two pages: Why is it ill-advised to allow a jury to formulate a conclusion based on the comparison of friction ridge impressions?

Expectations for Passing:

a) The trainee adequately explained the differences novices and experts display during the analysis of friction ridge impressions.
b) The trainee adequately explained the differences novices and experts display during the comparison of friction ridge impressions.
c) The trainee adequately explained the differences novices and experts display during the evaluation of friction ridge impressions.
d) The trainee adequately discussed the value of training for the examination of friction ridge impressions.
e) The trainee adequately supported the use of trained examiners for rendering of source conclusions for friction ridge impressions with findings from the novice versus expert studies.
f) The trainee organized the content in a logical manner.
g) The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 12.3   Expert Studies

The admissibility of friction ridge evidence hinges on the ability of trained examiners to accurately perform friction ridge examinations. This lesson will review the results, significance, and limitations of published studies evaluating the performance of trained friction ridge examiners.

Learning Outcomes

12.3.1 The trainee will be able to describe the general design of published performance studies.

12.3.2 The trainee will be able to evaluate the strengths and limitations of the performance studies.

12.3.3 The trainee will be able to explain the error rate findings from the performance studies.

12.3.4 The trainee will be able to consider reasons for variation in examiner suitability decisions in the performance studies.

12.3.5 The trainee will be able to consider reasons for variation in examiner conclusions in the performance studies.

12.3.6 The trainee will be able to consider reasons for variation in examiner mark-up of images in the performance studies.

12.3.7 The trainee will be able to assess the ability to infer casework error rates from error rate studies.

12.3.8 The trainee will be able to consider the challenges of calculating error rates from casework.

12.3.9 The trainee will be able to support the use of trained examiners in the rendering of source conclusions for friction ridge impressions with findings from the examiner performance studies.

Instructional Methods

Lecture – Studies on Experts

This lecture introduces the results, significance, and limitations of published studies evaluating the performance of trained friction ridge examiners. During this lecture, the trainees will have the opportunity to review several known false identifications and false exclusions. This lecture will cover all learning outcomes in Lesson 12.3.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Eldridge, H.; De Donno, M.; Champod, C. Mind-Set – How Bias Leads to Errors in Friction Ridge Comparisons. *Forensic Science International* 2021 *318*, 110545. DOI: 10.1016/j.forsciint.2020.110545.
- Ulery, B.; Hicklin, A.; Buscaglia, J.; Roberts, M. Accuracy and Reliability of Forensic Latent Fingerprint Decisions. *Proceedings of the National Academy of Science* 2011 *108* (19) 7733-7738. DOI: 10.1073/pnas.1018707107.
- Langenburg, G.; Champod, C.; Genessay, T. Informing the Judgements of Fingerprint Analysts Using Quality Metric and Statistical Assessment Tools. *Forensic Science International* 2012 *219*, 183-198. DOI: 10.1016/j.forsciint.2011.12.017.
- Eldridge, H.; De Donno, M; Champod, C. Testing the Accuracy and Reliability of Palmar Friction Ridge Comparisons – A Black Box Study. *Forensic Science International*. 2021 *318*, 110457. DOI: 10.1016/j.forsciint.2020.110457.
- Koehler, J.; Liu, S. Fingerprint Error Rate on Close Non-Matches. *Journal of Forensic Science* 2021 *66*, 129-134. DOI: 10.1111/1556-4029.14580.
- Pacheco, I. et al. *Miami Dade Research Study for the Reliability of the ACE-V Process: Accuracy & Precision in Latent Fingerprint Examinations*. NIJ, 2014.

- Hicklin, Austin. *Improving the Rigor of the Latent Print Examination Process*. University of Lausanne PhD Thesis, 2017.
- Ulery, Bradford, et al. *Factors associated with latent fingerprint exclusion determinations*. FSI (275): 65-75, 2017.
- Neumann, Cedric, et al. *Improving the Understanding and the Reliability of the Concept of Sufficiency in Friction Ridge Examination*. NIJ, 2013.

Date Completed	Trainee Initials

Discussion Group

The trainee will participate in a discussion regarding the published research on examiner performance.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

Presentation – Expert Studies

The trainee will create and deliver a presentation comparing and contrasting two of the error rate studies discussed in this lesson. In addition, the trainee will discuss the difference between casework errors and error rates and discuss ways that error rate studies highlight potential weaknesses and strengths of friction ridge examiners.

Expectations for Passing:

a) The trainee adequately described the general design of chosen performance studies.
b) The trainee adequately described what false positive and false negative error rates mean within the chosen studies.
c) The trainee adequately described the strengths and limitations of each performance studies.
d) The trainee adequately explained the error rate findings from each performance studies and the possible causes for different values.
e) The trainee adequately discussed the issues with inferring or calculating casework error rates from error rate studies.
f) The trainee adequately supported the use of trained examiners in the rendering of source conclusions for friction ridge impressions with findings from the examiner performance studies.
g) The presentation was logical and cohesive.

Date Passed	Trainee Initials	Trainer Initials

Module 13   Human Factors and Quality Assurance

Lesson 13.1   Human Factors

Human factors are a natural part of the examination process and may impact the performance of the examiners. This lesson will include factors from the following four realms listed in the 2012 Expert Working Group on Human Factors in the Analysis of Latent Prints report, Latent Print Examination and Human Factors: Improving Practice through a Systems Approach: analyst actions, analyst conditions, supervisory issues, and organizational issues. The trainee will apply these human factors to specific case studies of mistakes and violations.

Learning Outcomes

13.1.1 The trainee will be able to describe decision-based mistakes that could be made by an examiner.

13.1.2 The trainee will be able to describe skill-based mistakes that could be made by an examiner.

13.1.3 The trainee will be able to describe perception-based mistakes that could be made by an examiner.

13.1.4 The trainee will be able to describe violations that could be committed by an examiner.

13.1.5 The trainee will be able to discuss the adverse mental states that could affect examiner performance.

13.1.6 The trainee will be able to discuss the adverse physiological states that could affect examiner performance.

13.1.7 The trainee will be able to explain how communication could affect examiner performance.

13.1.8 The trainee will be able to discuss the physical or mental limitations that could affect examiner performance.

13.1.9 The trainee will be able to explain how the technical environment could affect examiner performance.

13.1.10 The trainee will be able to explain how the physical environment could affect examiner performance.

13.1.11 The trainee will be able to discuss the supervisory leadership failures that could affect examiner performance.

13.1.12 The trainee will be able to explain how a supervisor's failure to correct known problems could affect examiner performance.

13.1.13 The trainee will be able to discuss the supervisory operational planning failures that could affect examiner performance.

13.1.14 The trainee will be able to discuss the supervisory violations that could affect examiner performance.

13.1.15 The trainee will be able to discuss organizational resource management failures that could affect examiner performance.

13.1.16 The trainee will be able to explain how WSPCLD operational processes could affect examiner performance.

13.1.17 The trainee will be able to explain how the organization's climate could affect examiner performance.

13.1.18 The trainee will be able to evaluate the human factors associated with the cases concerning the erroneous identification of the following individuals: Shirley McKie (1999) and Brandon Mayfield (2004).

13.1.19 The trainee will be able to assess the possible human factors associated with the following forgery and fabrication cases: William DePalma (fabrication 1967), Herman Wiggins (fabrication 1970's), NY State Troop "C" (fabrication 1989), Frederik van der Vyver (fabrication 2005), and Peter Paul Biro (Jackson Pollack forgery 2008).

Instructional Methods

Lecture – Human Factors

This lecture will introduce human factors from the following four realms listed in the 2012 Expert Working Group on Human Factors in the Analysis of Latent Prints report, Latent Print Examination and Human Factors: Improving Practice through a Systems Approach: analyst actions, analyst conditions, supervisory issues, and organizational issues. This lecture will include case examples of mistakes and violations. The lecture will cover all learning outcomes for Lesson 13.1.

Date Completed	Trainee Initials	Trainer Initials

<u>Literature Review</u>

- Anon. *Police investigation supervisor admits faking fingerprints (editorial).* The New York Times 1993 July 30.
- Biederman, A. et al. *Decision theoretic properties of forensic identification: Underlying logic and argumentative implications*. FSI (177):120-132, 2008.
- Black, John. *Evaluating the extent and scope of "verification" in analysis, comparison, and verification (ACE-V)*. Wiley Encyclopedia of Forensic Science, John Wiley & Sons, Chichester, 2009.
- Bonebreak, G. *Fabricating Fingerprint Evidence.* Identification News 1976; 26:(3-13).
- Busey, T., et al. *The impact of fatigue on latent print examinations as revealed by behavioral and eye gaze testing*. FSI 2015.
- Geller, B. et al. *A chronological review of fingerprint forgery.* J Forensic Sci 1999; 44(5):963-968.
- Expert Working Group on Human Factors in the Analysis of Latent Prints. *Latent Print Examination and Human Factors: Improving Practice through a Systems Approach*. National Institute of Standards and Technology, 2012.
- Schiffer, Beatrice and Stauffer, Eric. *Accreditation: Organizational*. Wiley Encyclopedia of Forensic Science, John Wiley & Sons, Chichester, 2009.
- Scottish Government. *The Fingerprint Inquiry Report*, APS Group Scotland, 2011, Preface, Part 7, and Part 8.
- U.S. Department of Justice Office of Inspector General. *A Review of the FBI's Handling of the Brandon Mayfield Case*. Office of Inspector General. Oversight and Review Division, 2006.
- Wertheim, Pat. Detection of forged and fabricated latent prints. JFI 44(6): 652-681, 1994.
- Wertheim, Pat. *Forensic Forgery Case: Scientific Examination Report*. 2008.
- Wertheim, Pat. *Van der Vyver Report.* 2006. Accessed online 02-13-2023 (www.clpex.com/legacy/TheDetail/300-399/TheDetail330.htm).

Date Completed	Trainee Initials

<u>Discussion Group</u>

The trainee must participate in a discussion group that evaluates the human factors involved at least one of the erroneous identification cases and one of the forgery/fabrication cases listed above.

Date Completed	Trainee Initials	Trainer Initials
Discussion Participants (not including Trainee):		

Assessments and Performance Expectations

<u>Quiz – Human Factors</u>

Learning Outcomes 13.1.1 – 13.1.17

Date Completed	Trainee Initials	Trainer Initials

Lesson 13.2   Quality Assurance

This lesson will summarize how the WSP Crime Laboratory maintains the reliability of the forensic examinations and link these policies and procedures to accreditation requirements.

Learning Outcomes

13.2.1 The trainee should be able discuss the importance of testing during the hiring process.

13.2.2 The trainee should be able discuss the importance of testing during the training program.

13.2.3 The trainee will be able discuss the importance of competency testing at the completion of training.

13.2.4 The trainee will be able to describe the frequency, purpose, and importance of proficiency testing.

13.2.5 The trainee will be able to describe the frequency, purpose, and importance of internal audits.

13.2.6 The trainee will be able to describe the frequency, purpose, and importance of external assessments.

13.2.7 The trainee will be able to describe the methods of verification used and the importance and limitations of each method.

13.2.8 The trainee will be able to describe the methods of case review used and the purpose of each method.

13.2.9 The trainee will be able to describe the methods of testimony review used the purpose of the method.

13.2.10 The trainee will be able to describe the methods of conflict resolution used and the purpose of each method.

13.2.11 The trainee will be able to describe the methods and goals of corrective actions and preventative actions.

13.2.12 The trainee will be able to explain the importance of case documentation to quality assurance.

13.2.13 The trainee will be able to describe the methods used to shield the examiners from undue internal and external pressure.

13.2.14 The trainee will be able to describe the basic process for achieving and maintaining accreditation.

13.2.15 The trainee will be able to discuss the importance and describe the process of technical review.

13.2.16 The trainee will be able to discuss the importance and describe the process of administrative review.

Instructional Methods

Workshop – Case Review

This workshop will introduce the case review, including review by the case analyst, verifications, technical review and administrative review. The workshop will introduce different approaches or strategies to review. This workshop will cover learning outcomes 13.2.8, 13.2.15 and 13.2.16.

Date Completed	Trainee Initials	Trainer Initials

Lecture – Quality Assurance

This lecture will introduce how the WSP Crime Laboratory maintains the reliability of the forensic examinations and link these policies and procedures to accreditation requirements. This lecture will cover all learning outcomes for Lesson 13.2.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- WSP Crime Laboratory Quality Operations Manual, Chapters 4, 9, 10, 12, 16, 17, 25
- Latent Prints Technical Manual Sections 7.3.4, 7.4.4, and Chapters 8, 12
- Gray, M. Leanne. *Chapter 12 – Quality Assurance.* The Fingerprint Sourcebook. National Institute of Justice, 2011

Date Completed	Trainee Initials

Assessments and Performance Expectations

The trainee will be given copies of the applicable documents for all assigned verifications, technical reviews, and administrative reviews. They will complete their reviews and compare their notes with the scientist assigned the review. To successfully complete a review, they must note all required changes.

Graded Practical – Verifications

Expectations for Passing:

- The trainee must successfully complete ten (10) verifications (at least 3 will be blind verifications). Any failed cases of the last three (3) will result in a replacement case being assigned.

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Graded Practical – Technical Reviews

Expectations for Passing:

- The trainee must successfully complete twenty (20) technical reviews (ten (10) processing cases, ten (10) comparison cases with at least five (5) cases containing strong support for same source conclusions). Any failed cases of the last five (5) will result in a replacement case being assigned.

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Graded Practical – Administrative Reviews

Expectations for Passing:

- The trainee must successfully complete twenty (20) administrative reviews. Any failed cases of the last five (5) will result in a replacement case being assigned.

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Essay – Quality Assurance

All learning outcomes for Lesson 13.2.

Write an essay describing and discussing the factors of Quality Assurance used by the WSCPLD (to include tests during training, competency tests, proficiency tests, audits, assessments, verification, technical review, administrative review, conflict resolution processes, corrective actions, preventative actions, and case documentation) and how these attribute to quality casework. This essay will be less than three pages long.

Expectations for Passing: This essay must adequately address all learning outcomes in 13.2. Additionally:

- The trainee organized the content in a logical manner.
- The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Module 14   Testimony

Lesson 14.1   Admissibility of Expert Testimony

On any given day, the admissibility of an expert's testimony may be challenged. This lesson will review the history of expert testimony; applicable federal and state rules for expert opinion testimony; the purpose of motions *in limine* to exclude expert testimony; the process and purpose of evidentiary hearings; and common regional challenges to the admissibility of friction ridge evidence.

Learning Outcomes

14.1.1 The trainee will be able to recite the history of expert testimony in the United States.

14.1.2 The trainee shall be able to explain the significance of the following cases as they relate to friction ridge evidence: *U.S. v. Mitchell* (1999), U*.S. v. Llera-Plaza* I and II (2002), *Commonwealth of MA v. Patterson* (2005), *New Hampshire v. Langill* (2008), and *U.S. v Rose* (2008)

14.1.3 The trainee shall be able to describe the application of the *Frye* Test to the admissibility of expert testimony and variations of the *Frye* Test.

14.1.4 The trainee shall be able to describe the application of the Federal Rules of Evidence to the admissibility of expert testimony.

14.1.5 The trainee shall be able to explain the application of the five *Daubert* factors to the admissibility of expert testimony.

14.1.6 The trainee shall be able to evaluate friction ridge examination using the five *Daubert* factors.

14.1.7 The trainee shall be able to explain how *General Electric v. Joiner* (1997) and *Khumo Tire v. Carmichael* (1999) clarified and expanded the scope of the *Daubert* factors.

14.1.8 The trainee shall be able to describe applicable state rules for expert opinion testimony.

14.1.9 The trainee shall be able to describe the purpose for motions *in limine* to exclude expert testimony.

14.1.10 The trainee shall be able to describe the process and purpose of evidentiary hearings.

14.1.11 The trainee shall be able to summarize common challenges to the admission of friction ridge evidence or expert opinion testimony.

14.1.12 The trainee shall be able to define hearsay.

14.1.13 The trainee shall be able to describe the confrontation clause of the Sixth Amendment to the United States Constitution and the reformation of the confrontation clause via the following court decisions:

- *Crawford v. Washington* (2004).
- *Melendez-Diaz v. Massachusetts* (2009).
- *Bullcoming v. New Mexico* (2011).
- *Illinois v. Williams* (2012).

Instructional Methods

Lecture – Admissibility of Expert Testimony

This lesson will introduce the history of expert testimony; applicable federal and state rules for expert opinion testimony; the purpose of motions *in limine* to exclude expert testimony; the process and purpose of evidentiary hearings; and common regional challenges to the admissibility of friction ridge evidence. This lecture will cover all learning outcomes in Lesson 14.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- American Association for the Advancement of Science. *Forensic Science Assessments: A Quality and Gap Analysis – Latent Fingerprint Examination.* Washington, D.C. 2017.

- Epstein, Jules. "The testifying forensic discipline expert – A primer." *WIREs Forensic Science* 2019; 1:e1320. https://doi.org/10.1002/wfs2.1320
- Moenssens, A. "Expert witness: Who is?." *Wiley Encyclopedia of Forensic Science*. 2009. John Wiley & Sons, Chichester.
- Moenssens, Andre and Meagher, Steven *Chapter 13 – Fingerprints and the Law.* The Fingerprint Sourcebook. National Institute of Justice, 2011.
- National Academy of Sciences. *Strengthening Forensic Science in the United States: A Path Forward*. National Research Council, 1999.

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – Admissibility of Expert Testimony

All learning outcomes for Lesson 14.1

Date Completed	Trainee Initials	Trainer Initials

Lesson 14.2   Responsibilities of the Expert Witness

Once beginning casework, examiners will need to manage subpoenas and court orders for their cases. This lesson reviews expectations of the expert witness in responding to subpoenas, discovery and disclosure, court orders, preparation for trials or hearings, and testimony.

Learning Outcomes

14.2.1 The trainee will be able to explain the importance of discovery and disclosure and describe the requirements for responding to discovery motions and court orders.

14.2.2 The trainee will be able to explain the importance of pre-trial conferences and general preparation for testimony.

14.2.4 The trainee will be able to describe the appropriate clothing to be worn for court.

14.2.5 The trainee will be able to describe the layout of the courtroom and the typical location of the judge, jury, court reporter, witness, prosecution, and defendant.

14.2.6 The trainee will be able to describe the roles of the judge, jury, court reporter, prosecution, and defense.

14.2.7 The trainee will be able to describe the rules for entering and exiting the witness stand.

14.2.8 The trainee will be able to describe technology in the courtroom that may be used by witnesses.

14.2.9 The trainee will be able to explain methods of effective communication with juries, judges, and attorneys.

14.2.10 The trainee will be able to explain the importance of appropriate courtroom demeanor and etiquette.

14.2.11 The trainee will be able to describe the appropriate response when an objection is raised.

14.2.12 The trainee will be able to describe the process for referring to notes, reports, or other materials.

14.2.13 The trainee will be able to explain the implications of social media on the credibility of expert witnesses.

Instructional Methods

Lecture – Subpoenas and Court Orders

This lesson reviews expectations of the expert witness in responding to subpoenas, discovery and disclosure, court orders, preparation for trials or hearings, and testimony. This lecture will cover all learning outcomes in Lesson 14.2.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Eldridge, H. *Juror comprehension of forensic expert testimony: A literature review and gap analysis*. FSI: Synergy 1 (2019) 24-34
- WSP Crime Laboratory Quality Operations Manual, Sections 10.10-10.12

Date Completed	Trainee Initials

Assessments and Performance Expectations

Quiz – Responsibilities of the Expert Witness

All learning outcomes for Lesson 14.2

Date Completed	Trainee Initials	Trainer Initials

Lesson 14.3   Qualifications

Testimony often begins with the introduction of the friction ridge examiner to the court through a series of questions eliciting their education, training, and experience. This lesson will review the presentation of education, training, and experience during testimony. The trainee will develop a list of qualifying questions and complete an official curriculum vitae to keep on file.

Learning Outcomes

14.3.1 The trainee will be able to prepare a curriculum vitae (CV).

14.3.2 The trainee will be able to recite their formal education (e.g. university and degree obtained).

14.3.3 The trainee will be able to describe the training program they have completed and explain the significance of the training program.

14.3.4 The trainee will be able to recite the title and general description of any relevant formal training courses completed.

14.3.5 The trainee will be able to describe any memberships to professional organizations and the significance of those memberships.

14.3.6 The trainee will be able to describe any professional certifications received and the significance of those certifications.

14.3.7 The trainee will be able to describe casework experience in friction ridge examinations.

14.3.8 The trainee will be able to explain the importance of accurately describing qualifications and the legal implications of misrepresenting education, training, or experience.

14.3.9 The trainee will be able to explain why an expert's qualifications may be challenged under *voir dire* or cross-examination.

Instructional Methods

Practice 1 – Complete a list of Qualifying Questions

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Complete a CV

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

The completion of 14.3.1 is noted above under Practice.

See lesson 14.6 for learning outcomes 14.3.2 and 14.3.4-14.3.7.

Presentation – Training Program

Learning outcome 14.3.3.

The trainee will give a brief (less than 5 minute) presentation covering their background as well as the design and significance of their training.

Expectations for Passing:

a) The trainee adequately introduced themselves and their background (name, title, formal education, and any previous relevant job experience).
b) The trainee adequately summarized the design of the training program.
c) The trainee adequately explained the significance of the training program.
d) The presentation was logical (order of the topics and transitions between topics) and cohesive (stayed on message).

Date Passed	Trainee Initials	Trainer Initials

Essay – Expert Qualifications

Learning outcomes 14.3.8 and 14.3.9.

Write an essay explaining the importance of accurately describing qualifications and why they may be challenged on cross-examination. This essay will be less than three pages long.

Expectations for Passing: This essay must adequately address learning outcome 14.3.8 and 14.3.9. Additionally:

- The trainee organized the content in a logical manner.
- The trainee used proper writing mechanics.

Date Passed	Trainee Initials	Trainer Initials

Lesson 14.4   Direct Examination

Direct examination and cross-examination both serve purposes within the criminal justice process. This lesson will focus on the direct examination process.

Learning Outcomes

14.4.1 The trainee will be able to describe the types of testimony experts are allowed to provide.

14.4.2 The trainee will be able to explain the difference between facts and opinions (inferences).

14.4.3 The trainee should be able to explain the concept of "ultimate issue" and limitations of expert testimony on ultimate issues in a case.

14.4.4 The trainee will be able to explain the importance of testifying within their expertise and the possible consequences of testifying beyond their expertise.

14.4.5 The trainee will be able to explain the importance of chain of custody of evidence.

14.4.6 The trainee should be able to describe the general process attorneys use to develop, promote, and employ their theory of a case and the expert witness's ethical obligation to stay within the supportable bounds of their discipline during testimony.

Instructional Methods

Lecture – Direct Examination

This lecture will introduce the direct examination process and discuss examples of testifying beyond one's expertise. This lecture will cover all learning outcomes in Lesson 14.4.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Moenssens, A. "Direct examination of experts." *Wiley Encyclopedia of Forensic Science*, 2009. John Wiley & Sons, Chichester.
- Moenssens, A. "Ethics: Codes of conduct for expert witnesses." *Wiley Encyclopedia of Forensic Science*. 2009. John Wiley & Sons, Chichester.

Date Completed	Trainee Initials

Practice 1 – Direct Testimony Questions

The trainee will create a list of direct testimony questions introducing the foundations of friction ridge examinations to include variation of the features in the population, persistency of the features, and examiner performance.

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Direct Testimony Answers

The trainee will practice with a trainer answering typical direct questions regarding lab requests, receipt of evidence, chain of custody, and the case examination process.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Quiz – Direct Examination

All learning outcomes for Lesson 14.4

Date Completed	Trainee Initials	Trainer Initials

Lesson 14.5   Cross Examination

This lesson will include the purpose and methods of cross-examination, including common issues raised during cross examination.

Learning Outcomes

14.5.1 The trainee will be able to explain the importance of cross-examination as guaranteed by the Sixth Amendment of the United States Constitution.

14.5.2 The trainee will be able to predict which learned treatises (books or written authorities) in the friction ridge discipline may be used to impeach expert testimony.

14.5.3 The trainee will be able to formulate responses to learned treatises in the friction ridge discipline commonly used to impeach expert testimony.

14.5.4 The trainee will be able to describe what a "leading question" is and how leading questions are used during cross-examination.

14.5.5 The trainee will be able to explain general cross-examination methods used to control the testimony of the witness and the witness's ethical obligation to maintain accuracy and transparency during testimony.

Instructional Methods

Lecture – Cross Examination

This lecture will introduce the purpose and methods of cross-examination, including common issues raised during cross examination. This lecture will cover all learning outcomes in Lesson 14.5.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Edmond, G. et al. "A guide to interpreting forensic testimony: Scientific approaches to fingerprint evidence." *Law, Probability & Risk*. 2014. 13(1): 1-25.
- Edmond, G. et al. "How to cross-examine forensic scientists: A guide for lawyers." *Australian Bar Review*. 2014. (39):174-197.
- Moenssens, A. "Cross-examination of experts." *Wiley Encyclopedia of Forensic Science.* 2009. John Wiley & Sons, Chichester.
- Steele, L. "The defense challenge to fingerprints." *Criminal Law Bulletin.* 2004. 40(3): 213-240.
- Girod, A., et al. "Fingermark age determinations: Legal considerations, review of the literature and practical propositions." *Forensic Science International*. (262): 212-226.

Date Completed	Trainee Initials

Practice – Cross Examination Tactics

The trainee will identify common cross examination tactics raised in the literature reviewed and practice answering questions regarding issues that explore the limitation of friction ridge examinations.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

See lesson 14.6 for learning outcome 14.4.3.

Quiz – Cross Examination

Learning outcomes 14.5.1, 14.5.2, 14.5.4, and 14.5.5.

Date Completed	Trainee Initials	Trainer Initials

Lesson 14.6   Mock Trial

As the trainee has witnessed by attending actual court testimony over the last year, testimony is one of the critical functions of a friction ridge examiner. Essays and presentations throughout the training program have reinforced the foundation of friction ridge examination. The mock-trial brings these elements together, culminating in a testimony competency test. The testimony competency and comparison competency must both be passed to begin supervised casework.

Learning Outcomes

14.6.1 The trainee will be able to follow appropriate dress code for court.

14.6.2 The trainee will be able to display appropriate demeanor and etiquette.

14.6.3 The trainee will be able to communicate effectively with juries, judges, and attorneys.

14.6.4 The trainee will be able to respond appropriately to objections.

14.6.5 The trainee will be able to follow the appropriate process when referring to notes, reports, or other materials.

14.6.6 The trainee will be able to articulate their qualifications (education, training, experience, professional organizations, and certifications, as applicable).

14.6.7 The trainee will be able to articulate the method for receiving evidence and requests for examinations.

14.6.8 The trainee will be able to articulate evidence handling (including chain of custody) and marking procedures.

14.6.9 The trainee will be able to articulate the manner in which the three-dimensional features of the skin transfer information about the skin to a two-dimensional impression.

14.6.10 The trainee will be able to articulate the factors that affect the quantity and clarity of friction ridge impressions.

14.6.11 The trainee will be able to articulate the types and significance of the friction ridge skin features that can be transferred to a surface.

14.6.12 The trainee will be able to articulate the basis for the discriminating power of the features of the friction ridge skin using concepts from the embryological development, findings of twin studies, findings of statistical models, and empirical observations.

14.6.13 The trainee will be able to articulate the basis for the persistent nature of the features of the friction ridge skin using the structure and physiology of the skin and empirical observations.

14.6.14 The trainee will be able to articulate the analysis process and the basis for suitability and search parameter decisions.

14.6.15 The trainee will be able to articulate the selection of target data, the diagnostic macroscopic and microscopic information that guides the comparison process, and the weighting of similarities and differences.

14.6.16 The trainee will be able to articulate the possible source conclusions that can be rendered after comparison, the inferential process for rendering source conclusions, and thresholds for rendering source conclusions.

14.6.17 The trainee will be able to articulate the basis for categorical conclusions.

14.6.18 The trainee will be able to articulate the strengths and limitations of categorical conclusions and statistical results.

14.6.19 The trainee will be able to articulate the significance of the studies comparing novices to trained friction ridge examiners.

14.6.20 The trainee will be able to articulate the significance of the studies evaluating error rates of trained friction ridge examiners.

14.6.21 The trainee will be able to articulate the significance of human factors in examiner performance and the quality assurance processes in place to improve performance.

14.6.22 The trainee will be able to articulate facts and inferences within the supportable bounds of the friction ridge examination discipline.

Assessments and Performance Expectations

Testimony Competency Test

The final moot court will serve as the testimony competency test and will cover: qualifying questions, evidentiary hearing direct examination, evidentiary hearing cross-examination, case specific direct examination, and case specific cross-examination.

Expectations for Passing: Learning outcomes 9.1.4, 14.3.2, 14.3.4-14.3.7, as well as all learning outcomes for Lesson 14.6 must be adequately met.

Date Passed	Trainee Initials	Trainer Initials

Module 15   Supervised Comparison Casework

Introduction

The trainee must successfully complete a comparison competency test, an ABIS competency, and a testimony competency and be approved by the Division Commander prior to performing supervised comparison and ABIS casework. The trainee must successfully complete twenty (20) supervised comparison cases before being authorized for independent comparison casework.

Comparison Supervised Casework

The trainee must successfully complete twenty (20) supervised comparison cases. The casework supervisor will review and evaluate all ACE decisions and case documentation against the criteria as noted below prior to the trainee submitting the case to either verification and/or technical review. Once the trainee has successfully completed a minimum of 20 comparison cases, the supervisor will evaluate the completed cases before signing for completion of supervised casework.

A failed case will result in a replacement case being assigned. If the trainee fails more than five (5) cases, an independent review of all supervised cases will be completed by the trainer, technical lead, and supervisor. In the event of extenuating circumstances, which will be documented, additional supervised cases may be assigned. Barring any extenuating circumstances, failure of five (5) supervised cases will result in the overall failure of Supervised Comparison Casework.

Criteria for Passing:
- No more than one suitable print not marked.
- No more than one non-suitable print marked.
- No erroneous strong evidence for same source conclusions.
- No more than one false inclusion.
- No more than one false inconclusive conclusion.
- No more than one false incomplete conclusion.
- No more than one missed strong evidence for same source conclusion.
- No more than one erroneous strong evidence for different source conclusion.
- Proper analysis of impressions.
- Accurate completion of case notes.
- Proper selection, encoding, and search of database quality prints.
- Accurate completion of LIMS report.

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Module 16   Latent Print Processing

Lesson 16.1   Evidence Preservation and Collection

A fundamental aspect of case management is to identify and document the unique characteristics of the case and of any evidence that is associated with the case. This lesson will familiarize the trainee with the standard principles in examining evidence for the presence of friction ridge impressions and other types of evidence while preserving the integrity of the evidence. The trainee will also be introduced to the ideas of contamination and DNA transfer.

Learning Outcomes

16.1.1 The trainee will be able to describe the precautions that must be taken when handling and preserving evidence that may be examined by any of the following functional areas: DNA, Materials Analysis, or Firearms.

16.1.2 The trainee will be able to describe the order of examinations between the various Functional Areas.

16.1.3 The trainee will be able to recognize and minimize any potential for evidence to be contaminated.

16.1.4 The trainee will be able to explain the importance of a clean work area and examination tools.

16.1.5 The trainee will be able to describe the different types of trace evidence which may be encountered during evidence examination.

16.1.6 The trainee will be able to demonstrate preserving the integrity of evidence.

16.1.7 The trainee will be able to demonstrate the examination and collection of trace evidence.

16.1.8 The trainee will be able to identify the appropriate time to create a new parent item versus a new child item and demonstrate the proper creation of the new item.

Instructional Methods

Lecture – CRIM101

Date Completed	Trainee Initials	Trainer Initials

Workshop – Evidence collection

This workshop will introduce the different types of trace evidence and preservation strategies. The trainee will be shown the different methods of collection and packaging. The workshop will discuss the different requirements for creating new parent and child items in LIMS for created evidence, distinguishing between the two situations. This workshop will cover all learning outcomes in Lesson 16.1.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Amick J, et al. Integrating DNA collection into the latent print section. J Forensic Identification 2004; 54(2): 170-177.
- California Criminalistics Institute. Summary of experiments investigating the impact of fingerprint processing and fingerprint reagents on PCR-based DNA typing profiles.
- Latent Prints Technical Manual, Chapter 4
- Lee HC, Ladd C. Preservation and collection of biological evidence. Croatian Med J 2001; 42(3): 225-228.
- National Institute of Standards and Technology. The Biological Evidence Preservation Handbook: Best Practices for Evidence Handlers. 2013: 9-24.
- Forensic Science Regulator. 2018. The Control and Avoidance of Contamination in Laboratory Activities Involving DNA Evidence Recovery and Analysis.

Date Completed	Trainee Initials

Practice – Collection and Packaging

Collect, package, and label the following pieces of trace evidence: a loose hair/fiber, piece of tape, debris, cellular or other biological material, and blood. Create the new item in LIMS.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Quiz – Evidence Collection

Learning outcomes 16.1.1, 16.1.2, 16.1.4, 16.1.5, and 16.1.8.

Date Completed	Trainee Initials	Trainer Initials

Graded Practical – Evidence Collection

Learning outcomes 16.1.3 and 16.1.6-16.1.8.

Expectations for Passing:

- Proper recognition and collection of DNA and trace evidence.
- Proper creation of a new parent item in LIMS.
- Proper creation of a new child item in LIMS.

Date Passed	Trainee Initials	Trainer Initials

Lesson 16.2   Reagent Preparation

Reagents are used routinely in processing cases to develop latent prints. These reagents must be prepared and tested to ensure they are working properly. This lesson covers reagent preparation and labeling, chemical hygiene, safety equipment, and documentation requirements.

Learning Outcomes

16.2.1 The trainee will be able to prepare latent print development reagents following approved methods.

16.2.2 The trainee will be able to follow proper chemical hygiene procedures (e.g. using fume hoods and personal protective equipment).

16.2.3 The trainee will be able to follow requirements for documenting and labeling prepared reagents.

16.2.4 The trainee will be able to assign expiration dates to prepared reagents.

16.2.5 The trainee will be able to follow requirements for quality control checks of prepared reagents.

16.2.6 The trainee will be able to locate and interpret Safety Data Sheets (SDSs).

16.2.7 The trainee will be able to follow requirements for the storage of chemicals and reagents.

16.2.8 The trainee will be able to follow requirements for the disposal of chemicals and reagents.

16.2.9 The trainee will be able to operate and maintain safety equipment (e.g. eye wash stations and personal safety showers).

Instructional Methods

Lecture – Reagent Preparation

This lecture will introduce reagent preparation and labeling, chemical hygiene, safety equipment, and documentation requirements. This lecture will cover all learning outcomes in Lesson 16.2.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Latent Prints Technical Manual, Sections 4.1 13.3, and Chapters 5, 14, 15.
- WSP Crime Laboratory Quality Operations Manual, Sections 13.1 and 14.2.3.
- Crime Laboratory Division Safety Manual.
- Relevant SDS's.

Date Completed	Trainee Initials

Practice – Reagent Preparation

The trainee will (under the guidance of a trainer) prepare at least one (1) reagent commonly used in the laboratory, following all relevant policies and procedures.

Reagent	Trainee (initials/date)	Trainer (initials)

Assessments and Performance Expectations

Graded Practical – Reagent Preparation

The trainee will be observed disposing of an expired reagent and preparing a reagent commonly used for processing.

Expectations for Passing: The trainee must meet learning outcomes 16.2.1 – 16.2.5 and 16.2.7 – 16.2.8.

Date Completed	Trainee Initials	Trainer Initials

Quiz – SDSs

The quiz will cover learning outcome 16.2.6.

Date Completed	Trainee Initials	Trainer Initials

Lesson 16.3   Equipment Use, Maintenance, and Performance Checks

Latent print processing involves a variety of equipment that must be maintained to ensure proper functioning. This lesson will explain the following for each piece of equipment that must be checked or maintained: method of the equipment check, frequency of checks, method of maintenance, frequency of maintenance, and the documentation.

Learning Outcomes

16.3.1 The trainee will be able to describe the location and components of Equipment Logs for the assigned laboratory.
16.3.2 The trainee will be able to operate the equipment associated with each development technique.
16.3.3 The trainee will be able to check the performance of the required equipment.
16.3.4 The trainee will be able to maintain the required equipment.
16.3.5 The trainee will be able to document performance checks, maintenance, and service calls of the required equipment.

Instructional Methods

Lecture – Equipment Maintenance and Performance Checks

This lecture introduces the following for each piece of equipment that must be checked or maintained: method of the equipment check, frequency of checks, method of maintenance, frequency of maintenance, and the documentation.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- WSP Crime Laboratory Quality Operations Manual, Chapter 13
- Latent Prints Technical Manual, Section 13.2
- Latent Prints Equipment Logs

Date Completed	Trainee Initials

Practice – Equipment Use, Maintenance, and Performance Checks

The trainee (under the guidance of a trainer) will use (to include performance checks) and maintain each piece of equipment, following all relevant policies and procedures for at least a month. The trainers initials below indicate the trainee has demonstrated proper use and maintenance of the equipment.

Equipment	Trainee (initials/date)	Trainer (initials)
Alternate Light Source (ALS) List Model(s):		
Balance		

Camera		
MVC®		
Cyvac®*		
Laser List Model(s):		
NinCha®		

*Olympia Laboratory Only

Assessments and Performance Expectations

The completion of all learning outcomes is noted above under Practice.

Lesson 16.4   Forensic Photography

The dominant latent print recovery method used in the laboratory is digital photography. This lesson will explain basic concepts in photography, photography techniques, and the use of the cameras and associated software.

Learning Outcomes

16.4.1 The trainee will be able to recite the properties of light.

16.4.2 The trainee will be able to describe the file types used.

16.4.3 The trainee will be able to define the following: f-stop, shutter speed, aperture, and exposure.

16.4.4 The trainee will be able to explain how changes in the shutter speed and aperture affect exposure.

16.4.5 The trainee will be able to explain the relationship between aperture and depth of field.

16.4.6 The trainee will be able to identify basic camera components: camera body, lens, shutter, diaphragm, and shutter release.

16.4.7 The trainee will be able to describe the type of sensor and the resolution settings of the camera.

16.4.8 The trainee will be able to explain the relationship of pixels and the resolution settings of the camera.

16.4.9 The trainee will be able to demonstrate proper positioning of objects/surfaces and scales in latent print photographs.

16.4.10 The trainee will be able to demonstrate proper lighting techniques for latent print photography.

16.4.11 The trainee will be able to demonstrate appropriate photography methods for latent prints (e.g. macro photography, high contrast photography, reflective photography, and fluorescent photography).

16.4.12 The trainee will be able to demonstrate appropriate photography using the camera software.

Instructional Methods

Workshop – Forensic Photography

This workshop will introduce the basic concepts in photography, photography techniques, and the use of cameras and associated software. This workshop will cover learning outcomes 16.4.1 to 16.4.8.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Latent Prints Technical Manual, Chapter 6.
- Champod, Christophe, et al. Fingerprints and Other Ridge Skin Impressions. (2nd Edition) CRC Press, New York, 2016, Chapter 3.
- Chavez, Conrad. Adobe Photoshop Classroom in a Book (2023 Release). Adobe Press, 2022.
- London, Barbara, et al. Photography, 12th Edition. Pearson, 2016, Chapters 1-5 and 12.
- London, Barbara, et al. A Short Course in Photography: Digital, 4th Edition. Pearson, 2018, Chapters 1-3.
- Long, Ben. Complete Digital Photography, 9th Edition. CDP, 2018.
- Peterson, Bryan. Understanding Close-Up Photography: Creative Close Encounters with or Without a Macro Lens. Amphoto Books, 2009.
- Redsicker, David R. Forensic Photography, 2nd Edition. CRC Press, New York, 2000, Chapters 1, 8, and 9.
- Robinson, Edward. Crime Scene Photography, 3rd Edition. Elsevier, 2016.
- Scientific Working Group on Friction Ridge Analysis, Study, & Technology (SWGFAST) Guideline, Standard for Friction Ridge Impression Digital Imaging.
- Applicable camera user manuals.

Date Completed	Trainee Initials

Practice 1 – Photography

The trainee will photograph friction ridge impressions developed with each of the following development techniques: black powder, cyanoacrylate, a fluorescent dye stain, Lumicyano, suspended powder, and Amido Black.

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Photographing Curved and Concave Substrates

The trainee will photograph friction ridge impressions developed with both black powder and fluorescent dye stain or Lumicyano on 4 different curved or concaved substrates.

Date Completed	Trainee Initials	Trainer Initials

Practice 3 – Photography Lighting Techniques

The trainee will photograph friction ridge impressions using each of the following lighting techniques: transmitted, direct, reflected, and oblique.

Date Completed	Trainee Initials	Trainer Initials

Assessments and Performance Expectations

Quiz – Forensic Photography

Learning outcomes 16.4.1 – 16.4.8

Date Completed	Trainee Initials	Trainer Initials

Graded Practical – Forensic Photography

Learning outcomes 16.4.9 – 16.4.12

The trainee will be provided ten (10) objects with developed latent prints to be photographed.

Expectations for passing:

Each photograph will be graded (pass/fail) on the following:

- Exposure
- Focus
- Resolution
- Scale placement

Date Passed	Trainee Initials	Trainer Initials

Lesson 16.5   Latent Print Processing Methods

The selection of the appropriate latent print reagent or sequence of reagents depends on the nature of the surface and the nature of the latent print residue. This lesson will explain the following for each latent print processing method: reagent application, equipment, recovery method, quality controls, chemical hygiene, safety equipment, and documentation requirements.

Practice cases will be provided to prepare the trainee for the competency – these cases bring together lessons regarding processing techniques and photography, and processing case documentation.

Learning Outcomes

16.5.1 The trainee will be able to apply each reagent to the appropriate type of item, type of surface, or targeted latent residue.

16.5.2 The trainee will be able to follow proper chemical hygiene procedures and (e.g. using fume hoods and personal protective equipment).

16.5.3 The trainee will be able to select the correct sequence of reagents according to the type of item, type of surface, or expected latent residue.

16.5.4 The trainee will be able to document the results of each latent print development technique.

16.5.5 The trainee will be able to follow requirements for quality control checks of prepared reagents.

Instructional Methods

Workshop – Latent Print Processing Methods

This lecture introduces the following for each latent print processing method: reagent application, equipment, recovery method, quality controls, chemical hygiene, safety equipment, and documentation requirements.

Date Completed	Trainee Initials	Trainer Initials

Literature Review

- Latent Prints Technical Manual, Chapters 5, 13
- Fingermark Visualization Manual, Home Office, 2014
- Processing Guide for Developing Latent Prints, U.S. Department of Justice, FBI, 2000
- WSP Crime Laboratory Quality Operations Manual, Chapters 11, 18

Date Completed	Trainee Initials

Practice 1 – Visual Examination

Place test impressions on ten non-porous items and examine these items for visible prints with a variety of lighting techniques (direct, oblique, reflected, and transmitted light). Photograph any visible latent prints as if it would be used in casework.

Date Completed	Trainee Initials	Trainer Initials

Practice 2 – Powder Processing

Process the items from "Visual Examination" with powder – five using conventional powder and five using magnetic powder. Photograph each developed latent print prior to lifting. Photograph (as it would be used in casework) and then lift each developed latent print. Complete the required information on the lift cards.

Date Completed	Trainee Initials	Trainer Initials

Practice 3 – Chemical Processing

Use each listed chemical technique to process provided items. Photograph (as it would be used in casework) one developed latent print from each method.

Technique	Date Completed	Trainee Initials	Trainer Initials
Acid Yellow 7			
Amido Black			
Basic Yellow 40			
Cyanoacrylate			
DFO			
Gun Blue			
Indanedione/Indanedione Zinc Chloride			
Iodine			
Lumicyano			
Ninhydrin			
Ninhydrin HT			
Oil Red O			
Physical Developer			
Powder Suspension			
R.A.M.			
Rhodamine 6G			
SPR			

Practice 4 – Processing Cases

The trainee will be provided twenty (20) processing practice cases. The trainer will verify that all relevant policies and procedures have been followed prior to signing off on each test case below.

Test Case	Trainee (initials/completion date)	Trainer (initials/review date)
1		
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Assessments and Performance Expectations

Processing Competency Test
A test case containing 10 items will be assigned as the competency test.

Expectations for Passing:
- For each item:
    - Proper selection of development techniques.
    - Proper sequence of development techniques.
    - Proper selection of suitable latent prints.
        - All suitable latent prints selected.
        - No more than 2 unsuitable latent prints selected.
- Proper forensic photography.
- Proper digital imaging storage.
- Adherence to policies and procedures.
- Accurate completion of case notes.
- Accurate completion of a LIMS processing report.

Date Passed	Trainee Initials	Trainer Initials

Module 17   Supervised Processing Casework

Introduction
The trainee must successfully complete a processing competency test prior to performing supervised processing casework. The trainee must successfully complete twenty (20) supervised processing cases before being authorized for independent processing casework.

Processing Supervised Casework

The goal of supervised processing casework is to transition the analyst to independent processing casework. By the end of supervised casework, the trainee must consistently: make sound technical decisions, follow policy and procedure, recognize anomalies and take appropriate action, compile accurate and understandable case notes, stay organized, use efficient processes, and properly use software and equipment. The trainee must successfully complete a minimum of twenty (20) supervised processing cases.

The trainee will review the case record with a trainer prior to requesting the evidence or working the case. This review will ensure the evidence is ready to be examined for latent prints and expectations of the request are clear (e.g. which evidence and subjects of interest).

After receiving the evidence, the trainee will discuss the evidence and appropriate processing techniques with the trainer. After application of each processing technique, the trainee will assess if there are any latent prints suitable for recovery. A trainer will confirm this decision (and review any latent print photographs) prior to the trainee using a subsequent development technique. Once the processing is complete, the trainer will ensure the evidence has been properly marked by the trainee and properly repackaged.

After the lab work is complete, the casework supervisor will review and evaluate the following prior to the trainee submitting a case to either verification and/or technical review: case file, notes, latent print photographs (if applicable), comparison results (if applicable), and LIMS generated report.

A failed case will result in a replacement case being assigned. If the trainee fails more than five (5) cases, an independent review of all supervised cases will be completed by the trainer, technical lead, and supervisor. In the event of extenuating circumstances, which will be documented, additional supervised cases may be assigned. Barring any extenuating circumstances, failure of five (5) supervised cases will result in the overall failure of Supervised Processing Casework.

The performance expectations for each item in the case are:
- Correct processing techniques selected.
- Correct sequence of techniques selected.
- Correct selection of latent prints for photography.
  - All suitable latent prints selected.
  - No more than 2 unsuitable latent prints selected.
- Proper latent print photography.
- Proper evidence marking.
- Proper digital imaging.

In addition, the expectations for each case with recovered latent prints are:
- No more than one non-suitable print marked.
- No erroneous strong evidence for same source conclusions.
- No more than one false inclusion.
- No more than one false inconclusive conclusion.

- No more than one false incomplete conclusion.
- No more than one missed strong evidence for same source conclusion.
- No more than one erroneous strong evidence for different source conclusion.
- Proper analysis of impressions.
- Accurate completion of case notes.
- Proper selection, encoding, and search of database quality prints.
- Accurate completion of LIMS report.

Case #	Completion date	Trainer (initials, review date, and P/F)
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