Department of Forensic Science

LATENT PRINT TRAINING MANUAL

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1 Introduction

1.1 Overview

The goal of this manual is to provide uniform coordination and quality training in all aspects of friction ridge examination for forensic latent print examiners employed by the Commonwealth of Virginia. This manual is intended to be used in a formal training program that will establish a certain minimum standard of professional competency throughout the Department of Forensic Science.

1.1.1 The training program will be coordinated by the Training Coordinator (TC). The TC is designated by the Section Supervisor in consultation with the Program Manager (PM).

1.1.2 The training period should be completed in approximately one year, which is to include successful completion of all components of the competency exam.

1.1.3 The TC will be responsible for the overall training, which will incorporate all of the listed topics, but may delegate certain duties and blocks of instruction to other examiners in the section. The modules do not need to be completed in the order they are listed in the manual. The TC is responsible for ensuring that the Latent Print Training Record is completed. The various activities for the Modules will be assessed on a Pass/Fail basis.

1.1.3.1 Passing for the verbal and written exams is at least 85% correct responses. See Appendix B for presentation, verbal exam, and written paper passing criteria.

1.1.4 The TC will complete monthly performance evaluations of the trainee per the appropriate electronic workflow. The TC is required to discuss each evaluation with the trainee prior to providing it to the PM and Laboratory Director. Any relevant comments by either the trainee or coordinator are to be included with the report.

1.1.5 It is recommended that each new member of the section spend time in each of the laboratories observing casework, participating in question-and-answer sessions, attending court, and performing supervised work-alongs.

1.1.6 Multiple presentations are required throughout the training program. At a minimum, the TC and the Section Supervisor shall attend each presentation. The PM shall be in attendance for the Legal History Module Presentation(s). To promote the trainee’s development through engaging with various viewpoints from colleagues throughout the section, all latent print staff can be invited to, and are encouraged to attend, each of the trainee’s presentations.

1.1.7 Documentation shall be prepared by the staff members that spent time with the trainee summarizing the activities as well as providing the TC with observations and recommendations related to the trainee’s knowledge and performance.

1.1.8 Should a trainee demonstrate a deficiency which may impact successful completion of the training program, the TC will notify the trainee's Supervisor, who will notify the Section Supervisor (if different from Supervisor), the PM and the Laboratory Director within five working days.

1.1.8.1 A deficiency can include, but is not limited to, failing to obtain an 85% on a verbal or written exam, not meeting expectations on a presentation, submitting assignments past a due date, not exhibiting critical thinking skills, poor decision making, or unethical behavior.

1.1.8.2 If expected results are not reached for the required practical exercises, additional training (i.e., comparison packets, AFIS searches, or LatentSleuth runs) shall be completed as determined by the TC and PM. Any additional requirements and results will be documented via MFR.

1.1.9 Expectations of Trainee

1.1.9.1 Training Notebook

The trainee shall maintain a notebook to document training received. This notebook should include, but is not limited to, daily training received (to include observed events), activities performed by the trainee, and all completed assignments. The Latent Print Training Record shall be dated and initialed by the trainee and TC as the trainee completes each described objective and assignment.
The trainee should provide a weekly written progress report to the TC, to include activities or goals accomplished during the week (i.e., exercises completed, cases work observed, lectures and presentations) as well as objectives for the upcoming week.

1.1.9.2 Readings

The trainee is expected to complete required readings, explore suggested readings when necessary, and utilize additional resources as appropriate.

Required Readings: Readings that shall be read because they are essential to successfully completing the module. Information provided by these readings may be presented on the module verbal or written exam as well as the technical final.

Suggested Readings: readings that provide supplemental or background information on topics presented in each module and will assist in a deeper understanding of these topics.

Additional Resources: Readings or other resources that provide information on topics related to each module. These may include, but are not limited to, articles with real-world applications of topics, future research suggestions, or practical application exercises for practice beyond what is required.

1.1.10 Guidelines for Competency Exam

1.1.10.1 Completion of the Practical Exercises listed in the following sections of the Latent Print Training Manual demonstrates competence in these processes/methods. The TC shall authorize the trainee to participate in supervised work-alongs after the review of the exercises. The TC's initials in the training record shall serve as documentation.

Quality Assurance and Quality Control
Latent Print Development Techniques
Recording Friction Ridge Skin
ACE-V Method: Analysis
ACE-V Method: Comparison and Evaluation
Automated Fingerprint Identification System (AFIS)
Photography
Digital Imaging and Mideo
LatentSleuth
Legal Aspects and Testimony

1.1.10.2 Practical Test

The practical test is a mock case, intended to simulate an average case in difficulty and complexity. It should contain 3-5 items for processing, 2-3 lift cards and 2-3 exemplar cards for comparison. There should be clear expected outcomes for the processing and comparison results. Latent prints should be intentionally placed on certain items with an expected result of successful development and capture. The lift cards should contain latent prints which the ground truth is known and has been validated through comparison and verification by qualified examiners. At least one latent print shall be searched in AFIS/NGI and the expected hit result obtained. The test shall be approved by the PM prior to being presented to the trainee.

1.1.10.3 Technical Final

The technical final examination will be given by the Laboratory's Latent Print Section Supervisor and TC in the presence of the PM and other Department management (as needed) to ascertain the technical knowledge of the individual with guidance from the Virginia DFS Latent Prints Oral Technical Review Form. This examination will be limited to three (3) hours. After the examination, the TC, PM and relevant management, with input from other attendees, will assess the individual's performance. The performance of the individual will be determined to be either satisfactory or unsatisfactory. The trainee must clearly demonstrate sufficient technical knowledge to perform examinations unaided and to draw correct conclusions. If the performance is deemed to be unsatisfactory, the TC, Section Supervisor, PM, and Laboratory Director will determine the appropriate action. After satisfactory completion of the technical oral examination, the individual will be subjected to a final mock trial.

1.1.10.4 Mock Trial

A mock trial will follow the successful completion of the technical oral examination. Section 19 of the Quality Manual (QM) outlines the roles and responsibilities of the participants as well as evaluation and grading guidelines.

1.1.11 Training Documentation

The following shall be maintained and serve as the technical training file:

- written tests
- description of practical exercises, with results as applicable
- copies of the presentations
- competency exam
- signed and dated Latent Print Training Record
- signed and dated Department Training Documentation form
- monthly training reports

At the completion of the training, the technical training file should be retained by the trainee or supervisor and be accessible for internal and external quality audits.

1.1.12 Transition from Trainee to Examiner

The employee's Supervisor or TC should monitor the new examiner's casework for a period of at least six months following certification by the Department. In addition, the Supervisor, or designee will accompany the newly qualified examiner to court for the first few court appearances. Approximately four to six months after qualification, the trainee will complete a Training Program Evaluation form in accordance with the QM.

1.2 Experienced Personnel

1.2.1 Assessment

A technical assessment interview will be conducted with the new employee, Section Supervisor, TC, and PM. The interview will contain questions from each module of this training manual.

1.2.2 Individual Training Plan (ITP)

1.2.2.1 The ITP, see Appendix A for template, will address what additional training is needed for each module. The ITP is written by the TC and approved by the PM and Section Supervisor. If no

additional training is required for a specific module, the plan must contain documentation related to what training the new employee received in the subject matter.

1.2.2.2 At a minimum, the new employee shall take verbal, written, or practical exams for each module, provide a presentation on how the discipline meets the prongs of Daubert, and provide a presentation on the 2009 NAS report recommendations, specifically how the Department addresses them. Information on the 2016 PCAST report as it relates to latent prints should be included in one of the presentations.

1.2.2.3 Monthly performance evaluations as described in this Section and the QM shall be completed for experienced personnel.

1.2.3 Training Documentation

All training documentation listed above, in addition to the Individual Training Plan, shall be maintained by the employee and serve as the technical training file.

1.2.4 Guidelines for Competency Examination

An experienced examiner shall complete a competency exam as outlined in this manual, approximately four months from their hire date.

1.3 Training of Forensic Science Laboratory Specialists (FLS)

1.3.1 The training program will be coordinated by the TC. The TC is designated by the Section Supervisor in consultation with the PM.

1.3.2 The TC will be responsible for the overall training, which will incorporate all of the listed topics, but may delegate certain duties and blocks of instruction to other examiners in the section. The TC is responsible for assuring that the Latent Print Training Record is completed. The various activities for the Modules will be assessed on a Pass/Fail basis.

1.3.2.1 Passing for the verbal and written exams is at least 85% correct responses. See Appendix B for presentation, verbal exam, and written paper passing criteria.

1.3.3 Monthly performance evaluations, as outlined in the QM, of the trainee will be prepared by the TC and then be provided to the PM and the Laboratory Director of the laboratory in which the trainee is being trained. The TC is required to discuss each evaluation with the trainee prior to providing it to the PM and Laboratory Director. Any relevant comments by either the trainee or coordinator are to be included with the report.

1.3.4 Should a trainee demonstrate a deficiency which may impact successful completion of the training program, the TC will notify the trainee's Supervisor, who will notify the Section Supervisor (if different from Supervisor), the PM, and the Laboratory Director within five working days.

1.3.4.1 A deficiency can include, but not limited to, failing to obtain an 85% on a written or verbal exam, not meeting expectations on a presentation, submitting assignments past a due date, not exhibiting critical thinking skills, poor decision making, or unethical behavior.

1.3.5 Expectations of Trainee

See Section 1.1.9 of this manual for the requirements.

1.3.6 Guidelines for Competency Examination

An FLS shall complete a competency exam as outlined in this manual, for specific modules for which they are trained, approximately six months from their hire date.

2 Orientation

2.1 Facilities and Personnel

A tour of the building shall be provided as well as introductions to personnel.

2.2 Specific Topics

The trainee shall familiarize themselves with the below references and review the necessary training modules.

- Quality Manual (QM)
- Department Administrative policies
- Regional Operating Procedures (ROPs)
- Latent Print Procedures Manual
- Latent Print Training Manual
- Organization of the Department of Forensic Science (DFS)
- DFS Safety Manual
- Departmental training presentations (found in Ideagen: Documents Tab, DFS Folder, Resources Folder)
    - Quality System Training Modules 1-3
    - Ethics Training Module
    - Section Specific Modules (Breath Alcohol, Controlled Substances, Data Bank, Digital Multimedia Evidence, DNA, Firearms, Forensic Training Section, Latent Prints, Mitochondrial DNA, Toxicology, and Trace Evidence)
    - Legal Training for New Employees

2.3 Laboratory Locations and Capabilities

An introduction to the technical capabilities of all laboratories, to include the regional boundaries and areas of overlap, will be discussed.

2.4 Agencies and Court Systems

An explanation of the operation of local, state, and federal law enforcement agencies and court systems will be provided.

2.5 Employee Work Profile (EWP)

The duties of a forensic latent print examiner or forensic laboratory specialist, as determined by the classification of the position, will be clarified.

2.6 Software Systems

2.6.1 A brief tutorial shall be provided for the following systems:

- Forensic Advantage Laboratory Information Management System (FA LIMS)
- Qualtrax
- Mideo Caseworks
- LatentSleuth
- Multi-Modal Biometric Identification System (MBIS)

3 History

3.1 Purpose

To provide the trainee with a background in the historical foundations of the fingerprint field. Historical figures, events in the field, the history of classification systems and empirical evidence will be covered.

3.2 Objectives

3.2.1 The trainee will:

- Describe the use of friction ridge skin as a means of identification over the course of history
- Distinguish the impact of major figures and events in the history of fingerprints
- Summarize the fundamentals of fingerprint classification systems
- Summarize the history of empirical evidence that supports the use of friction ridge impressions as a means of identification

3.3 Mode of Instruction

3.3.1 Lecture

- History of Fingerprints

3.4 Assignments

3.4.1 Read the following:

- Ashbaugh, D. (1999). *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology*. Boca Raton, FL: CRC Press. pp. 11-60.

- United States Department of Justice (2011). "History". *The Fingerprint Sourcebook.* Washington, D.C.:U.S. Government Printing Office.

- United States Department of Justice. (2011). "Systems of Friction Ridge Classification". *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office. pp. 5-3 - 5-10; 5-18 – 5-24. (BOOK)

3.5 Mode of Evaluation

3.5.1 Review of the History written exam to ensure its successful completion.

3.6 Suggested Readings

- Berry, J.; Stoney, D. A. "History and Development of Fingerprinting". *Advances in Fingerprint Technology*, 2nd ed.; Lee, H. C., Gaensslen, R. E., Eds.; CRC Press: Boca Raton, FL, 2001; pp 1–40. (BOOK)
- Gillhelm, N. (2001). *A Life of Sir Francis Galton: From African Exploration to the Birth of Eugenics.* New York, NY: Oxford University Press. pp. 231-249. (BOOK)
- Sodhi, G.S., Kaur, J. (2005) "The Forgotten Indian Pioneers of Fingerprint Science" Current Science, 88(1), pp 185-191.

4 Legal History

4.1 Purpose

To provide the trainee with knowledge pertaining to the introduction of fingerprint science to the criminal justice system and significant cases associated with the discipline.

4.2 Objectives

4.2.1 The trainee will:

- Recognize the significance of court cases that introduced fingerprints as a means of identification to the United States' criminal justice system
- Compare and contrast the historical and current evidence admissibility standards of the United States and Virginia and summarize the court cases that relate to them
- Summarize the implications of the NAS and PCAST reports on the fingerprint discipline
- Understand and discuss the challenges posed to the use and science of fingerprints

4.3 Mode of Instruction

4.3.1 Lecture

- Fingerprints in Courts

4.4 Assignments

4.4.1 Read the following:

- Moenssens, A. (1969). *Fingerprints and the Law*. Philadelphia, PA: Chilton Book Company. Chapter 3. (BOOK)

- United States Department of Justice. (2011). "Fingerprints and the Law". *The Fingerprint Sourcebook.* Washington, D.C.: U.S. Government Printing Office. (BOOK)

- Court Decisions:
  - Daubert v Merrell Dow Pharmaceuticals
  - Frye v US
  - US v Llera Plaza II
  - US v Mitchell – Final
  - US v Mitchell – Joyner
  - Spencer I – IV

- NAS Report

- PCAST Report

4.4.2 Provide a 15-20 minute presentation focused on how the discipline meets the challenges (prongs) of Daubert and Virginia's admissibility standards.

4.4.3 Provide a 10-15 minute presentation including a brief summary of the challenges to the latent print discipline stated within the 2009 NAS report as well as the 2016 PCAST report and how the Virginia Department of Forensic Science addresses them.

4.5 Mode of Evaluation

4.5.1 The presentations will be evaluated on if the trainee successfully presents the information within the allotted time to the audience with a minimal amount of visible or distracting nervousness and successfully answering questions from the audience. See Appendix B for additional criteria. The trainee will have two attempts to complete these assignments.

4.5.2 Review of the Legal History written exam to ensure its successful completion.

4.6 Suggested Readings

- IAI PCAST Response
- ATF PCAST Response
- DOJ PCAST Statement
- DOJ PCAST Statement Abstract
- FBI PCAST Response
- SWGFAST NAS Comments
- Moenssens, A. (1969). *Fingerprints and the Law*. Philadelphia, PA: Chilton Book Company. Chapters 7-11 and Appendix 1. (BOOK)
- Moenssens, Andre. Admissibility of Fingerprint Evidence and Constitutional Objections to Fingerprinting Raised in Criminal and Civil Court. (1963) Chicago-Kent Law Review.
- General Electric v Joiner
- Kumho Tire Co v Carmichael
- McGovern v Van Riper
- People v Roach
- People v Sallow
- US v Havvard
- Wertheim, P. A. (1994). Detection of Forged and Fabricated Latent Prints . *JFI*, 44(6), 652–681.
- Who killed Inge? 11 years later mysterious Lotz murder still haunts | You
- US expert fingers Lotz cops | News24

5 Biology and Physiology

5.1 Purpose

To provide the trainee with the biological foundation for the use of friction ridge skin as a means of identification, including associated biological terminology, the development, growth, anatomical features, and abnormalities of friction ridge skin: factors impacting persistence of friction ridge skin; and chemical compositions of latent print residue.

5.2 Objectives

5.2.1 The trainee will:

- Explain the biological basis for the use of fingerprints as a means of identification.
- Discuss and diagram the anatomical features of friction ridge skin.
- Explain the embryological development of friction ridge skin and the timeline associated with formation.
- Summarize and diagram volar pad development and explain its relation to pattern formation.
- Understand and define key biological terminology, including but not limited to, developmental noise, developmental stability, fluctuating asymmetry, and highly discriminable vs. unique.
- Describe the factors that may affect friction ridge skin persistence (e.g., age, wound/mutilation, disease) and explain the healing process of the skin.
- Summarize abnormalities that can affect friction ridge skin.
- Identify the chemical composition of latent print residue.

5.3 Mode of Instruction

5.3.1 Lectures

- Anatomy and Physiology of Friction Ridge Skin
- Embryology and the Development of Friction Ridge Skin

5.4 Assignments

5.4.1 Read the following:

- Ashbaugh, D. (1999). *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology*. Boca Raton, FL: CRC Press. pp. 61-85.
- Champod, C.; Lennard, C.J.; Margot, P.; Stoilovic, M. (2016) Chapter 1. *Fingerprints and Other Ridge Skin Impressions.* Boca Raton, FL: CRC Press. (BOOK)
  - Chapter 1 – Friction Ridge Skin and Prints
- Drahansky, M., et al. (2012). Influence of Skin Diseases on Fingerprint Recognition. *Journal of Biomedicine and Biotechnology.* 2012, 1-14.
- Kücken, M., & Champod, C. (2013). Merkel cells and the individuality of friction ridge skin. *Journal of Theoretical Biology*, *317*, 229–237.
- Maceo, A. (2003). The Biology of Skin: Book Report. *JFI*, 53 (5), 585-595.United States Department of Justice. (2011). "Anatomy and Physiology of Adult Friction Ridge Skin". *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office.
  - Primary source for *The Fingerprint Sourcebook* selection above: Maceo, A. (2005). The Basis for the Uniqueness and Persistence of Scars in the Friction Ridge Skin. *Fingerprint Whorld*, 31 (121), 147-161.
- United States Department of Justice. (2011). "Embryology and Morphology of Friction Ridge Skin". *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office. (BOOK)
  - Primary source for *The Fingerprint Sourcebook* selection above: Wertheim , K.; Maceo, A. (2002). The Critical Stage of Friction Ridge and Pattern Formation. *JFI*, 52 (1), 35-85.

- Wertheim, K. (1998). An Extreme Case of Fingerprint Mutilation. *JFI,* 48 (4), 466-477.
- White, A. V. (2022). Features of the Friction Ridge Skin: Attributes, Diagnosticity, and Limitations. *JFI*, *72*(1), 33-45.

5.4.2 The trainee shall choose one of the following two options.

Option 1: Two Presentations

- Provide a 10-15 minute presentation focused on anatomy and physiology as they relate to friction ridge skin.

- Provide a 10-15 minute presentation focused on embryology and the development of friction ridge skin.

Option 2: One Presentation

- Provide a 25-30 minute presentation focused on anatomy, physiology as well as the embryological development of friction ridge skin

5.4.3 Prepare a diagram depicting the structure of the skin.

5.4.4 Prepare a diagram describing the progression of the volar pads and how they relate to the pattern development.

5.4.5 Prepare a timeline depicting the stages of embryological development.

5.5 Mode of Evaluation

5.5.1 The presentation(s) will be evaluated on if whether the trainee successfully presents the information within the allotted time to the audience with a minimal amount of visible or distracting nervousness and successfully answering questions from the audience. See Appendix B for additional criteria. The trainee will have two attempts to complete this assignment.

5.5.2 Review of the Biology and Physiology written exam to ensure its successful completion.

5.6 Suggested Readings

- Babler, W. J. (1991). Embryologic Development of Epidermal Ridges and Their Configurations. *Birth Defects Original Article Series,* 27 (2), 95-112.
- David, T. J. (1973). Congenital Malformations of Human Dermatoglyphs. *Archives of Disease in Childhood*. 48, 191-198.
- Feng, J., et al. (2009). Fingerprint Alteration. MSU Technical Report.
- Gaensslen, R.; Lee, H. (2001). *Advances in Fingerprint Technology.* New York, NY: Elsevier. (BOOK)
  - Chapter 3 – Composition of Latent Print Residue
- Kim, D.-K.; Holbrook, K. A. (1995). The appearance, density, and distribution of Merkel cells in human embryonic and fetal skin: Their relation to sweat gland and hair follicle development. *Journal of Investigative Dermatology*, 104 (3), 411-416.
- Kücken, M. (2007). Models for Fingerprint Pattern Formation. *Forensic Science International,* 171*,* 85-96.
- Kücken, M.; Newell, C. (2005). Fingerprint Formation. *Journal of Theoretical Biology.* 235, 71-83.
- Kücken, M.; Newell, C. (2004). A Model for Fingerprint Formation. *Europhysics Letters*, 68 (1), 141-146.
- Maceo, A. (2005). The Basis for the Uniqueness and Persistence of Scars in the Friction Ridge Skin. *Fingerprint Whorld*, 31 (121), 147-161.
- Wertheim , K.; Maceo, A. (2002). The Critical Stage of Friction Ridge and Pattern Formation. *JFI*, 52 (1), 35-85.

6 Quality Assurance and Quality Control

6.1 Purpose

To provide the trainee with a working knowledge of the quality assurance policies of the Department and the Latent Print Section specific procedures. This module covers the Laboratory Information Management System (LIMS), evidence handling, including its maintenance, chain of custody, and documentation, as well as the generation of Certificates of Analysis.

6.2 Objectives

The trainee will:

- Understand and recall the QM and Latent Print Section SOP to discuss the quality assurance policies of the Department and those related to the Latent Print Section specifically.
- Understand and explain how DFS policies and procedures meet accreditation requirements.
- Describe the LIMS and how to use it.
- Summarize the flow of evidence through the laboratory system and how the chain of custody is documented.
- Demonstrate the ability to properly maintain, mark, and package evidence.
- Explain the importance of the maintenance and reagent logs and demonstrate how to properly complete them.
- Develop a working knowledge of the various documentation and reports related to the Latent Print Section of the Department of Forensic Science.
- Identify the proper format and content of a Certificate of Analysis (CoA).
- Complete technical and administrative reviews in accordance with policy and procedures.

6.3 Mode of Instruction

6.3.1 Lectures

- Quality Assurance and Quality Control
- Evidence Handling

6.3.2 Technical / Administrative Review training

The following documents shall be read and discussed with the TC:

- Quality Manual - Monitoring Results Section
- Latent Print Procedures Manual - Quality Assurance Section, Examination Documentation Section, Report Wording Section
- Technical Review Form
- ANAB AR 3125 ISO/IEC 17025:2017 Forensic Science Testing Laboratories Accreditation Requirements - Sections 7.5 Technical Records, 7.7 Ensuring the validity of results, 7.8 Reporting Results and 7.11 Control of data and information management
- ISO/IEC 17025:2017 – Sections 7.5 Technical Records, 7.7 Ensuring the validity of results, 7.8 Reporting of results and 7.11 Control of data and information management

6.4 Observation

6.4.1 Shadow numerous examiners as they complete all aspects of casework. The purpose of observation is for the trainee to gain understanding of documentation requirements and how the LIMS is utilized. Observation events should be recorded in the training record.

6.5 Assignments

6.5.1 Read and understand the evidence packaging and marking criteria listed in the QM.

6.5.2 Read and understand the evidence marking criteria listed in the Latent Print Procedures Manual.

6.5.3 Read and understand the examination documentation requirements in the QM and the Latent Print Procedures Manual.

6.5.4 Accurately complete draft certificates of analysis for evidence that has been examined (either in mock cases or supervised casework).

6.5.5 Complete the Quality Manual Questions

6.6 Practical Exercises

6.6.1 The trainee should document the review of at least five case files using the appropriate Technical Review Form. Case files should be generated by multiple examiners and shall include at least one from each of the other laboratories (it is acceptable for these to be post-release reviews).. The potential findings of the reviews shall be discussed with the TC. Technical Review forms generated in this capacity shall be marked as Training and retained in their Training File. The case files shall be technically reviewed by an authorized examiner pursuant to the Quality Manual prior to release.

6.6.2 Complete a DFS Audit Trail Worksheet on at least one case.

6.7 Mode of Evaluation

6.7.1 Review of the case notes and draft certificates of analysis generated as a part of the five mock cases completed for the Practical Exercise in the Digital Imaging Module to ensure completion in accordance with QM and Section Manual.

6.7.2 Review the Audit Trail Worksheet to ensure each question was properly addressed.

7 Latent Print Development Techniques

7.1 Purpose

To provide the trainee with comprehensive knowledge of the physical and chemical methods available for latent print development, considerations of sequential processing, and strategies related to detecting forged and fabricated prints in casework.

7.2 Objectives

The trainee will develop their knowledge of latent print development practices and demonstrate their ability to properly develop latent prints by:

- Applying safety practices when dealing with biohazards, syringes, controlled substances, firearms, alternate light sources, and chemicals in the laboratory and recognizing their importance.
- Participating in the preparation and use of reagents while employing appropriate quality assurance measures.
- Properly utilizing the various types of powders listed in the DFS LX Procedures Manual and demonstrating the ability to lift latent prints from various surfaces for preservation.
- Appropriately employing the chemical processing techniques listed in the DFS LX Procedures Manual while adhering to the method of sequential processing.
- Applying the method of sequential processing to preserve evidence for examinations in other disciplines. (i.e., biological evidence for DNA, hair and fiber collection, preservation of firearms evidence)
- Recalling the details related to the physical and chemical processing methods listed in the DFS LX Procedures Manual (type of process, surface viability, target substrate, capture method)
- Describing the scientific process of cyanoacrylate ester (superglue) fuming and dye staining.
- Explaining how alternate light sources work as related to latent fingerprint excitation (fluorescence and luminescence).
- Defining forged and fabricated prints, summarizing real world examples of each as well as strategies to detect them in casework.

7.3 Mode of Instruction

7.3.1 Lecture

- Latent Print Development

7.3.2 Demonstrations

7.3.2.1 Observe examiners processing evidence for casework to gain an understanding of each of the development techniques performed, e.g., how to properly apply the techniques to casework evidence while adhering to the method of sequential processing.

7.3.2.2 Observe examiners in other disciplines processing evidence for casework in order to gain an understanding of techniques performed and how to adhere to the method of sequential processing in multi-discipline casework.

7.4 Assignments

7.4.1 Properly prepare reagents available for use in the DFS LX Procedures Manual.

7.4.2 Read the following:

- United States Department of Justice. (2011). Chapter 7: “Latent Print Development”. *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office. (BOOK)
  - Chapter 7 – Latent Print Development
    - Sections 7.1 - 7.14

- Champod, C.; Lennard, C.J.; Margot, P.; Stoilovic, M. (2016) Chapter 5. *Fingerprints and Other Ridge Skin Impressions.* Boca Raton, FL: CRC Press. (BOOK)
  - Chapter 5 – Issues Related to the Exploitation of Fingerprints and Fingermarks
    - Section 5; Pages 327-330 (Second Edition)
- Wertheim, P. A. (1994). Detection of Forged and Fabricated Latent Prints. *JFI*, 44 (6), 652–681.

7.4.3 Provide a 10-15 minute presentation focused on a new development technique or a modification to a current technique, based on research and testing performed by the trainee, that should be considered for implementation at the Department.

7.5 Practical Exercises

7.5.1 Process numerous items to include, but not limited to; plastic, metal, , Styrofoam, paper, cardboard, adhesive surfaces, thermal receipts, and surfaces containing blood prints, with the appropriate development techniques.

7.6 Mode of Evaluation

7.6.1 Review of the items processed during the practical exercises to determine if the appropriate techniques were properly utilized.

7.6.2 The presentation will be evaluated on whether the trainee successfully presents the information within the allotted time to the audience with a minimal amount of visible or distracting nervousness and successfully answering questions from the audience. See Appendix B for additional criteria. The trainee will have two attempts to complete this assignment.

7.6.3 Review of the Latent Print Development Techniques written exam to ensure its successful completion.

7.7 Suggested Readings

- Champod, C.; Lennard, C.J.; Margot, P.; Stoilovic, M. (2016). Chapter 4. *Fingerprints and Other Ridge Skin Impressions.* Boca Raton, FL: CRC Press. (BOOK)
  - Chapter 4 – Fingermark Detection and Enhancement (Second Edition)
    - Pages 179 - 314 (Second Edition)
  - Chapter 5 – Issues Related to the Exploitation of Fingerprints and Fingermarks
    - Section 4: “Age Estimation of Marks”. Pages 322 - 327 (Second Edition)
- Champod, C.; Espinoza, M. (2014). Forgeries of Fingerprints in Forensic Science. Handbook of Biometric Anti-Spoofing (Pages 13 - 34).
  - Section 2.3 – Fingerprint Anti-spoofing in Forensic Science (Pages 28 - 32)
  - Section 2.4 – Conclusion (Pages 32 - 34)
- FBI Latent Print Processing Guide (2000)
- DEA Latent Print Examination Manual (2020)
- Bonebreak, G. C. (1976). Fabricating Fingerprint Evidence. *Identification News*, 3–13.
- Barton, K.; Matthias, G. (2019) Distinguishing Forged and Fabricated Prints. *JFI*, 69 (2) Page 195.
- Sellenraad, Ashley. (2018) A Case Report: The analysis of Patent Prints Identified as Forgeries. *JFI*, 68 (1) Pages 003-009.
- Wertheim, P.A. (1998) Integrity Assurance: Policies and Procedures to Prevent Fabrication of Latent Print Evidence. *JFI*, 48 (4), Pages 431-441.
- https://www.news24.com/You/Archive/who-killed-inge-11-years-later-mysterious-lotz-murder-still-haunts-20170728
- https://www.news24.com/News24/US-expert-fingers-Lotz-cops-20070813
- Antoine, K. M., Mortazavi, S., Miller, A. D., & Miller, L. M. (2010). Chemical differences are observed in children’s versus adults’ latent fingerprints as a function of time. *Journal of Forensic Sciences.* 55 (2), 513–518.

8 Recording Friction Ridge Skin

8.1 Purpose

To provide the trainee with practical knowledge of the materials, procedures, methods, and techniques of recording friction ridge skin on both living and deceased subjects.

8.2 Objectives

The trainee will:

- Develop knowledge of the equipment necessary for recording friction ridge skin.
- Demonstrate the ability to properly record complete and legible major case prints on both living and deceased subjects.
- Recall, summarize, and practice the various methods of recording friction ridge skin from cadavers in differing states of decomposition (including, but not limited to, Mikrosil, ink & spoon, boiling rehydration, and chemical rehydration).
- Understand and adhere to the procedures relating to the handling of evidence potentially contaminated with bloodborne pathogens or other hazards.

8.3 Mode of Instruction

8.3.1 Lectures

- Recording Friction Ridge Skin
- Recording Postmortem Friction Ridge Skin
- Forensic Science Academy class on postmortem collection, if possible.

8.3.2 Demonstrations

8.3.2.1 Emphasis is placed on practical hands-on work in this training module. The trainee will record major case prints of several individuals utilizing the various prescribed methods.

8.4 Assignments

Read the following:

- United States Department of Justice. (2011). “Recording Living and Postmortem Friction Ridge Exemplars”. *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office. (BOOK)

8.5 Practical Exercises

8.5.1 Collect exemplars (tenprint, palm print, and major case prints) from at least three individuals, with at least one being post-mortem.

8.6 Mode of Evaluation

8.6.1 Review of the written Recording Friction Ridge Skin exam to ensure its successful completion.

8.6.2 Review of the practical exercises to ensure the trainee’s ability to obtain legible exemplars from living and deceased individuals

8.7 Suggested Readings

- United States Department of Justice. (Rev 12-84). *The Science of Fingerprints.* Washington, D.C.: U.S. Government Printing Office. pp. 111-157. (BOOK)
- Bryan T. Johnson. (Feb. 2023) FBI DVI Postmortem Fingerprint Training.

9 Cognitive Factors in Comparative Analysis

9.1 Purpose

Fingerprint comparisons are conducted using comparative analysis. Comparative analysis is a cognitive process in which the primary "tool" is the examiner's brain. Therefore, it is important to be aware of how the brain "sees" images and how one's view can be influenced by outside factors, and as a result, the implications this can have on the decision-making process when conducting latent print comparisons.

9.2 Objectives

The trainee will:

- Understand the role the brain plays in the comparative analysis process.
- Recognize and discuss the various cognitive factors, that can influence the decisio- making process when completing comparisons and how to mitigate them.

9.3 Mode of Instruction

9.3.1 Lectures

- Cognitive Factors and their Effects on Fingerprint Comparison Science

9.4 Assignments

9.4.1 Read the following:

- Ashbaugh, D. (1999). *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology.* Boca Raton, FL: CRC Press. pp. 103-108.

- Risinger, D.M., Saks, M.J., Thompson, W.C., & Rosenthal, R. (2002) The Daubert/Kuhmo Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion. *California Law Review, 90* (1). 1-56.

- Stacey, R. (2004). A Report on the Erroneous Fingerprint Individualization in the Madrid Train Bombing Case. *Journal of Forensic Identification, 54* (6), 706-718.

- Byrd, J. S. (2006). Confirmation Bias, Ethics, and Mistakes in Forensics. *Journal of Forensic Identification. 56* (4), 511-525.

- Dror, I.E., Charlton, D., & Peron, A.E. (2006). Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications. *Forensic Science International, 156* (1). 74-78.

- Dror, I.E., Hind, S.L., Peron, A.E., & Charlton, D. (2005). When Emotions get the Better of Us: The Effect of Contextual Top-down Processing on Matching Fingerprints. *Applied Cognitive Psychology. 19* (6). 799-809.

- Dror, I., & Charlton, D. (2006). Why Experts Make Errors. *Journal of Forensic Identification. 56* (4). 600-616.

- Dror, I.E. (2014). Practical Solutions to Cognitive and Human Factor Challenges in Forensic Science. *Forensic Science Policy & Management*, 4(3–4).1–9.

- Eldridge, H. (2021) Mind-set - How bias leads to errors in friction ridge comparisons. Forensic Science International 318. 1- 14.

- Kunkler, K. (2023) Reducing the impact of cognitive bias in decision making: Practical actions for forensic science practitioners. Forensic Science International Synergy 7. 1- 8.

- Langenburg, G., et al. (2009) Testing for potential contextual bias effects during the verification stage of the ACE-V methodology when conducting fingerprint comparisons. *Journal of Forensic Science.* 54(3), 571-582.

- United States Department of Justice. (2011). "Special Abilities and Vulnerabilities in Forensic Science". *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office.

- United States Department of Justice. (2006) Unclassified Executive Summary of the Office of the Inspector General: A Review of the FBI's Handling of the Brandon Mayfield Case.

9.5 Mode of Evaluation

Review of the written Cognitive Factors in Comparative Analysis exam to ensure its successful completion.

9.6 Suggested Readings

- Ashbaugh, D. (1999). *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology.* Boca Raton, FL: CRC Press. pp. 103-108. (BOOK)
- Dror, I.E., Charlton, D., & Peron, A.E. (2006). Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications. Forensic Science International, 156 (1). 74-78.
- Dror, I. et al. (2005). When Emotions get the Better of Us: The Effect of Contextual Top-down Processing on Matching Fingerprints. Applied Cognitive Psychology. 19 (6). 799-809.
- Dror, I. (2012). "Letter to the Editor: Combating Bias: The Next Step in Fighting Cognitive and Psychological Communication". *Journal of Forensic Science.* 57 (1). 276-277.
- Risinger, D.M., Saks, M.J., Thompson, W.C., & Rosenthal, R. (2002) The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion. California Law Review, 90 (1). 1-56.
- Stacey, R. (2004). A Report on the Erroneous Fingerprint Individualization in the Madrid Train Bombing Case. *JFI*, 54 (6), 706-718.

10 ACE-V Method - Analysis

10.1 Purpose

To provide the trainee with the knowledge and ability to detect friction ridge features and document the totality of observed data in friction ridge impressions of all complexity levels and defend suitability decisions.

10.2 Objectives

The trainee will:

- Define common terminology associated with the analysis of latent prints including, but not limited to, specificity, rarity, pattern forced, clarity, distortion, and tolerance.
- Identify the various types of distortion and recognize the effects on friction ridge prints.
- Analyze latent prints, including appropriate documentation of the totality of observed data (anatomical region, orientation, ridge flow / pattern type, anchor point(s), scars, creasesm incipient ridges, ridge features, etc.) and categorization of suitability for comparison.
- Evaluate the observed data in friction ridge prints suitable for comparison to determine complexity level and defend the decision.
- Support and defend suitability for comparison decisions

10.3 Mode of Instruction

10.3.1 Lectures

- Analysis
- Distortion
- Finger & Palm Print Orientation Clues

10.3.2 Demonstrations

10.3.2.1 The trainee should observe experienced examiners analyzing latent prints. The purpose of this observation is for the trainee to obtain knowledge regarding an efficient workflow to accurately conduct and document latent print analysis.

10.3.2.2 The trainee should be observed by experienced examiners analyzing latent prints. Feedback should be given to the trainee during this process.

10.4 Assignments

10.4.1 Read the following:

- Champod, C.; Lennard, C.J.; Margot, P.; Stoilovic, M. (2016). Chapter 2. *Fingerprints and Other Ridge Skin Impressions.* Boca Raton, FL: CRC Press. (BOOK)
  - Chapter 2 – Friction Ridge Identification Process
    - Introduction & Section 2.1; Pages 33 – 55 (Second Edition)

- Expert Working Group on Human Factors in Latent Print Analysis. (2012). "Latent Print Examination and Human Factors: Improving the Practice Through a Systems Approach". U.S. Department of Commerce, national Institute of Standards and Technology. Chapters 1-3, 7.

- Langenburg, G., Champod C. (2011). The GYRO System – A Recommended Approach to More Transparent Documentation. *JFI*, 61 (4), 373-384.

- United States Department of Justice. (2011). "Examination Process". *The Fingerprint Sourcebook.* Washington, D.C.: U.S. Government Printing Office. (BOOK)

- White, Alice. (2022). Features of the Friction Ridge Skin: Attributes, Diagnosticity, and Limitations. *JFI*, 72 (1), 46-127.

10.4.2 Analyze approximately 50 latent prints developed from the latent print development processing practical exercises and seek feedback from the TC or designee.

10.4.3 Analyze approximately 50 latent prints obtained from actual casework and seek feedback from the TC or designee.

10.5 Practical Exercises

10.5.1 Complete analysis exercise packets 1 through 10.

10.6 Mode of Evaluation

10.6.1 Review of the Analysis Exercise Packets 1-10 to ensure the trainee obtained the expected results.

10.6.2 Successful completion of the ACE-V verbal exam conducted by the TC. See Appendix B for additional criteria. Note: The verbal exam is to be used as a mode of evaluation for this module in conjunction with the ACE-V Comparison and Evaluation Module. The trainee will have two attempts to complete this assignment.

10.7 Suggested Readings

- Eldridge, H.; et. al. (2020) Examining and expanding the friction ridge value decision. Forensic Science International 314.
- OSAC (2020) Standard for Examining Friction Ridge Impressions
- OSAC (2020) Best Practice Recommendation for Analysis of Friction Ridge Impressions
- OSAC (2020) Standard for Consultation During Friction Ridge Examination
- People v. Cline Court Opinion
- SWGFAST (2012) Document #8: Standard for the Documentation of Analysis, Comparison, Evaluation, and Verification (ACE-V) (Latent).
- United States Department of Justice. (Rev 12-84). *The Science of Fingerprints.* Washington, D.C.: U.S. Government Printing Office. Chapters 2 and 3. (BOOK)
- United States Department of Justice. (2006) Unclassified Executive Summary of the Office of the Inspector General: A Review of the FBI's Handling of the Brandon Mayfield Case.

11 ACE-V Method Comparison and Evaluation

11.1 Purpose

To provide the trainee with the knowledge and ability to conduct and document comparisons and render appropriate source conclusions during the evaluation stage of the ACE-V method.

11.2 Objectives

The trainee will:

- Develop a thorough understanding of the ACE-V methodology in order to evaluate and discuss its components and related research in depth.
- Appropriately compare latent prints including proper documentation of all comparisons according to policy and procedure.
- Develop knowledge of impression shape, ridge flow, and crease tendencies in both finger and palm prints to aid in completing efficient comparisons.
- Appropriately articulate and defend how comparison conclusions are reached.
- Demonstrate knowledge of DFS policies and procedures related to the examination process.
- Describe close non-match comparisons and briefly summarize research and case examples..
- Demonstrate knowledge of DFS policies and procedures related to the Verification process.
- Develop skills related to conflict resolution to engage in productive conversations when a difference of opinion occurs.

11.3 Mode of Instruction

11.3.1 The trainee should participate in difference of opinion conversations for both the analysis and comparison phases with the TC and fellow examiners to develop skills of productive communication related to conflict resolution..

11.3.2 Lectures

- Comparison, Evaluation & Verification of Friction Ridge Prints
- Finger & Palm Print Smart Searching
    - Primary source for presentation: Smith, Ron (2021) Palm Prints Searching Smart. Ron Smith & Associates, Inc.

11.3.3 Demonstrations

11.3.3.1 The trainee should observe experienced examiners comparing latent prints. The purpose of this observation is for the trainee to obtain knowledge regarding an efficient workflow to accurately conduct and document latent print comparisons.

11.3.3.2 The trainee should be observed by experienced examiners conducting comparisons of latent prints. Feedback should be given to the trainee during this process.

11.4 Assignments

11.4.1 Read the following:

- Busey, T.; et. al. (2021). Characterizing missed identifications and errors in latent fingerprint comparisons using eye-tracking data. PLoS ONE 16 (5), e0251674.

- Champod, C.; Lennard, C.J.; Margot, P.; Stoilovic, M. (2016). Chapter 2. *Fingerprints and Other Ridge Skin Impressions.* Boca Raton, FL: CRC Press. (BOOK)
  - Chapter 2 – Friction Ridge Identification Process
    - Sections 2.2 - 2.8; Pages 56 – 116 (Second Edition)

- Dror, I., Langenburg, G. (2018) "Cannot Decide": The Fine Line Between Appropriate Inconclusive Determinations Versus Unjustifiably Deciding Not To Decide. *Journal of Forensic Sciences.* 1-6.

- Koehler, J.J., Liu, S. (2021) Fingerprint error rate on close non-matches. *Journal of Forensic Sciences.* 66: 129-134.

- Neumann, et al. (2007). Computation of Likelihood Ratios in Fingerprint Identifications for Configurations of Any Number of Minutiae. *Journal of Forensic Sciences.* 52 (1), 54-64.

- Pacheco, I., Cerchial, B, & Stoiloff, S. (2014). Miami-Dade Research Study for the Reliability of the ACE-V Process: Accuracy and Precision in Latent Fingerprint Examinations. Unpublished document.

- Rairden, A; et. al. (2018) Resolving latent conflict: What happens when latent print examiners enter the cage?. Forensic Science International 289 (2018) 215-222.

- Tangen, J.; et. al. (2011) Identifying Fingerprint Expertise. Psychological Science 22 (8) 995-997.

- Ulery, B.T., Hicklin, R.A., Buscaglia, J, & Roberts, M.A. (2010). Accuracy and Reliability of Forensic Latent Fingerprint Decisions. Proceedings of the National Academy of Sciences. 108 (19), 7733- 7738.

- Ulery, B.T., Hicklin, R.A., Buscaglia, J, & Roberts, M.A. (2015). Changes in latent fingerprint examiners' markup between analysis and comparison. Forensic Science International 247 (2015) 54–61.

- Ulery, et al. (2014). Measuring What Latent Fingerprint Examiners Consider Sufficient Information for Individualization Determinations. PLoS ONE 9 (11): e110179.

- Ulery, B.T., Hicklin, R.A., Buscaglia, J, & Roberts, M.A. (2012). Repeatability and Reproducibility of Decisions by Latent Fingerprint Examiners. PLoS ONE 7(3): e32800.

11.4.2 Compare approximately 50 latent prints developed from latent print development processing practical exercises and seek feedback from the TC or designee.

11.4.3 Compare approximately 50 latent prints obtained from actual casework and seek feedback from the TC or designee.

11.5 Practical Exercises

11.5.1 Complete Comparison Exercise packets 1-10.

11.6 Mode of Evaluation

11.6.1 Successful completion of the ACE-V verbal exam conducted by the TC. See Appendix B for additional Criteria. Note: The verbal exam is to be used as a mode of evaluation for this module in conjunction with the ACE-V Analysis Module. The trainee will have two attempts to complete this assignment.

11.6.2 Review Comparison Exercise Packets 1-10. If an erroneous identification(s) occurs or the trainee does not achieve a 95% of the expected results for exclusion(s) and inconclusive(s) decisions, additional comparison packets shall be completed as determined by the TC and PM. The successful completion of at least ten comparison packets is required.

11.6.3 Review of the Final Comparison Packet to ensure the trainee obtained the expected results. See Appendix C for details the practical exam.

11.7 Suggested Readings

- Ashbaugh, D. (1999). *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology.* Boca Raton, FL: CRC Press. pp. 103-108. (BOOK)
- Cowger, J. (1983). Chapters 6 – 8. *Friction Ridge Skin: Comparison and Identification of Fingerprints.* Elsevier Science Publishing Co., Inc. (BOOK)
- Giuliano, A. (2019). Artifacts Caused by Livescan Affect a Latent Print Comparison: An Actual Case. *JFI*, 69 (1), 20-25.
- Neumann, C.; et. al. (2013). Improving the Understanding and the Reliability of the Concept of "Sufficiency" in Friction Ridge Examination. Unpublished document.
- OSAC (2019) Best Practice Recommendation for the Resolution of Conflicts in Friction Ridge Examination
- OSAC (2019) Best Practice Recommendation for Verification in Friction Ridge Examination
- OSAC (2020) Best Practice Recommendation for Comparison and Evaluation of Friction Ridge Impressions
- OSAC (2020) Standard for Consultation During Friction Ridge Examination
- OSAC (2020) Standard for Examining Friction Ridge Impressions
- SWGFAST (2012) Document #8: Standard for the Documentation of Analysis, Comparison, Evaluation, and Verification (ACE-V) (Latent).
- SWGFAST (2013) Document #10 Standards for Examining Friction Ridge Impressions and Resulting Conclusions (Latent/Tenprint).
- SWGFAST (2013) Document #19: Standard Terminology of Friction Ridge Examination (Latent/Tenprint).
- Thompson M. B., Tangen J. M. (2014) The Nature of Expertise in Fingerprint Matching: Experts Can Do a Lot with a Little. PLoS ONE 9(12): e114759.

12 Automated Fingerprint Identification System (AFIS)

12.1 Purpose

To provide the trainee with the knowledge, skills and ability to successfully conduct latent print searches utilizing Automated Fingerprint Identification Systems (AFIS) and properly generate required documentation. Searches will be conducted using NEC's Multi-modal Biometric Identification System (MBIS) which can be used to search both the Virginia Central Criminal Records Exchange (CCRE) and the FBI's Next Generation Identification (NGI) friction ridge databases.

12.2 Objectives

The trainee will:

- Discuss appropriate case approach and how to determine if friction ridge prints are suitable for searching in databases.
- Demonstrate their knowledge of and skills in the operation of the MBIS and its limitations.
- Demonstrate how to search latent prints in each database, encode minutiae, document the locations of the axis, core, and delta, know the limitations of each system's requirements for searching, and search for and request known exemplars in both the state and federal databases.
- Generate appropriate documentation for both state and federal database searches.
- Explain why identifications cannot be made by solely conducting a comparison on-screen of prints searched in the databases.
- Understand and properly employ the appropriate quality assurance checks that are required by VA-DFS policy when searching latent prints in databases.

12.3 Mode of Instruction

12.3.1 Lectures

- AFIS Module
- MBIS Walkthrough and Tips PowerPoint (Living Document, Located in OneDrive)

12.3.2 Demonstrations

12.3.2.1 The trainee will observe examiners entering latent prints into the available AFIS systems.

12.4 Assignments

Read the following:

- United States Department of Justice. (2011). "Automated Fingerprint Identification System". *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office. (BOOK)

12.5 Practical Exercises

12.5.1 Search at least ten latent prints in the available databases under the supervision of the TC or designee.

12.6 Mode of Evaluation

12.6.1 Demonstration of successfully entering latent prints and declaring hits as applicable.

12.6.2 Successful completion of the Virginia State Police AFIS test.

13 Photography

13.1 Purpose

To provide the trainee with the knowledge and skills necessary to preserve quality images of latent prints utilizing state-of-the-art photography equipment under different lighting conditions. Also, this module imparts familiarization with different image processing techniques on images of latent prints developed from various methods.

13.2 Objectives

- The trainee will gain knowledge on latent print photography and demonstrate the skills to properly photograph latent prints by:
- Utilizing and understanding state-of-art photography equipment including digital cameras, lenses, filters and the Full Spectrum Imaging System(s) (FSIS/FSIS II).
- Understanding, describing and properly employing appropriate lighting techniques including those of fluorescent and ultraviolet imaging systems.
- Practicing proper maintenance and calibration techniques for the cameras and other photographic equipment including scanners.
- Demonstrating a complete understanding of photographic procedures including resolution requirements, documentation and the use of scales.
- Recognizing and explaining the importance of adjusting exposure settings including the aperture, shutter speed and ISO settings, the use of lenses and white balancing photographs.
- Illustrating their ability to photograph latent prints developed with chemical and physical techniques (including fluorescent latent prints), plastic and patent prints as well as post-mortem prints.
- Participating in exercises that will develop and refine the skills of image processing techniques for prints developed and captured from various processing methods.

13.3 Mode of Instruction

13.3.1 Lectures

- Photography Lighting Techniques
- Photographic Theory
- FSIS Familiarization

13.3.2 Demonstrations

13.3.2.1 Observe examiners photographing latent prints utilizing various lighting techniques.

13.3.2.2 Observe examiners utilizing image processing techniques in both the Mideo and Photoshop software.

13.4 Assignments

13.4.1 Read the following**:**

- United States Department of Justice. (2011). Chapter 8. *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office. (BOOK)
  - Chapter 8 – The Preservation of Friction Ridges
    - Sections 8.5 - 8.7

- Champod, C.; Lennard, C.J.; Margot, P.; Stoilovic, M. (2016). Chapter 3. *Fingerprints and Other Ridge Skin Impressions.* Boca Raton, FL: CRC Press. (BOOK)
  - Chapter 3 – Chemistry, Light, and Photography

        - Sections 3.3 - 3.7; Pages 133 - 177 (Second Edition)

- Robinson, Edward M. (2010) *Crime Scene Photography* (Second Edition). Academic Press. (BOOK/PDF)
    - Chapter 3 – Basic Exposure (Non-Flash) Concepts
        - Pages 52 - 67: Exposure Stops, Exposure Variables (Shutter Speed, F/Stop, Film Speeds/Digital ISO Equivalents)
    - Chapter 4 – Focus, Depth of Field, and Lenses
        - Pages 127 - 136: Resolution, Acutance, and Sharpness
        - Pages 156 - 163: Depth of Field
        - Pages 185 - 187: Macro Lenses
    - Chapter 10 – Digital Imaging Technologies
        - Pages 520 - 525: Image File Formats (JPG, RAW, TIFF)
        - Pages 526 - 528: Image Processing
    - Chapter 11 – Digital Image Processing of Evidentiary Photography
        - Pages 534 - 580: Digital Image Processing of Evidentiary Photography

- Mancini, K., & Sidoriak, J. (2017). *Fundamentals of Forensic Photography: Practical techniques for evidence documentation on location and in the Laboratory* (First Edition). Routledge Taylor & Francis Group. (BOOK)
    - Chapter 1 – Equipment and Technology
        - Page 2: DSLR Camera
        - Page 8: Lenses
        - Page 14: Macro or Close-Up Lenses
    - Chapter 2 – Basic Photography Principles
    - Chapter 3 – Digital Photography
        - Page 39: Resolution
        - Pages 40 - 42: File Types, Compression
        - Pages 50 - 53: Metadata, Metadata Descriptions
    - Chapter 4 – Lighting
        - Pages 59 - 67: Lighting Styles and Effects
    - Chapter 6 – Evidence Documentation
        - Pages 110 - 111: Fluorescence Photography
    - Chapter 8 – Photomicrography
        - Pages 153 - 154: Lenses for Close-up and Macro Photography
        - Page 156: Creating a Close-Up Image
        - Page 157: Close-Up and Macro Photography Depth of Field
        - Page 158: Close-Up Aperture Selection and Diffraction
        - Page 159: Exposure Compensation, Image Magnification
    - Chapter 12 – Digital Image Processing
        - Pages 221 - 223: Best Practices, Image Processing, Image Corrections
        - Page 224: Color, Contrast, and Brightness Adjustments
        - Page 226: Scaling and Resizing an Image

- ASTM's Standard Practice for Latent Print Evidence Imaging Resolution Document

13.4.2 Complete the Nikon DSLR Familiarization Exercise

13.4.3 Complete the Photo Processing Exercise

13.5 Practical Exercises

13.5.1 Capture latent prints that have been developed with various techniques and on a variety of surfaces (it is acceptable to utilize items processed during the practical exercises of the Latent Print development Techniques Module). These will included, but are not limited to:

- Prints developed with cyanoacrylate ester on clear plastic bags, soda cans, dark glass bottles, reflective surface (i.e., CD or mirror) and other commonly encountered surfaces.
- Prints developed with dye stains utilizing the ALS on the above listed surfaces.
- Prints developed on a variety of colored porous papers.
- Visible, patent or plastic prints.
- Utilize the FSIS to capture prints prior to and post processing with cyanoacrylate ester.

13.5.2 Perform a resolution test for a scanner and understand how to properly document its completion.

13.5.3 Perform a resolution test for the Nikon camera and understand how to properly document its completion.

13.6 Mode of Evaluation

13.6.1 Review of the Latent Print Photography written exam to ensure its successful completion.

13.6.2 Successful completion of the Photography Practical Exam. See Appendix C for details of the practical exam.

13.7 Suggested Readings

- Journal of Forensic Identification Articles - Photoshop (Lab Color Mode - Ninhydrin)
  - Dalrymple, B. (2004). Background Subtraction Through Exhibit Substitution. *JFI*, (54), 150–157.
  - Grady, D. P. (2001). Using Adobe Photoshop's Channel Mixer as an Evidence Enhancement Tool. *JFI*, (51), 378–384.
  - Osborn, S., & Wilson, K. (2009). Digital Enhancement of Latent Prints using Adobe Photoshop Black & White Adjustments. *JFI*, (59), 373–385.
  - Smith, J. (2012). Computer Fingerprint Enhancement: The Joy of Lab Color. *JFI*, (62), 464–475.
  - Smith, J. (2007). Image Enhancement and Adobe Photoshop: Using Calculations to Extract Image Detail. *JFI*, (57), 493–505.
- Camera (NIKON) Manuals
- Robinson, Edward M. (2010) *Crime Scene Photography* (Second Edition). Academic Press. (BOOK/PDF)
  - Chapter 3 - Basic Exposure (Non-Flash) Concepts
    - Pages 72 - 75: Exposure Latitude and Dynamic Range

14 Digital Imaging and Mideo

14.1 Purpose

To provide the trainee with an understanding of the Mideo software and how it is utilized to complete latent print casework.

14.2 Objectives

The trainee will:

- Demonstrate understanding of and ability to import and export images to and from Mideo.
- Express understanding of the folder structure and, specifically, the information stored in each folder within Mideo.
- Develop knowledge of the Mideo field set (note taking) capabilities.
  - What information is recorded in each field
  - Which fields are mandatory
  - What is the help dialog box and how is it accessed
  - How to clear a field
  - How to edit data
- Demonstrate knowledge of and ability to use Mideo's enhancement tools.
  - Adobe Photoshop tools and features
  - When it is best to use Photoshop and why
- Illustrate knowledge of and ability to use the tools needed to complete an Analysis on a latent print.
  - Print Orientation Tool
  - Complex Mark Up: GYRO
  - Use of the Graphic Grouping Tool
- Demonstrate ability to document a comparison and create a comparison workspace as well as an exclusion clarified image.
- Discuss the History Log feature.

14.3 Mode of Instruction

14.3.1 Observe examiners working at least two cases from start to finish to gain an understanding of case approach utilizing the Mideo software.

14.3.2 Observe examiners utilizing all the available features and tools in the Mideo software.

14.4 Assignments

14.4.1 The TC or designee will observe the trainee demonstrate or discuss the following and shall document the successful completion in the training record:

- Briefly summarize the purpose of each folder created for a new case (i.e., what is each folder designed to contain?).
- Demonstrate how to import an image from a CD.
- Demonstrate how to capture and import an image from a scanner.
- Demonstrate how to calibrate an image.
- Demonstrate how to invert an image.
- Demonstrate how to rotate an image.
- Define the GYRO acronym.
- Describe how to zoom in an image (i.e., make the latent appear bigger).
- Demonstrate how to create a comparison workspace.
- Demonstrate how to open an image in Photoshop and how to properly return it to Mideo.

- Explain how clarifications completed in Photoshop are distinguished in the History file from those done in Mideo.

14.4.2 Provide printed documentation from the Mideo system demonstrating knowledge and skill accomplishing the following specific tasks.

- Clarified image of a visible latent print (no development needed to photograph) with the Analysis documented using the GYRO tools and appropriate field sets completed (Analysis note page).
- Clarified image of a latent print developed with Ninhydrin, clarified using Photoshop (to fulfill 13.4.1: “Demonstrate how to open an image in Photoshop and how to properly return it to Mideo”), with the Analysis documented using the GYRO tools and appropriate field sets completed (Analysis note page and history showing use of Photoshop).
- Clarified image of a latent print developed with dye stain/ALS with the Analysis documented using the GYRO tools and appropriate field sets completed (Analysis note page).
- Clarified image of a latent print developed with Black Powder preserved on a lift card with the Analysis documented using the GYRO tools and appropriate field sets completed (Analysis note page).
- A comparison workspace depicting an identification.
- A workspace depicting an exclusion.

14.5 Practical Exercises

14.5.1 Complete five mock cases, which include comparisons, from start to finish.

14.6 Mode of Evaluation

14.6.1 Observation of the trainee to ensure they have the necessary skills and knowledge to complete casework utilizing Mideo.

14.6.2 Review of the Analysis and Latent Notes printed from Mideo of the latent prints included in each of the Comparison Exercise Packets to ensure they have properly documented the expected result for each image.

15 LatentSleuth

15.1 Purpose

To provide the trainee with an understanding of the LatentSleuth software and how it is utilized to complete latent print casework.

15.2 Objectives

The trainee will:

- Demonstrate their ability to navigate the LatentSleuth application.
- Demonstrate their ability to import and edit latent prints using the available tools in the LatentSleuth application.
- Demonstrate their ability to import and crop exemplar images and create exemplar templates and groups in the LatentSleuth application.
- Demonstrate their understanding of the recognition results of a LatentSleuth search and their ability to properly review it.
- Understand the policies related to LatentSleuth in the DFS LX Procedures Manual.

15.3 Mode of Instruction

15.3.1 Lectures

- When is LatentSleuth Effective?
- Sciometrics LatentSleuth: Validation for Accuracy & Evaluation of Efficiency in Casework

15.3.2 Observe examiners utilizing LatentSleuth for at least two cases.

15.4 Assignments

15.4.1 Read the following:

- Sciometrics LatentSleuth User's Guide
- LatentSleuth Quick Reference Card
- Davis, J., Hood, M. (2019) Evaluation of an Emerging Automated Searching Technology to Improve the Efficiency and Reliability of Latent Print Comparison.
- Davis, J., Hood, M., Cillessen, S. (2023) LatentSleuth: An Emerging Latent Print Automated Searching Technology - A Validation Study. *JFI*, 74 (4), 339-356.

15.4.2 The TC or designee will observe the trainee demonstrate the following and shall document the successful completion in the training record.

- How to import a latent into the LatentSleuth application
- How to import an exemplar and create a tenprint group and template in the LatentSleuth application
- How to edit a latent in the LatentSleuth application using the available tools (quality regions, paint quality map, paint high contrast image, etc.)
- How to review the recognition results for a LatentSleuth search

15.5 Practical Exercises

15.5.1 Complete two work-along cases utilizing LatentSleuth.

15.5.2 Complete Practice Packets (A-D).

15.6 Mode of Evaluation

15.6.1 Successful completion of the competency test.

15.6.2 The expected candidate must be in the top five on the list for each latent search to be considered successful.

16 Legal Aspects and Testimony

16.1 Purpose

To provide the trainee with an understanding of the legal aspects of latent print forensic identification and how to effectively present expert testimony.

16.2 Objectives

The trainee will:

- Recall relevant legal aspects and challenges of latent print discipline and describe how both DFS and the discipline as a whole addresses them.
- Recognize the components of a courtroom criminal proceeding
- Prepare a current Statement of Qualifications (optional: and *curriculum vitae)*
- Demonstrate their ability to answer *voir dire* questions during testimony
- Summarize the DFS Subpoena Appearance and Management Policy and recall how to properly complete a subpoena disposition
- Demonstrate their ability and understanding of how to present expert testimony
- Practice and develop their testimony skills

16.3 Mode of Instruction

16.3.1 Lectures

- Expert Testimony

- DFS Subpoena Disposition PowerPoint
  - (Find in Ideagen – Documents Tab, DFS Folder, Resources Folder, Review Folder)

16.3.2 Observe expert testimony.

16.4 Assignments

16.4.1 Read the following:

- Ausdemore, M., Hendricks, J. H., & Neumann, C. (n.d.). Review of Several False Positive Error Rate Estimates for Latent Fingerprint Examination Proposed Based on the 2014 Miami Dade Police Department Study.

- Clark, J. D. (2002) ACE-V: Is It Scientifically Reliable and Accurate? *JFI*, 52 (4). 401-408.

- DFS Subpoena Appearance and Management Policy

- Langenburg, G. (2003). Defending Against the Critic's Curse. *The Chesapeake Examiner*, *41*(1), 5–16.

- Robinson, Edward M. (2010) *Crime Scene Photography* (Second Edition). Academic Press. (BOOK/PDF)
  - Chapter 12 – Legal Issues Related to Photographs and Digital Images
    - Pages 601 - 604: A History of Processed Images Should Be Maintained

- State of North Carolina vs. Juan Foronte McPhaul (Court of Appeals of North Carolina November 2017).

- United States Department of Justice. (2011). "Fingerprint and the Law". *The Fingerprint Sourcebook.* Washington, D.C.: U.S. Government Printing Office. (BOOK)

- Wertheim, K. (2002) Response to: ACE-V: Is It Scientifically Reliable and Accurate? *JFI*, 52 (6). 669-677.

16.4.2 Create a current Statement of Qualifications (optional: and *curriculum vitae*).

16.4.3 Provide a 15-20 minute presentation addressing at least three current challenges to the latent print discipline (Proficiency testing/Brenden Max, Close Non-Matches, Lack of Discipline-wide Standard, AI, Uniqueness vs. Discriminability, etc.) and discuss how those challenges are being addressed both at the Virginia Department of Forensic Science and by the discipline as a whole.

16.4.4 Complete the Legal Aspects and Testimony Worksheet

16.4.5 Optional: Watch a previously recorded Latent Print trainee's mock trial.

16.5 Practical Exercises

16.5.1 Participate in at least two mini-mock trials with the TC focusing on the following aspects of testimony:

- *Voir Dire* (use *Vior dire* Question Sheet)
- Chain of Custody
- ACE-V methodology
- Sufficiency
- Scientific certainty
- Bias
- Error rates
- Cross-examination
- Re-direct examination

Additional sessions may be necessary if deemed appropriate by the TC. Mini-mock trials are intended to be one-on-one training with the trainee and TC in order to gain practice in verbalizing concepts and to identify areas that may need to be refined prior to the final mock trial.
If possible, a DFS employee from another section (Firearms, Controlled Substances, etc.) should serve as the defense attorney for one of the mini-mock trials. This can help the trainee field questions that may not normally be asked by someone that is familiar with the latent print discipline.

16.6 Mode of Evaluation

16.6.1 The presentation will be evaluated on if the trainee successfully presents the information within the allotted time to the audience with a minimal amount of visible or distracting nervousness and successfully answering questions from the audience. See Appendix B for additional criteria. The trainee will have two attempts to complete this assignment.

16.6.2 Successful completion of a final mock trial (as defined in the QM final competency testing requirements).

16.7 Suggested Readings

- Garrett, L. Brandon. (2018) The Reliable Application of Fingerprint Evidence. 66 UCLA Law Review (64). 64-94.
- Hartman v. Bagley
- Kaye, D. (2012). “Latent Print Examination and Human Factors: Improving the Practice Through a Systems Approach”. Chapter 6: Testimony. 113-139.
- Kelley, S., Gardner, B. O., Murrie, D. C., Pan, K. D. H., & Kafadar, K. (2020). How do latent print examiners perceive proficiency testing? an analysis of examiner perceptions, performance, and print quality. *Science & Justice*, 60(2), 120–127.
- Kennedy v. State
- Koehler, J. Jonathan. (2020) Forensic Source Conclusions - Twenty Threats to Validity
- People v. Cline
- State v. Hayden
- Wong, C., Aharoni, E., Rafig oglu Aliyev, G., & Du Bois, J. (2015). The Potential for Blind Collaborative Justice: Testing for Impact of Expert Blinding and Consensus Building on the Validity of Forensic Testimony. Unpublished document.

Appendix A - Individual Training Plan (ITP) Template

For each section listed below include the following information:

- List previous documented training received
- Provide detailed plan, including assignments, exercises, exams and presentations to be completed with dates, for each section.

The objectives listed in the Latent Print Training Manual should be used as a guide for questions during the assessment to determine the individual's knowledge level.

History
Legal History
Biology and Physiology
Quality Assurance and Quality Control
Latent Print Development Techniques
Recording Friction Ridge Skin
Cognitive Factors in Comparative Analysis
ACE-V Method: Analysis
ACE-V Method: Comparison and Evaluation
Automated Fingerprint Identification System (AFIS)
Photography
Digital Imaging and Mideo
LatentSleuth
Legal Aspects and Testimony

The expected completion of this training plan is _____.

Appendix B - Presentation and Verbal Exam Criteria

Presentations

Trainee	
Appearance	
Presentation:	
Introduction	
Organization	
Graphics	
Typos	
Succinct	
Accuracy	
Presenter:	
Eye Contact	
Use of fillers	

Comments:

Verbal Exam

Trainee	
Verbal Exam: (100 Points)	
Accurate & Complete Answers (refer to exam key)	
Follow Ups / Clarifications (if applicable)	
Communicative Aspects: (20 Points)	
Succinct / Coherent	
Composure / Professionalism	
Use of fillers	
Distracting movements / Speaking speed	
Total Points	/ 120 Points

Appendix C - Guidelines for Practical Finals

Final Comparison Packet

Contains 10 latent prints and 3 sets of exemplars, which have been previously vetted and agreed upon by the Latent Print Technical Resource Team.

Practical Latent Print Photography Competency

- Consists of six items with one latent marked per item with a P# to ensure the correct latent is captured.
  - latent lift
  - paper processed with ninhydrin
  - clear glass processed with black powder
  - plastic grocery bag processed with cyanoacrylate ester and dye stain
  - firearm magazine processed with cyanoacrylate ester and dye stain
  - clear plastic soda bottle processed with cyanoacrylate ester

- Capture one latent image per item.
- Import the images into the appropriate Mideo folder.
- Name the file lab name (in place of the case number), the item number followed by the latent number.
  - Example: Western W-1 P1

- No enhancement techniques shall be performed on the images.

Appendix D - References

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- ASTM's Standard Practice for Latent Print Evidence Imaging Resolution Document
- Ausdemore, M., Hendricks, J. H., & Neumann, C. (n.d.). Review of Several False Positive Error Rate Estimates for Latent Fingerprint Examination Proposed Based on the 2014 Miami Dade Police Department Study.
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  - Hartman v. Bagley
  - Kennedy v. State
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  - McGovern v Van Riper
  - People v Roach
  - People v Sallow
  - People v. Cline
  - Spencer I – IV
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- Davis, J., Hood, M., Cillessen, S. (2023) LatentSleuth: An Emerging Latent Print Automated Searching Technology - A Validation Study. *JFI*, 74 (4), 339-356.
- DEA Latent Print Examination Manual (2020)
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