SCIENTIFIC WORKING GROUP ON
FRICTION RIDGE ANALYSIS, STUDY AND TECHNOLOGY
(SWGFAST)

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SWGFAST
Introduction

This introduction is presented to familiarize the reader with the Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST). The introduction includes a description of the organizational structure, various procedures, SWGFAST's history and goals. The structure and content of this new format for presenting the work of SWGFAST are also introduced.

In 1995, the United States Federal Bureau of Investigation, hosted a group of latent print examiners at the FBI academy to discuss developing consensus standards which would preserve and improve the quality of service provided by the latent print community. The Technical Working Group on Friction Ridge Analysis, Study and Technology (TWGFAST)[1] was formed. The initial group, now known as SWGFAST, expanded and maintains a roster of 30 to 40 members. All members are actively involved in the field of what friction ridge analysis. They represent the community at large and come from the private sector and over twenty-five different law enforcement agencies. The participating agencies include a balance of Federal, State and local law enforcement agencies. This balance has been maintained to provide diverse perspectives (i.e., local versus large agency issues), however individuals, not agencies, are elected as members. Additionally, ASCLD, the International Association for Identification, and the FBI have been invited to designate a representative as an ex-officio member. This insures representation and communication with those organizations. When the need to replace members has occurred, SWGFAST elects new members through a process of nomination and election. Candidates for membership have been nominated by SWGFAST members, submitted by their agencies, or they have submitted their own name. Members are then elected by SWGFAST for five year terms.

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SWGFAST uses a process of creation, review, revision, publication, community review, revision and finally adoption to create the various guidelines. This process was established with the intent to gain a widespread consensus within the latent print community. All SWGFAST guidelines and documents directed for use by the community are adopted following this procedure. The document is originally prepared by a committee. The committee then submits the document to the entire group for review and approval. During the approval process, revisions are made and the document is approved as a "Draft for Comment" or the document is returned to the committee for further work. After the document is approved, it is made public and community comment is solicited and encouraged. In the past, SWGFAST documents have been published in the *Journal of Forensic Identification* and posted on the Internet. Currently, documents are submitted for publication in both *Forensic Science Communications* (published by the FBI) and the *Journal of Forensic Identification* (published by the International Association for Identification). They are also posted on the Internet at www.swgfast.org. Republishing and distribution of the documents is encouraged via communications within the State Divisions of the International Association for Identification and other fingerprint organizations. A reasonable comment period is normally established based on publication dates and IAI seminars, the intent being to allow publication and an opportunity to host discussions at the annual IAI seminar and other meetings. To insure that all documents remain accurate during a time when challenges and changes in our field are increasing, SWGFAST will automatically review all documents on a five-year cycle. Provisions have also been made to allow modifications during the interim, if the need should present itself.

During the initial meetings, SWGFAST organized itself into committees to create the various guidelines. These guidelines dealt with minimum qualifications for a latent print examiner trainee, the subjects which should be included within a training program, and guidelines for quality assurance. These original documents were approved as "drafts for comment" in November 1996. After publishing, a comment period, presentation at the 1997 IAI seminar, and a review of all submitted comments, SWGFAST approved the initial three documents in December 1997. These guidelines were then republished in the *Journal of Forensic Identification*. The next set of projects was identified and the preliminary work on the various guidelines and documents presented here as "drafts for comment" was initiated.

During the last couple of years, SWGFAST has also been involved in several projects which relate to our goals. In 1998, the National Institute on Standards and Technology (NIST), scheduled a meeting for the five-year review of the one of the standards which has involved the latent print community, the ANSI-NIST standard "ITL-1993 *Data Format for the Interchange of Fingerprint, Facial, & Scar Mark & Tattoo Information*." SWGFAST prepared and made a presentation during that meeting and remained active during the review, revision and approval process. SWGFAST played an active role in pursuing language in the standard which would better support the latent print community. Before the Daubert Hearing, which was held during the Bryon Mitchell trial in Philadelphia (July 1999), SWGFAST provided support for the prosecution team. Recently, SWGFAST has been involved in beta testing and critiquing of a new CD-Rom for Latent Print Examiner introductory training developed by the Advanced Technologies Group at the FBI Training Academy. Current SWGFAST projects include completing the comment period and approving the "draft for comment" documents presented in this digest, the production of a glossary, the creation of Automation Guidelines, and developing a set of Identification Standards.

In 1998, the FBI enlisted the *National Forensic Science Technology Center* in Florida to provide support for the various Scientific Working Groups that the FBI sponsors. The NFSTC has provided assistance in guiding the various SWGs in developing and implementing optimal business processes that will establish and maintain consistency in SWG organizations, life cycles, and business processes. With that guidance, SWGFAST has created a set of bylaws. Future appendices will also be added to provide further descriptions relating to various SWGFAST procedures. With the recent creation of the bylaws, the original objectives were revisited and the following excerpts from the bylaws identify our objectives:

To establish guidelines for the development and enhancement of friction ridge examiners' knowledge, skills and abilities.

To discuss and share friction ridge examination methods and protocols.

To encourage and evaluate research and innovative technology related to friction ridge examination.

To establish and disseminate guidelines for quality assurance and quality control.

To cooperate with other national and international organizations in developing standards.

To disseminate SWGFAST studies, guidelines and findings.

With this publishing, SWGFAST has assembled the previously approved guidelines and the current "drafts for comments" into separate sections within a single document. In the section containing the drafts for comments, a comment period is noted and instructions for written input are provided. This preface and the bylaws are also included to provide an explanation of what SWGFAST is, how it operates, and how interested parties can participate. A roster of current SWGFAST members is also included. In the future, additional appendices will be added and as documents are approved or created for comment, they will also be added.

Among the current "Drafts for Comments," several documents are presented. Four of the documents are topical glossaries. The current topics are anatomy, fingerprint classification, automation and identification. Future topics will include chemical processing and terms used historically or that are now considered antiquated. Upon approval of all topical glossaries, the various glossaries will be consolidated into a single document.

There are many guidelines, research and studies to be initiated. It is our sincere hope that the Federal Bureau of Investigation will continue to lead the way in continuing to sponsor this important effort. Additionally, it is our desire that the relevant community become familiar with and embrace the SWGFAST efforts. The task of writing standards and guidelines can be accomplished by a handful of individuals, but the community must also be involved and embrace those standards for the efforts to provide a true consensus.

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SWGFAST [1]
Minimum Qualifications for Latent Print Examiner Trainees

1. Education/Experience Requirements

1.1 Four year college degree from an accredited college or university

or

1.2 Two year associate degree or sixty college semester hours, plus two years job related experience

or

1.3 High school diploma or equivalent plus four years of job related experience
Examples of job related experience:

- Ten-print work
- AFIS ten-print/latent work
- Crime scene processing
- Crime scene photography
- Criminal investigation

1.4 By the year 2005, a four year college degree from an accredited college or university is recommended to be the minimum education required for a latent print examiner trainee.

2. Personal Background Recommendations

2.1 No prior felony convictions

2.2 Pre-employment drug screen

2.3 Background investigation

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SWGFAST [1]
Training To Competency for Latent Print Examiners

The following outline provides the recommended training program to achieve expertise in friction ridge analysis:

1. Introduction to Friction Ridge Skin Analysis

    1.1 Principles and Foundation

        1.1.1 Required Objectives

            1.1.1.1 An understanding of the basic foundations for friction ridge analysis (permanence and individuality) as a means of identification

            1.1.1.2 An understanding of the biology/physiology of friction ridge skin

            1.1.1.3 An understanding of scientific methodology and its application to friction ridge analysis

        1.1.2 Supplemental Objectives

            1.1.2.1 An understanding of early methods of personal identification, such as scars, marks, and tattoos

            1.1.2.2 An understanding of identification methods other than friction ridge skin

            1.1.2.3 An understanding of government and civilian applications of fingerprints, palm prints, and footprints through friction ridge identifications

            1.1.2.4 An understanding of the applications of friction ridge impressions for manual and/or automated repositories for 'single print' and 'unidentified latent prints'

            1.1.2.5 An understanding of early recordings and an awareness of fingerprints

    1.2 Friction Ridge Pattern Recognition and Interpretation

        1.2.1 Required Objectives

1.2.1.1 An understanding of common terminology and definitions associated with friction ridge pattern recognition (arch, loop, whorl) and interpretation, as defined by the FBI publication, The Science of Fingerprints

1.2.1.2 An understanding of pattern recognition and interpretation associated with operational needs of the individual agency

1.2.1.3 An understanding of friction ridge formations as they relate to recognition, interpretation and individualization

1.2.2 Supplemental Objective

An understanding of various classification systems (definitions and formulas)

1.3 Standards to Measure Competency

1.3.1 Student must pass written tests and/or practical exercises of the 'Required Objectives'

1.3.2 Student must successfully demonstrate and communicate knowledge of the 'Required Objectives'

2. Friction Ridge Analysis (Evaluation, Comparison and Identification)

The following objectives are required. The student must demonstrate knowledge of these objectives by passing written tests and/or practical exercises, and by communicating an understanding of the objectives and underlying principles.

2.1 An understanding of the individual friction ridge structure (i.e., continuity, texture, pore, and edge definition) for determining the existence of individualizing features

2.2 An ability to evaluate friction ridge detail to determine the value for comparative analysis

2.3 An ability to recognize and utilize friction ridge flow, scars, creases, and other friction ridge detail for supporting the comparison process

2.4 An ability to recognize and properly determine, when possible, the area from which the friction ridges originated

2.5 The knowledge to properly interpret friction ridge impressions that present unusual appearance (due to effects such as color reversal, pressure distortion, slippage, and overlays) during the evaluation and comparison process

2.6 An ability to render a proper identification decision

2.7 A knowledge of various methods used to record known friction ridge impressions and the ability to properly evaluate ridge structure based on each method

2.8 A knowledge of the benefits associated with obtaining 'elimination prints' and 4 major case prints'

2.9 An ability to recognize simultaneous or adjacent latent impressions and their value for comparison purposes

2.10 A knowledge of different policies regarding identifications in countries other than the United States of America

3. Friction Ridge Detection and Preservation

The following objectives are required. The student must demonstrate knowledge of these objectives by passing written tests and/or practical exercises, and by communicating an understanding of the objectives and underlying principles.

3.1 Knowledge of the generally accepted techniques for the detection and visualization of friction ridge impressions

3.2 An ability to assess the effectiveness/results of any techniques applied by the student

3.3 An understanding of generally accepted preservation methods for friction ridge impressions

4. Documentation of Examination

An understanding of proper procedures for recording examination activities is required and must be demonstrated through written tests and/or practical exercises.

4.1 Documentation must be in a form such that a qualified latent print examiner could evaluate what was done and replicate any comparisons.

4.2 Documentation must include, as a minimum, case identifier(s), identity of examiner(s), date of activities, number and description of items for examination, results/conclusions of the examinations, and the identity of the verifier in the event an identification is made.

4.3 A well documented chain of custody must be maintained.

5. Communication

5.1 The student must successfully demonstrate, through testing and/or practical exercises, an ability to accurately reflect case examinations and conclusions in written form.

5.2 The student must successfully demonstrate an ability to present case examinations and conclusions.

6. Internship

6.1 Required Objective

An ability to practically demonstrate all phases of training under the direction/review of an instructor

6.2 Supplemental Objective

Active participation in other educational sources, such as seminars, conferences, schools and lectures

6.3 Standard to Measure Competency

Must successfully perform case examinations to the level at which internship is no longer necessary

7. Instructor Qualifications

7.1 Essential Qualifications

7.1.1 An instructor must possess the knowledge, skills, and abilities for the courses being instructed.

7.1.2 An instructor for the Friction Ridge Analysis segment of training must have been accepted in court as an expert in friction ridge identification.

7.2 Desirable Qualifications

7.2.1 An instructor should have received training courses on how to be an instructor.

7.2.2 An instructor should have attained accreditation/certification from recognized institutions, agencies, or professional organizations.

7.2.3 An instructor should have completed a structured training and internship program covering the same subject matter.

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SWGFAST [1]
Quality Assurance Guidelines for Latent Print Examiners

Friction ridge examinations are based on the following premises:

The fundamentals of the science of friction ridge identifications are permanence and individuality. The comparison and identification of two areas of friction ridge skin impressions are based on the examination of infinite combinations of ridge structure, individual ridge appearance, pores, minutiae, and spatial relationships.

There is no scientific basis for requiring that a minimum number of corresponding friction ridge features be present in two impressions in order to effect an identification.

1. Fundamental Principles of Quality Assurance in Friction Ridge Analysis

    1.1 Latent print examiners must be successfully trained to competency before effecting an identification.

    1.2 All identifications must be verified by a qualified latent print examiner.

2. Friction Ridge Analysis

    2.1 Definitions and Conclusions

        2.1.1 Print Evaluation

        Prints are of value for comparison or they are not. "Of value for comparison" means that sufficient ridge detail is present to warrant a comparison in the opinion of the examiner.

        2.1.2 Identification

        An "identification" is the determination that two corresponding areas of friction skin impressions originated from the same person to the exclusion of all others.

        2.1.3 Non-identification

        "Non-identification" is the determination that two corresponding areas of friction skin impressions did not originate from the same person.

        2.1.4 Incomplete or Unclear Known Impressions

        Incomplete or unclear known friction skin impressions may result in the inability to reach either an identification or non-identification decision.

2.1.5 Qualified Identifications

Friction ridge identifications are absolute conclusions. Probable, possible, or likely identification conclusions are outside of the acceptable limits of the science of friction ridge identification.

2.2 Errors

2.2.1 Erroneous Identifications

An erroneous identification is the incorrect determination that two areas of friction ridge impressions originated from the same person. An erroneous identification is the most serious error an examiner can make in technical casework.

2.2.2 Erroneous Verifications

Verification of an erroneous identification is equal to having effected the original erroneous identification.

2.2.3 Clerical and Administrative Errors

Clerical and administrative errors are not erroneous identifications. Examples include, but are not limited to, writing the wrong finger number or name.

2.2.4 Missed Identifications

A missed identification is the failure to make an identification when in fact both friction ridge impressions are from the same origin. This is not an erroneous identification.

2.3 Conflict Resolution

Each agency should define in writing the procedures to resolve conflicting opinions.

2.4 Corrective Actions

The agency is responsible for writing and enforcing policy to handle fingerprint errors. When preparing written policy governing comparison errors, a variety of corrective actions should be included. The corrective actions should be appropriate to the level of the error, the skill level of the examiner, and the circumstances.

3. Quality Manual

A Quality Manual(s) must be maintained. A Quality Manual(s) must contain documentation of all significant aspects of latent development and analysis procedures, as well as any related documents or laboratory records that are pertinent to the analysis or interpretation of results. Documentation must exist for the following topic areas as applicable:

3.1 Methods and Procedures for Latent Print Development

This document must describe in detail the procedures currently used for the development of latent prints. Revisions must be clearly documented and appropriately authorized.

3.2 Formulary for the Preparation and Procedures for the Storage of Chemicals

If chemicals are obtained commercially, a list of suppliers and complete ordering information must be included.

3.3 Laboratory Safety Procedures

Laboratory safety procedures shall comply with state and federal guidelines. All chemicals and supplies must be stored, used, and disposed of under conditions recommended by the manufacturer and in a manner conforming to established safety requirements.

3.4 Material Safety Data Sheets

3.5 Evidence Handling Procedures

3.6 Proficiency Testing

3.7 Training and Qualification Records

The agency shall maintain a current copy of in-service training records and curriculum vitae for each examiner.

3.8 Equipment Calibration and Maintenance Logs

3.9 Method Validation Records

3.10 Policy and Procedure Manuals for Electronic Fingerprint Systems

3.11 Testimony Review

4. Latent Print Lifts and Photographs/Images

The following shall apply at the time of collection:

4.1 Latent Print Lifts shall include the following:

4.1.1 Unique Case Identifier

4.1.2 Date and Initials or Date and Personal Marking

4.1.3 Impression Source (Description or Source Identifier)

4.2 Latent Print Lifts or Case Notes shall include the following:

4.2.1 Scene Location or Address

4.2.2 Significant information about the orientation and/or position of the latent print on the object through description and/or diagram(s)

4.3 Latent Print Photographs/Images or Case Notes shall include the following:

4.3.1 Unique Case Identifier

4.3.2 Date and Initials or Date and Personal Marking

4.3.3 Impression Source (Description or Source Identifier)

4.3.4 Scene Location or Address

4.3.5 Significant information about the orientation and/or position of the latent print on the object through description and/or diagram(s)

4.3.6 Scale Information

5. Evidence Handling Procedures

Evidence must be collected, received, and stored so as to preserve the identity, integrity, condition, and security of the item.

5.1 Chain of Custody

A clear, well-documented chain of custody must be maintained from the time that the evidence is collected or received until it is released.

5.2 Evidence Handling and Storage

Each agency shall prepare a written policy to ensure that evidence will be handled, processed, and preserved so as to protect against loss, contamination, or deterioration.

6. Case Work Documentation and Report Writing

Procedures must be in place to ensure the accuracy and completeness of documentation.

6.1 Case Work Documentation

6.1.1 Documentation must be sufficient to ensure that any qualified latent print examiner could evaluate what was done and replicate any comparisons.

6.1.2 Verification of all identifications must be documented.

6.2 Report Writing

Reports must contain the following:

6.2.1 Case Identifier

6.2.2 Identity of Examiner

6.2.3 Date of Report

6.2.4 Description of Evidence

6.2.5 Results of Latent Print Examination

7. Proficiency Tests

A proficiency test should be administered to each latent print examiner annually.

7.1 Proficiency tests may be purchased externally, developed in-house, or obtained from another agency. Random technical case review by a competent latent print examiner shall be considered equivalent to proficiency testing.

7.2 The specific policies, procedures, and criteria for any corrective action taken as a result of a discrepancy in a proficiency test should be clearly documented in writing by each agency.

7.3 At a minimum, proficiency test records should include the date, and the name and test results of the examiner

8. Continuing Education

8.1 Examiner skills must be maintained by activities such as:

8.1.1 Receiving specialized training

8.1.2 Attending educational seminars

8.1.3 Reading professional publications

8.1.4 Conducting and publishing research

8.1.5 Completing self-study programs

8.1.6 Instructing specialized classes or seminars

8.1.7 Continuing formal education

8.2 Agency management must provide the opportunity to comply with these requirements.

9. Testimony Review

Agencies must have written procedures for review of testimony and should review annually the testimony of each examiner. Review may consist of:

9.1 Personal or Video Tape Observation of Testimony

9.2 Testimony Evaluation Survey Form

9.3 Verbal Communication with Court Officials

9.4 Review of Written Transcript of Testimony

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SWGFAST
Guidelines for Professional Conduct
DRAFT FOR COMMENT
Comment period ends July 31, 2001

PREAMBLE

I shall, as a practitioner of the fingerprint science, regard myself as a member of a noble and honorable profession. It is my duty to serve the interests of justice to the best of my abilities at all times. I will be guided by those practices and procedures, which are generally recognized within the profession to be consistent with a high level of professionalism. My motives, methods, and actions shall at all times be above reproach and consistent with proper moral conduct.*

A. I shall cooperate with other professionals in the forensic sciences to promote its advancement through scientific research. Knowledge of any new discoveries, developments or techniques applicable to the forensic sciences shall be shared with the peer community;

B. I shall not undertake examinations or give testimony in areas in which I am not qualified;

C. Expertise is based on training, study, experience, and judgment. I shall not misrepresent my qualifications of expertise;

D. I shall make examinations of evidentiary items utilizing accepted scientific techniques and methods which are reliable and accurate with appropriate standards and controls;

E. Techniques and opinions shall be based on facts and interpretations and shall not be knowingly misrepresented;

F. I shall render unbiased testimony and endeavor to promote the understanding of my examinations and findings in an impartial manner;

G. I shall keep all privileged communications confidential;

H. If deemed to have merit, any transgressions of this Guidelines for Professional Conduct shall be reported to the proper authorities.

*These guidelines are not intended to supercede or supplant any other code(s) of ethics.

SWGFAST
Validation of Research and Technology
DRAFT FOR COMMENT
Comment period ends July 31, 2001

The purpose of validation is to ensure the integrity of all techniques and procedures used for the development of friction ridge detail in order to establish confidence in those techniques and procedures for the examiner and the scientific and legal communities.

1. VALIDATION

General considerations for validation of technical techniques or procedures for the development of friction ridge detail

1.1 Validation is the process used by the scientific community to acquire the necessary information to assess the ability of a technique or procedure to reliably obtain a desired result. Validation determines the conditions under which results can be obtained and determines the limitations of the technique or procedure. The validation process identifies the critical aspects of the technique or procedure that must be carefully controlled and monitored.

1.2 Prior to the implementation of the technique or procedure, validation testing must be conducted.

1.3 Once a technique or procedure has been validated, appropriate documentation must be available. (refer to Appendices and Section 1.7).

1.4 The validation process includes:

1.4.1 Literature research: Review of publications, academic materials, safety procedures and protocols, etc. involving the technique or procedure being validated.

1.4.2 Standard samples: The samples should be selected to represent the type of specimens to be routinely analyzed by the technique or procedure.

1.4.3 Consistency: The methods tested and results must show the same outcome on each test.

1.4.4 Reproducibility: The test must be reproducible by another individual using the original test documentation.

1.4.5 Environmental Studies: When applicable, evaluate the method using known samples exposed to a variety of environmental conditions.

1.5 Validation of Established Technique or Procedure (see Appendices A and B)

1.5.1 Internal Validation

Prior to implementing an existing technique or procedure, the reliability of the technique or procedure must be demonstrated. This internal validation must include:

1.5.1.1 The techniques and procedures must be tested using similar samples and conditions as those being examined.

1.5.1.2 If a modification has been made, the modification must be compared to the original technique or procedure using identical samples.

1.5.1.3 Consistency and reproducibility must be determined by repetitive analyses, preferably by different individuals.

1.6 Validation of New or Innovative Techniques or Procedures (see Appendix C)

1.6.1 Internal Validation

Prior to implementing a new or innovative technique or procedure, the reliability of the technique or procedure must be demonstrated. This internal validation must include:

1.6.1.1 The techniques and procedures must be tested using similar samples and conditions as those being examined.

1.6.1.2 If a modification has been made, the modification must be compared to the original technique or procedure using identical samples.

1.6.1.3 Consistency and reproducibility must be determined by repetitive analyses, preferably by different individuals.

1.6.2 External Validation

Validation studies must have been completed by a scientific, scholastic, and/or professional organization other than that of the immediate organization prior to the implementation of the technique or procedure.

1.7 All validation must be documented

1.7.1 Documentation must be sufficient to ensure that any qualified individual could evaluate what was done and replicate the validation process.

1.7.2 Documentation must be in the form of either laboratory notes, reports, laboratory books or log books, which should include references, personal communications, etc.

1.7.3 Documentation of external validation must identify the name and professional affiliation of the person(s) conducting the study, date, as well as the research question, procedures, results and conclusion(s).

RESEARCH AND TECHNOLOGY

Objective: To identify research needs in the area of friction ridge development and analysis, examples as follows:

1. Standardization of scientific terminology
2. Development of new techniques or procedures
3. The examination of ridge detail for the presence of molecular material
4. Statistical analysis in identification/association
5. Automated System and size changes of juvenile to adult
6. Statistical studies to support the use of edgeoscopy/poroscopy/ridgeology detail in place of, or in conjunction with minutiae
7. Improvement of livescan detail to capture ridgeology detail
8. Screening tests (form-blindness tests, etc.)
9. Competency tests (proficiency, etc.)
10. Training and education
11. Determining the constituency of fingerprint residue prior to processing
12. Multidisciplinary approach in research of fingerprints
13. Age of fingerprints
14. Funding (identifying available sources)
    a. Scholarships (IAI, etc.)
    b. Grants (NIJ, BJA, etc.)
15. Safety
16. Revisiting/modification of previously established techniques or procedures

APPENDIX A

The following is an example of a guideline for validation testing of an **established** technique or procedure, using a formulation prepared by the tester or a member of the testing organization.

Purpose: Detection of latent prints on specific surface type or specific component of latent print residue.

Materials: Chemicals, lab ware and incidental materials required for preparation and use.

Safety: Review all safety procedures prior to beginning validation testing, including preparation, application, storage and disposal of chemical and biohazard materials.

Formula: State formula being used.

Procedure: To include step by step methods used in testing the technique or procedure, as well as time increments, environmental conditions (i.e., humidity, heat, atmospheric), formulations, amounts and materials, when applicable.

Results: Descriptive observation(s) of the test.

Conclusion: Discussion or evaluation of the results and effect(s) of the technique or procedure on the development of latent prints or above stated purpose.

Reference: List source(s) for procedure, technique and formulation.

Validation: List name of individual(s) who conducted validation, their title, agency of individual(s) and date of validation.

Attached is an example of a validation test.

VALIDATION TEST EXAMPLE FOR APPENDIX A

Purpose: Test ninhydrin solution for developing latent prints on paper

Materials: Ninhydrin crystals, acetone, beakers, measuring scale, weigh Boats, magnetic stirrer and bar, storage bottle, tray, forceps and safety equipment.

Formula: 6 grams of ninhydrin crystals dissolved in 1 liter of acetone, yielding a 0.6% concentration.

Procedure: *Follow all prescribed safety procedures.

1. Weigh out 6 grams of ninhydrin crystals and empty into a beaker containing 1 liter of acetone and stir until dissolved.
2. Pour ninhydrin solution into storage bottle.
3. Place fingerprints on the type of paper similar to that being processed in casework.
4. Pour sufficient amount of ninhydrin solution into tray.
5. Dip test paper using forceps into ninhydrin solution and saturate paper with the solution.
6. Allow to air dry, five minutes.
7. Place test paper in a humidity chamber (set at 80% humidity at 50 degrees C.) for 1 hour.
8. Dispose of used ninhydrin solution in accordance with prescribed safety standards.

Results: Latent prints developed on the test paper.

Conclusion: The solution and procedure tested developed latent prints, and is therefore, valid for use in the development of latent prints on paper.

Reference: Federal Bureau of Investigation, The Science of Fingerprints, page 180, 1973.

Personal communication, Chemist James McBride, Aldona County Sheriff's Department Criminalistics Laboratory, 8-27-98.

Validation testing conducted by Lee Render, Fingerprint Specialist with Avalong Police Department on 8-29-98.

APPENDIX B

The following is an example of a guideline for validation testing of an **established** technique or procedure, using a commercially prepared product.

Purpose: Detection of latent prints on specific surface type or specific component of latent print residue using a commercially prepared product.

Materials: Commercially prepared product and incidental materials required for use.

Safety: Review all safety procedures prior to beginning validation testing, including preparation, application, storage and disposal of chemical and biohazard materials.

Formula: State product and manufacturer's supplied information.

Procedure: To include step by step methods used in testing the technique or procedure, as well as time increments, environmental conditions (i.e., humidity, heat, atmospheric), formulations, amounts and materials, when applicable.

Results: Descriptive observation(s) of the test.

Conclusion: Discussion or evaluation of the results and effect(s) of the technique or procedure on the development of latent prints or above stated purpose.

Reference: List source(s) for procedure, technique and formulation.

Validation: List name of individual(s) who conducted validation, their title, agency of individual(s) and date of validation.

Attached is an example of a validation test.

VALIDATION TEST EXAMPLE FOR APPENDIX B

The following is an example of a guideline for validation testing of an **established** technique or procedure, using a commercially prepared solution.

Purpose: Test commercially prepared ninhydrin solution for developing latent prints on paper.

Materials: Commercially prepared ninhydrin solution in an aerosol can, forceps and safety equipment.

Formula: State product and manufacturer's supplied information.

Procedure: *Follow all prescribed safety procedures.

1. Place fingerprints on the type of paper similar to that being processed in casework.
2. Spray test paper with ninhydrin solution, allowing paper to become saturated with the solution.
3. Allow to air dry, ten minutes.
4. Heat test paper using an electric steam iron (set at the cotton setting), one minute.

Results: Latent prints developed on the test paper.

Conclusion: The development of latent prints on the test paper demonstrates the validity of the procedure and solution used.

Reference: Material Safety Data Sheet, Commercial Products, Inc., provided by seller of product, received 7-19-98.

Federal Bureau of Investigation, The Science of Fingerprints, page 181, 1973

Validation: Conducted by Allyn Smythe, Latent Print Examiner, Penten Parrish Crime Lab on 7-31-98.

APPENDIX C

The following is an example of a guideline for validation testing of **a new or innovative technique or procedure** being implemented or being considered for implementation for use in latent print development.

Purpose: Detection of latent prints on specific surface type or specific component of latent print residue.

Literature: To include studies and academic research in the explanation of the technique, to include descriptive data and research procedure and findings.

Materials: Chemical(s) or product and incidental materials required for use.

Safety: Review all safety procedures prior to beginning validation testing, including preparation, application, storage and disposal of chemical and biohazard materials.

Formula: State name of technique or procedure.

Procedure: To include step by step methods used in testing the technique or procedure, as well as time increments, environmental conditions (i.e., humidity, heat, atmospheric), formulations, amounts and materials, when applicable.

Results: Descriptive observation(s) of the test.

Conclusion: Discussion or evaluation of the results and effect(s) of the technique or procedure on the development of latent prints or above stated purpose.

Reference: List source(s) for procedure, technique and formulation.

Validation: List name of individual(s) who conducted validation, their title, agency of individual(s) and date of validation.

Attached is a listing of examples of validation tests in the form of published articles for peer review.

VALIDATION TEST EXAMPLES FOR APPENDIX C

Allred, C.E. and Menzel, E.R., "A Novel Europium-Bioconjugate Method for Latent Fingerprint Detection," Forensic Science International, V. 85, No. 2, 1997, pp. 83-94.

Almog, J., Hirshfeld, A., and Klug, J.T., "Reagents for the Chemical Development of Latent Fingerprints: Synthesis and Properties of Some Ninhydrin Analogues," Journal of Forensic Science, V. 27, No. 4, 1982, pp. 912-917.

Brennan, J., Bramble, S., Crabtree, S., and Wright, G., "Fuming of Latent Fingerprints Using Dimethylaminocinnamaldehyde," Journal of Forensic Identification, V. 45, No. 4, 1995, pp. 373-380.

Burns, D.S., "Sticky-Side Powder: The Japanese Solution," Journal of Forensic Identification, V. 44, No. 2, 1994, pp. 133-138.

Cantu, A.A., Leben, D.A., Ramotowski, R.; Kopera, J., and Simms, J.R, "Use of Acidified Hydrogen Peroxide to Remove Excess Gun Blue from Gun Blue-Treated Cartridge Cases and to Develop Latent Prints on Untreated Cartridge Cases," Journal of Forensic Sciences, V. 43, No. 2, 1998, pp. 294-298.

Mashiko, K., German, E.R., Motojima, K., and Colman, C.D., "RTX: A New Ruthenium Tetroxide Fuming Procedure," Journal of Forensic Identification, V. 41, No. 6, 1991, pp. 429-436.

Pounds, C.A., Phil, M., Grigg, R., and Mongkolaussavaratana, T., "The Use of 1,8-Diazafluoren-9-one (DFO) for the Fluorescent Detection of Latent Fingerprints on Paper: A Preliminary Evaluation," Journal of Forensic Sciences, V. 35, No. 1, 1990, pp. 169-175.

Ramotowski, R., Cantu, A.A.; Joullie, M.M., and Petrovskaia, O., "1,2-Indaediones: A Preliminary Evaluation of a New Class of Amino Acid Visualizing Compounds," Fingerprint Whorld, V. 23, No. 90, 1997, pp. 131-140.

SWGFAST
Friction Ridge Automation Training Guidelines
DRAFT FOR COMMENT

Comment period ends July 31, 2001

1. Automation Training for Latent Print Examiners/Trainees

Latent Print Examiners/Trainees working with friction ridge automation should receive training that provides sufficient knowledge and skills necessary to understand friction ridge automation technology.

1.1 Qualifications

1.1.1 Latent Print Examiners/Trainees need knowledge, skills and the ability to recognize identifiable friction ridge detail before automation training.

1.1.2 Instructors must possess the knowledge, skills, and abilities for the courses being instructed.

1.2 Live Scan

1.2.1 Required objectives - Knowledge of live scan technology and how it differs from other methods of recording known friction ridge impressions, e.g. ink, inkless. The ability to recognize live scan generated artifacts and understand their cause and effect relative to friction ridge examinations.

1.2.1.1 Theory of operation - Understand how friction ridge detail on three dimensional skin is digitally captured as a two dimensional image.

1.2.1.2 Quality issues - Understand the process needed to achieve good quality friction ridge images, e.g., clean fingers, clean platen, proper rolling speed and movement, scan resolution, compression rate, equipment maintenance and calibration. Understand quality controls that ensure completeness, image quality and data integrity.

1.2.1.3 Electronic transfer - Understand what happens to the digital image file after capture.

1.2.1.3.1 Electronic transmission standards - Knowledge of ANSI/NIST, IAFIS EFTS and local standards for exchanging friction ridge records.

1.2.1.4 Information and image integrity - Knowledge of data authentication mechanisms, e.g., encryption, compression, and network

security.

1.2.2 Supplemental objectives:

1.2.2.1 Operation of equipment - Knowledge of live scan operator activities, e.g., booking officer techniques, exception handling (amputations, bandaged, etc.), moisturizing lotion, and rescans.

1.2.2.2 Equipment maintenance and calibration frequency, i.e., who does it, how often, and where it is documented.

1.2.2.3 Operator training - understanding of live scan operator training, i.e., who conducts the training, how often, and where it is documented.

1.3 Card Scan

1.3.1 Required objectives – Knowledge of card scan technology and how it captures, processes, stores and reproduces known friction ridge impressions, e.g., ink, inkless. The ability to recognize card scan generated artifacts and understand their cause and effect relative to friction ridge examinations.

1.3.1.1 Theory of operation – Understand the recording medium on the paper document and how known friction ridge impressions are captured as digital images.

1.3.1.2 Quality issues - Understand the process needed to achieve good quality friction ridge digital images, e.g., clean platen, scan resolution, compression rate, equipment maintenance and calibration. Understand quality controls that ensure completeness, image quality and data integrity.

1.3.1.3 Electronic transfer - Understand what happens to the digital image file after capture.

1.3.1.3.1 Electronic transmission standards - Knowledge of ANSI/NIST, IAFIS EFTS and local standards for exchanging known friction ridge impressions.

1.3.1.4 Information and image integrity - Knowledge of data authentication mechanisms, e.g., encryption, compression, and network security.

1.3.2 Supplemental objectives:

1.3.2.1 Operation of equipment - Knowledge of card scan operator activities,

e.g., booking officer techniques, exception handling (amputations, bandaged, etc.), and rescans.

1.3.2.2 Equipment maintenance and calibration frequency, i.e., who does it, how often, and where it is documented.

1.3.2.3 Operator training - knowledge of card scan operator training, i.e., who conducts the training, how often, and where it is documented.

1.4 Automated Fingerprint Identification System (AFIS)

The term AFIS as used herein includes automated systems for any friction ridge area, e.g., palmprints.

1.4.1 Required objectives related to Ten Print operations - Knowledge of AFIS processes related to acquisition, classification, searching, storage, retrieval, and identification of ten print records.

1.4.1.1 Theory of operation - Knowledge of AFIS procedures as an end-to-end process; e.g. capture through final reporting and storage.

1.4.1.1.1 Knowledge of which friction ridge areas, e.g. how many fingers, which fingers, palms, are used for searching and matching.

1.4.1.2 Quality issues - Understand the importance quality assurance has on maintaining the integrity of friction ridge data. Understand quality controls which ensure completeness, image quality and data integrity.

1.4.1.2.1 Knowledge of system requirements and limitations including text data fields, finger or palm print (image) quality, finger sequence and image replacement, image rotation, and tolerance for pattern interpretation.

1.4.1.2.2 Knowledge of system and component maintenance and calibration, i.e., who does it, how often, and where it is documented.

1.4.1.2.3 Knowledge of image, minutiae and text records association.

1.4.1.3 AFIS Minutiae - Knowledge of the basic concepts associated with minutiae recognition, placement, rotation, ridge counts and other minutiae factors related to searching and matching.

1.4.1.4 AFIS compatibility issues - Knowledge that some systems cannot interchange files.

1.4.1.5 Electronic transmission standards - Knowledge of ANSI/NIST, IAFIS EFTS and local standards for exchanging known friction ridge impressions.

1.4.2 Supplemental objectives:

1.4.2.1 Operation of equipment - Understand procedures used for processing ten print records.

1.4.2.2 System Integration – Understand the integration of friction ridge image, mugshot, tattoo/scar/mark, image, minutiae, personal descriptor and criminal history files.

1.4.3 Required objectives for Latent Prints - Knowledge of AFIS processes related to classification, searching and matching of latent prints (fingerprints and palm prints).

1.4.3.1 Theory of operations - Knowledge of AFIS text data filtering, pattern classification and referencing, minutiae extraction, searching, comparison, threshold scoring, candidate list comparison and matching.

1.4.3.2 System capabilities - Understand latent print v. ten print, ten print v. latent print, latent print v. latent print, ten print v. ten print, and palm print v. palm print search capabilities of the AFIS.

1.4.3.3 Encoding – Understand how to manually or automatically position latent print minutiae to emulate the system's automated minutiae extraction.

1.4.3.4 Pattern Interpretation - Understand automated classification and how to interpret latent prints in a similar manner.

1.4.3.5 Progression - Understand logical search progression, i.e., local AFIS first, then state, regional, national and international.

1.4.3.6 File penetration - Understand the benefits and liabilities of partial versus full database searches.

1.4.3.6.1 Search logic - Understand filtering criteria used to establish logical candidates, i.e., finger position, classification, sex, race, offense, geographic location, etc.

1.4.3.6.2 Candidate list - Understand the search result contents, e.g., ranked order, unique identifier, finger or palm position. Understand the need to ensure that candidates meet the search criteria.

1.4.3.6.3 Score - Understand the significance of the candidate scores, candidate thresholding, the meaning of differential scores between candidates, etc.

1.4.3.7 On screen examination - Understand the limitations of digital images.

1.4.3.8 Hard copy examination - Understand printer technology limitations versus examinations from original friction ridge documents, e.g., inked fingerprint cards.

1.4.3.9 Record authentication - Understand the processes for authentication, e.g., correct association of name, unique identifier, friction ridge images and criminal history record.

1.5 Digital Imaging

1.5.1 Required objectives – Knowledge of digital imaging procedures related to friction ridge impression capture, processing, storage, retrieval, transmission and display.

1.5.1.1 Historical development and legal precedents

1.5.1.2 Image file formats, e.g., bmp, tif, jpg

1.5.1.3 Compression, e.g., wsq, jpg

1.5.1.4 Image resolution, e.g., spatial, radiometric, spectral

1.5.1.5 Image processing, e.g., sharpening, FFT, histogram equalization

1.5.1.6 Equipment maintenance and calibration, i.e., who does it, how often, and where it is documented.

1.5.1.7 SWGFAST Friction Ridge Impression (Latent Print) Digital Image Guidelines

SWGFAST
Friction Ridge Digital Imaging Guidelines
DRAFT FOR COMMENT
Comment period ends July 31, 2001

1. Friction Ridge Impression (Latent Print) Digital Image Guidelines

These guidelines refer to the digital recording and depiction of friction ridge impressions that are present or developed on evidence.

Policies and procedures must be in place for the digital capture, storage, retrieval, display and transmission of friction ridge images retained as evidence. These guidelines are recommended procedures to preserve identity, authenticity, integrity, and security of friction ridge digital images.

1.1 Agencies should establish policies to determine which friction ridge digital images will be retained as evidence.

1.2 Friction ridge digital image documentation - Friction ridge digital images, case notes, or associated data shall include the following:

1.2.1 A unique case identifier. This association may be accomplished by one or more of the following methods:

1.2.1.1 As part of the digital image

1.2.1.2 As part of the file name

1.2.1.3 As data associated with a digital image within an imaging database

1.2.1.4 As data associated within a standardized record (i.e., ANSI NIST, Record Level 2)

1.2.2 Date and initials or date and personal marking

1.2.3 Description or identifier of the item bearing the friction ridge impression

1.2.4 Significant information about the orientation and/or position of the friction ridge impression on the object through description and/or diagram(s)

1.2.5 Scene location or address

1.2.6 Scale information

1.2.7 Make and model of capture device

1.3 Friction Ridge Impression Digital Image Quality

1.3.1 Friction ridge impressions should be captured (color or grayscale) at 1000 ppi or higher resolution. Grayscale digital imaging should be at a minimum of 8 bits. Color digital imaging should be at a minimum of 24 bits.

1.3.2 Friction ridge impression digital images shall be stored and transmitted without compression or with lossless compression.

1.4 Friction Ridge Impression Digital Image Integrity

1.4.1 Each original digital image shall be stored in a manner which permits authentication.

1.4.1.1 Original digital images are accurate replicas (pixel for pixel value) of the primary image.[1]

1.4.1.2 Subsequent images resulting from digital processing techniques shall not replace, or be considered, original images.

1.4.1.3 Digital images captured from lifts, or from conventional photographs or negatives, shall not replace the lift or photograph as original images.

1.5 Casework Documentation

1.5.1 Procedures must be in place to ensure accuracy and completeness of documentation.

1.5.2 Casework documentation shall distinguish friction ridge impression (latent print) digital images from lifts or photographs.

1.5.3 The application of digital image processing (enhancement) techniques to a copy of an original digital image for comparison purposes shall be documented. This documentation must be sufficient to enable evaluation or replication of the digital image processing techniques.

1.5.3.1 Digital images prepared for other purposes do not require digital image enhancement documentation, i.e., demonstrative court exhibits.

1.5.3.2 If only minor digital image adjustment are made to the entire image, similar to conventional photography/darkroom adjustment to brightness, contrast and color shift, etc., documentation is not required.

[1] SWGIT Glossary defines Primary Image as "Refers to the first instance in which an image is recorded onto any media that is a separate, identifiable object or objects. Examples include: a digital image recorded on a flash card or a digital image downloaded from the Internet." and Original Image as "An accurate and complete replica of the primary image, irrespective of media."

SWGFAST
Glossary - Friction Ridge Automation
DRAFT FOR COMMENT
Comment period ends July 31, 2001

ADIPS
Analog Digital Image Processing System. See digital image processing.

AFIS
Automated Fingerprint Identification System. Computerized system for storage, searching and retrieval of ten print and latent print records based on friction ridge detail.

ALGORITHM
Mathematical routine used in computer processing, e.g., an AFIS matching algorithm establishes the correlation of Level 2 detail between fingerprints.

ALPS
Automated Latent Print System. The latent print specific operations of an AFIS.

ALS
Automated Latent System. The latent print specific operations of an AFIS. 2. Alternate Light Source. Any light source, other than a laser, used to excite luminescence of latent prints, body fluids, etc., at crime scenes or on items of evidence. Now commonly referred to as a forensic light source, which includes lasers.

ANALOG
Image representation by waveform variations, e.g., video tape recordings or silver halide photographs of fingerprints.

ANSI
American National Standards Institute.

APIS
Automated Palm Print Identification System. Computerized system for storage, searching and retrieval of known and latent palm print records based on friction ridge detail.

ARTIFACT
Any information not present in the original object/image, inadvertently introduced by image capture, processing, compression, transmission, display or printing.
2. Any distortion or alteration not in the original friction ridge impression.

ASCII
American Standard Code for Information Interchange. A coding system that converts font characters to standard numeric values.

AUTHENTICATION
Process used to determine whether a digital image has been altered in any way since its capture.

BANDWIDTH
The total amount of data that can be transmitted per second, e.g., bandwidth may limit simultaneous high-speed transmission of digital images by multiple users in an AFIS network.

BAUD RATE
Used interchangeably with bits per second (bps), the unit of measure used to rate the speed at which data can be transmitted via computer modem.

BINARY IMAGE
An image type using only two radiometric values, e.g., black and white.

BIOMETRIC FINGERPRINTING
Digital image capture of friction ridges and/or a template from friction ridges.

BMP
Bitmap. A non-compressed image file format. The ".bmp" suffix is used for bitmap file names.

CARD-SCAN
Electronic recording of friction ridge impressions (fingers and/or palms) from fingerprint cards, palm print cards, etc. Sometimes referred to as dead-scan or flat-bed scanner.

CCD
Charged-Coupled Device. An electronic chip capture device used in optical recording instruments which converts light energy into electrical current, e.g., the chip in a digital camera or scanner for capturing friction ridge impressions.

CJIS
Criminal Justice Information Services.

CMOS
Complementary Metal Oxide Semiconductor. A digital image capture device. 2. A computer operating system.

COMPRESSION
The process of reducing the size of a data file.

COMPRESSION RATE
The ratio of the original file size compared to the compressed file size, e.g., 10 to 1.

COMPRESSION, LOSSLESS
Compression in which no image data is lost and the image can be restored to its original form.

COMPRESSION, LOSSY
Compression in which image data is lost and the image cannot be restored to its original form.

DEF
Direct Electronic Fingerprinting. See live-scan.

DIGITAL
Information or data that exists as numerical values.

DIGITAL CAMERA
A camera that records an image electronically as numerical values.

DIGITAL IMAGE PROCESSING
Image display and operations based on numerical pixel values and the application of computer algorithms.

DIRS
Digital Image Retrieval System. Normally an AFIS subsystem, also commonly referred to as IRS.

DOWN SAMPLING
The process of representing an image with a smaller number of samples.

DPI
Dots Per Inch. The printing resolution of an output device. Often referred to incorrectly as PPI (pixels per inch).

EFTS
Electronic Fingerprint Transmission Specifications. Documents prescribing content and format for electronic transactions.

ENCODING
AFIS process used to record minutiae data.

FFT
Fast Fourier Transform. An algorithm used in digital image processing.

FLS
Forensic Light Source. See ALS.

GRAY SCALE IMAGE
An image type using more than two radiometric values, i.e., 256 shades of gray in an eight bit image.

IAFIS
Integrated Automated Fingerprint Identification System. The FBI's national AFIS.

INTERPOLATION
A sampling technique used to increase the size of an image file by creating more pixels and increasing the apparent resolution of an image. When used to decrease image size, interpolation is generally referred to as down sampling.

IRS
Image Retrieval System. Normally an AFIS subsystem also commonly referred to as DIRS.

JPEG
Joint Photographic Experts Group. A compressed image file format. The ".jpg" suffix is used for JPEG file names. Most JPEG images use lossy compression.

LIVE-SCAN
Electronic recording of friction ridges (fingers and/or palms).

LT/TP - Latent /Ten Print
AFIS latent print to ten print search process. Sometimes referred to as LI (Latent Inquiry).

NIST
National Institute of Standards and Technology, U.S. Department of Commerce.

PIXEL
Short for picture element. The fundamental element of a digital image.

PPI
Pixels Per Inch. The spatial resolution of a digital image. Often referred to incorrectly as DPI (dots per inch).

RADIOMETRIC RESOLUTION
The number of intensity levels (such as the number of shades of gray or color values) in a digital image.

RUVIS
Reflected Ultra-Violet Imaging System. A system based on the detection and amplification of short-wave UV light (not luminescence) from latent prints.

SCANNER
A capture device used to create digital image files from original objects, photographs, etc.

SPATIAL DENSITY
A measure of the number of pixels in a digital image, e.g. pixels per inch.

SPATIAL RESOLUTION
The relationship of the individual pixels to the size of the actual area represented. This is similar to the relationship of film grain to individual details in a photograph.

SPECTRAL RESOLUTION
The color bands of light detected during image acquisition, e.g., detection from 520 to 700 nanometers.

TEMPLATE
Format of the extracted digital friction ridge detail.

TIFF
Tagged Image File Format. An image file format. The ".tif" suffix is used for TIFF file names. Most TIFF images are lossless.

TWAIN
Technology Without An Important Name. An image acquisition and output protocol commonly used between computers and image capture devices, printers, etc.

WSQ
Wavelet Scalar Quantization. A compression algorithm used to reduce finger or palm print image file size.

SWGFAST
Glossary - Fingerprint Classification
DRAFT FOR COMMENT
Comment period ends July 31, 2001

APPENDAGE
An attachment or connection within friction ridges.

ARCH - PLAIN
A fingerprint pattern in which the ridges enter on one side of the impression, and flow, or tend to flow, out the other with a rise or wave in the center.

ARCH - TENTED
A type of fingerprint pattern that possesses either an angle, an upthrust, or two of the three basic characteristics of the loop.

ALIAS (AKA)
1. A false name. 2. Another name an individual has used. (Also Known As)

BRIDGE
A connecting friction ridge between and at generally right angles to parallel running ridges.

CLASSIFICATION
Alpha/numeric formula of finger and palm print patterns used as a guide for filing and searching.

CORE
The approximate center of a pattern.

DELTA
That point on a ridge at or nearest to the point of divergence of two type lines, and located at or directly in front of the point of divergence

DIVERGENCE
The separation of two friction ridges that have been running parallel or nearly parallel.

FINAL
A numerical value that is derived from the ridge count of a little finger, usually the right.

FOCAL POINTS
Those areas that are enclosed within the pattern area of loops and whorls. They are also known as the core and the delta.

HENRY CLASSIFICATION
A system of fingerprint classification named for Sir Edward Richard Henry (1850 - 1931).

INKED PRINT (FINGER, PALM, FOOT)
A recording of the friction ridges with black ink on a suitable contrasting background.

INNER TERMINUS
See Core.

KEY
A numerical value derived from the ridge count of the first loop beginning with the right thumb exclusive of the little fingers.

LOOP - ULNAR
A type of pattern in which one or more ridges enter upon either side, recurve, touch or pass an imaginary line between delta and core and pass out, or tend to pass out on the same side the ridges entered. The flow of the pattern runs in the direction of the ulna bone of the forearm (toward the little finger).

LOOP - RADIAL
A type of pattern in which one or more ridges enter upon either side, recurve, touch or pass an imaginary line between delta and core and pass out, or tend to pass out on the same side the ridges entered. The flow of the pattern runs in the direction of the radius bone of the forearm (toward the thumb).

MAJOR
A value derived from the pattern types of the thumbs.

NCIC
National Crime Information Center

NCIC CLASSIFICATION
An alpha/numeric system of fingerprint classification.

OUTER TERMINUS
See Delta.

PATTERNS
The designation of friction ridge skin into basic categories of general shapes.

PATTERN AREA (CLASSIFICATION)
In the distal phalange of the fingers, the configuration of friction ridges that are utilized in classification.

PRIMARY
A numerical formula derived from the presence of any whorl pattern as they appear on the fingers.

RIDGE FLOW
The direction of a series of adjacent friction ridges. See Level 1 Detail.

RIDGE PATH
The course of a single friction ridge. See Level 2 Detail.

SECONDARY
An alpha expression derived from the pattern type of the index fingers.

SUB-SECONDARY
An alpha expression derived from the index, middle and ring fingers of both hands.

SUFFICIENT RECURVE
The space between the shoulders of a loop, free of any appendages that abut upon the recurve at a right angle on the outside.

TYPE LINES
The two innermost ridges associated with a delta that are parallel, diverge, and surround or tend to surround the pattern area.

WHORL - ACCIDENTAL
A fingerprint pattern consisting of two different types of patterns, with the exception of the plain arch, with two or more deltas; or a pattern which possesses some of the requirements for two or more different types; or a pattern which conforms to none of the definitions.

WHORL - CENTRAL POCKET LOOP
A type of fingerprint pattern which has two deltas, and at least one ridge which makes or tends to make one complete circuit, which may be spiral, oval, circular, or any variant of a circle. An imaginary line drawn between the two deltas, must not touch or cross any recurving ridges within the inner pattern area.

WHORL - DOUBLE LOOP
A type of fingerprint pattern that consists of two separate loop formations, with two separate and distinct sets of shoulders and two deltas.

WHORL - PLAIN
A type of fingerprint pattern which consists of one or more ridges which make or tend to make a complete circuit, with two deltas, between which, when an imaginary line is drawn, at least one recurving ridge within the inner pattern area is cut or touched.

Note: Many of the classification terms within this glossary are based upon the FBI's modified Henry classification definitions.

SWGFAST
Glossary - Anatomy
DRAFT FOR COMMENT
Comment period ends July 31, 2001

BALL AREA
The large cushion area below the base of the big toe.

BRACHYDACTYLY
Abnormal shortness of fingers or toes.

BULB OF FINGERS (THUMBS, TOES)
The portion of the friction skin on the tips of fingers, thumbs, or toes in the distal phalanx, from one side of the nail to the opposite side of the nail.

CALCAR AREA
Area located at the heel of the foot.

CARPAL DELTA AREA
Area of the palm containing a delta formation nearest the wrist.

CREASE
A line or linear depression; Grooves at the joints of the phalanges, at the junction of the digits and across the palmar and plantar surfaces that accommodate flexion.

DERMABRASION
A technique using chemicals, wire brush, surgery or lasers which can cause either temporary or permanent loss of ridge detail.

DERMAL PAPILLAE
Peg-like formations on the surface of the dermis.

DERMIS
The layer of skin beneath the epidermis.

DIGIT
A toe or finger.

DISSOCIATED RIDGES
Disrupted, rather than continuous, ridges; an area of ridge units that did not form into friction ridges.

DISTAL
Farthest away from the center or point of attachment. The direction away from the body

DUCT
A tube or canal that delivers secretions or excretions.

DYSPLASIA
Ridge units that did not form complete friction ridges due to a genetic cause.

ECCRINE GLANDS
Sweat glands that open on all surfaces of the skin.

ECTRODACTYLY
Congenital absence of all or part of a digit(s).

EPIDERMIS
The outer layer of the skin.

FETUS
For the human species, the unborn individual from about the end of the second month of development until birth. Earlier stages are termed embryo.

FIBULA
The smaller of the two bones in the lower leg on the little toe side.

FIBULAR AREA
The plantar area situated on the little toe side of the foot.

FINGER
See phalange.

FRICTION RIDGE
A raised portion of the epidermis on the palmar or plantar skin.

FULCRUM AREA
The area between the thumb and index finger on the palm.

HALLUCAL
A region which corresponds to the distal thenar and first interdigital region of the palm.

HYPERDACTYLY
Synonym of polydactyly. See polydactyly.

HYPOTHENAR AREA
The friction ridge skin on the palm, below the interdigital area on the ulnar side of the palm.

INTERDIGITAL
Palmar area below the fingers and above the thenar and hypothenar areas.

MACRODACTYLY
Abnormal largeness of fingers or toes.

MEDIAL
At or near the center.

MOTTLED SKIN

Ridge detail is present, but is dissociated due to trauma or genetic causes. It lacks any continuous pattern flow.

NACRODACTYLY
Congenitally abnormal largeness of fingers or toes.

ORTHODACTYLY
Fingers and toes cannot be flexed.

PALM (PALMAR AREA)
The friction ridge skin area on the side and underside of the hand.

PALMAR ZONE
The interdigital area of the palm.

PAPILLAE
Peg-like structures of the dermis.

PAPILLARY RIDGES
Orderly rows of eccrine glands positioned along the path of the friction ridge.

PATHOLOGY
The study of causes, nature and effects of diseases, trauma, and other abnormalities.

PATTERN FORMATIONS
Friction ridge skin arrangements formed as early as the third month of gestation.

PENTADACTYLY
The occurrence of five fingers or toes on a hand or foot.

PHALANGE (PHALANX)
A finger or toe, with proximal, medial and distal segments. Any bones in the fingers or toes.

PLANTAR AREA
The friction ridge skin area on the side and underside of the foot.

POLYDACTYLY
A hand or foot having more than the normal number of fingers or toes.

PORES
Small openings on friction ridges through which body fluids are released.

PROXIMAL
Situated at the closest point of attachment; direction toward the body.

RADIAL
The smaller of the two bones of the forearm, on the same side as the thumb.

RIDGE (FRICTION)
See Friction Ridge.

RIDGE APLASIA
Congenital absence of friction ridge skin.

RIDGE DISSOCIATION
See DISSOCIATED RIDGES

RIDGE DYSPLASIA
See DYSPLASIA

RIDGE HYPOPLASIA
Underdeveloped ridges associated with an excess of creases.

RUDIMENTARY RIDGE
See SECONDARY RIDGE

SCAR
A mark remaining after the healing of a wound.

SCARF SKIN
Dry or dead skin which has scaled and peeled away from the surface skin.

SEBACEOUS GLAND
An oil-secreting gland generally associated with a hair follicle.

SKIN
The outer covering of the body consisting of the dermis and epidermis.

SPLIT THUMB
Thumb that has conjoined distal phalanges.

SYNDACTYLY
Refers to webbed fingers. Side-to-side fusion of digits.

SYMPHALANGY
End to end fusion of the phalanges of the fingers or toes.

THENAR AREA
The large cushion of the palm located at the base of the thumb.

TIBIA
A bone in the lower leg.

TIBIAL AREA
The plantar area situated on the big toe side of the foot.

TRAUMA
Injury or damage.

ULNA
The larger of the two bones of the forearm, on the palmar side of the little finger.

VOLAR
Related to the palmar and plantar surfaces.

VOLAR PADS
Palmar and plantar fetal tissue growth that affects friction ridge skin development and patterns.

VOLAR SKIN
See friction skin.

WEBBED FINGERS
Two or more fingers connected along the sides by skin.

SWGFAST
Glossary - Identification
DRAFT FOR COMMENT
Comment period ends July 31, 2001

ANALYSIS
The methodical examination of friction skin impressions; separation into parts so as to determine the nature of the whole.

ARTIFACT
A structure or substance not normally present, but produced by some external agent or action.

BIFURCATION
The point at which one friction ridge divides into two friction ridges.

CHARACTERISTICS
Features of the friction ridges. Synonyms are minutia(e), Galton detail, point, feature, ridge formation, ridge morphology.

CLARITY
Visual quality of a friction ridge impression.

CLASS CHARACTERISTICS
Characteristics used to put things into groups or classes, e.g., arches, loops, whorls,

COMPARISON
The observation of two areas of friction ridge impressions for finding similarities and/or differences.

DISTORTION
Variances in the reproduction of friction skin caused by pressure, movement, force, contact surface, etc.

DOT
A single ridge unit whose length approximates its width in size.

EDGEOSCOPY
Study of the morphological characteristics of friction ridges; contour or shape of the edges of friction ridges.

ELASTICITY
The ability of skin to recover from stretching, compression, or distortion.

ELIMINATION PRINTS
Exemplars of friction ridge skin detail of persons known to have had access to the item examined for latent prints.

ENCLOSURE
A single friction ridge that bifurcates and rejoins after a short course and continues as a single friction ridge.

ENDING RIDGE
A single friction ridge that terminates within the friction ridge structure.

ERRONEOUS IDENTIFICATION
The incorrect determination that two areas of friction ridge impressions originated from the same source.

EVALUATION
The determination of the significance, value, or clarity of a friction ridge impression by careful observation and study.

EXEMPLAR
Friction ridge record of an individual, recorded electronically, photographically, by ink or other medium.

EXCLUSION
See non-identification.

FINGERPRINT
An impression of the friction ridges of all or any part of the finger.

FRICTION RIDGE DETAIL (MORPHOLOGY)
An area comprised of the combination of ridge flow, ridge characteristics, and ridge structure.

FRICTION RIDGE IDENTIFICATION
(See Identification)

FURROWS
Valleys or depressions between the friction ridges.

GALTON DETAILS
Term referring to friction ridge characteristics attributed to the research of English fingerprint pioneer, Sir Francis Galton.

INCIPIENT RIDGE
A friction ridge not fully developed which may appear shorter and thinner in appearance than fully developed friction ridges. (Interstitial, nascent)

INCONCLUSIVE
The inability to either identify (individualize) or exclude an area of friction ridge .

IDENTIFICATION
The determination that corresponding areas of friction ridge impressions originated from the same source to the exclusion of all others (Individualization).

INKED PRINT (FINGER, PALM, FOOT)
See exemplar.

INTERVENING RIDGES
The number of friction ridges between two characteristics.

LATENT PRINT
Transferred impression of friction ridge detail not readily visible; generic term used for questioned friction ridge detail.

LIFT
An adhesive or other medium on which recovered friction ridge detail is preserved.

LEVEL 1 DETAIL
Friction ridge flow and general morphological information.

LEVEL 2 DETAIL
Individual friction ridge paths and friction ridge events, e.g., bifurcations, ending ridges, dots.

LEVEL 3 DETAIL
Friction ridge dimensional attributes , e.g., width, edge shapes, and pores

MAJOR CASE PRINTS
A systematic recording of all of the friction ridge detail appearing on the palmar sides of the hands. This includes the extreme sides of the palms, and joints, tips and sides of the fingers.

MINUTIAE
See Characteristics.

MISSED IDENTIFICATION
The failure to make an identification (individualization) when in fact both friction ridge impressions are from the same source.

NON-IDENTIFICATION
The determination that two areas of friction ridge impressions did not originate from the same source. (exclusion)

PATENT PRINT
Friction ridge impression of unknown origin, visible without development.

POINTS/POINTS OF IDENTIFICATION
See Characteristics

POROSCOPY
A study of the size, shape and arrangement of pores.

QUALITATIVE
The clarity of information contained within a friction ridge impression.

QUANTITATIVE
The amount of information contained within a friction ridge impression.

RELATIVE POSITION
Proximity of characteristics to each other.

RIDGE CHARACTERISTICS
See Characteristics

RIDGEOLOGY
The study of the uniqueness of friction ridge skin and its use for personal identification (individualization).

RIDGE FLOW
A series of adjacent friction ridges in a directional arrangement. Also see Classification Terms glossary.

RIDGE PATH
The directional flow of a single friction ridge. Also see Classification Terms glossary

SHORT RIDGE
A single friction ridge beginning, traveling a short distance, and ending.

SPUR
A bifurcation with one short ridge branching off a longer ridge.

TRIFURCATION
The point at which one friction ridge divides into three friction ridges.

VERIFICATION
Confirmation of an examiner's conclusion by another qualified examiner.

SWGFAST
Bylaws

1. Name

    1.1 The name of the organization shall be the Scientific Working Group on Friction Ridge Analysis, Study and Technology, unincorporated, and herein referred to as *SWGFAST*.

2. Objectives

    2.1. To establish guidelines for the development and enhancement of friction ridge examiners' knowledge, skills and abilities.

    2.2 To discuss and share friction ridge examination methods and protocols.

    2.3 To encourage and evaluate research and innovative technology related to friction ridge examination.

    2.4 To establish and disseminate guidelines for quality assurance and quality control.

    2.5 To cooperate with other national and international organizations in developing standards.

    2.6 To disseminate SWGFAST studies, guidelines and findings.

3. Membership

    3.1 SWGFAST shall normally consist of 30 to 40 members actively involved in the field of friction ridge examination.

    3.3 At least one member shall be from the FBI. Other members shall be from local, state and federal law enforcement agencies, as well as the community at large.

    3.4 The American Society for Crime Laboratory Directors (ASCLD) and the International Association for Identification (IAI) shall be allowed to designate a representative as an ex-officio member at meetings. SWGFAST Members may nominate the designated representative for SWGFAST membership

    3.5 Membership terms shall be five years in duration.

3.5.1 A member may be re-elected.

3.6 Adding New Members

3.6.1 At least annually, the membership roster will be reviewed. As vacancies occur, members shall determine the need to elect new members.

3.6.2 Persons desiring membership can submit their name and pertinent background to any member. Candidates can also be nominated by any member.

3.6.3 A candidate must receive a majority vote of the members.

3.7 Membership Resignation

3.7.1 Members should submit their resignation in writing to the Executive Secretary.

3.8 Membership Termination

3.8.1 Any member may submit a written request to terminate the membership of another member. The request shall contain reasons to justify the termination and will be submitted to the Executive Committee.

3.8.1.1 The Executive Committee shall review the request and interview the individual whenever possible.

3.8.1.2 The Officers can terminate membership by a unanimous vote.

3.8.1.3 If a unanimous vote can not be reached by the Officers, the request may be presented to the members for voting by written ballot. A two-thirds majority vote of the members is required for termination.

3.8.1.4 If the terminated member desires to appeal, the appeal may be made to the members by the next regularly scheduled meeting. A two-thirds majority vote of the members is required to overturn the termination.

3.9 Membership Attendance

3.9.1 Guests may be invited to attend any meeting. Invitations will be extended by the Chairperson and Vice-Chairperson.

3.10 An official membership roster shall be documented.

3.11 Voting

3.11.1 Attendance of a majority of the total current membership shall constitute a quorum for voting at any regularly scheduled meeting.

3.11.2 Each member shall have one vote and the use of proxies is prohibited.

3.11.3 A simple majority vote is required unless otherwise noted.

4. Executive Committee and Duties

4.1 The Executive Committee shall include the Officers and Executive Secretary. Officers shall include the Chairperson, a Vice-Chairperson and Committee Chairpersons.

4.2. The Chairperson and Vice-Chairperson shall be elected from the members for a three-year term. The Chairperson and Vice-Chairperson may be re-elected.

4.3 The Chairperson shall preside at all meetings and direct the activities of the members. The Vice-Chairperson shall assist the Chairperson and assume the duties of the Chairperson during an absence.

4.4 Committee members shall elect a Committee Chairperson for a two-year term. The Committee Chairperson may be re-elected.

4.5. Officer resignations shall be submitted to the Executive Secretary.

4.6. Officers may be removed from office by a two-thirds vote of the membership.

4.7. If an Officer is unable to serve, resigns, or is removed from office, the Chairperson may designate a temporary replacement until the Officer is able to serve or is replaced through election.

4.8. The Executive Secretary shall be appointed by and serve at the discretion of the Chairperson. The Executive Secretary shall:

4.8.1 Record minutes of all meetings

4.8.2 Maintain written records and membership rolls

4.8.3 Distribute official correspondence and minutes to members

5. Meetings

5.1 There shall be a minimum of one meeting per year.

5.2 Meeting dates will be announced at least 60 days prior to a meeting. The announcements will be submitted for posting on the NFSTC-managed website (www.for-swg.org), the IAI website (www.theiai.org) and when possible, published in the *Journal of Forensic Identification* and in *Forensic Science Communications*.

6. Committees

6.1 The Chairperson shall establish standing committees and may appoint ad hoc committees.

6.2 The committee Chairperson will appoint the committee Vice-Chairperson.

6.3 Each committee shall define their goals and submit them to the members for modification or approval.

6.4. Committee documents require approval by a majority of the committee members.

6.5 Committee work products shall be submitted to the members for modification or approval.

7. Document Approval or Modification

7.1 Once a document, or portion thereof, is approved by the members as a draft for comment, majority approval is required to reopen further discussion. Any proposed change requires a two-thirds majority vote of the members.

7.2 Approved drafts for comment are submitted for community review (see Appendix).

7.4 All written community comments will be reviewed before final approval.

7.5 Any proposed change requires a two-thirds majority vote of the members.

7.6 Approved SWGFAST documents will be submitted for posting on the NFSTC-managed website (www.for-swg.org), the IAI website (www.theiai.org) and published

in the *Journal of Forensic Identification* and the *Forensic Science Communications*.

7.7 Guidelines, procedures and documents will be periodically reviewed (see Appendix).

8. Amendments to the Bylaws

8.1 Proposed amendments to the bylaws shall be submitted to the members.

8.2 Amendments to bylaws shall require a two-thirds majority vote.

9. Parliamentary Procedures

9.1 Members shall follow good business practices during meetings.

9.2 Should a dispute occur, Robert's Rules of Order will be used.

SWGFAST
Submitting Comments

According to the SWGFAST Bylaws , once a document is approved by the SWGFAST members as a "draft for comment," the draft is published for community review. During this review period, SWGFAST solicits constructive comments as to the content of each draft document. While interested persons may contact any SWGFAST member to discuss the documents, all suggestions for changes must be submitted in writing. Suggestions should be submitted with contributor information (name, address, phone number, and email address). This information will allow a SWGFAST member to contact the contributor to gather additional information if necessary and ultimately with the outcome after all suggestions have been reviewed.

The comment period for the documents currently presented will extend until the first SWGFAST meeting following the International Association for Identification seminar July 22 -28, 2001. That meeting is planned for August 6 -10, 2001. All comments should be submitted and received at least ten days prior to that meeting.

All suggestions should be forwarded to the Executive Secretary.

Executive Secretary:

Margaret Black
Orange County Sheriff-Coroner
Forensic Science Services
320 N. Flower
Santa Ana, CA 92703
email: mab@fss.co.orange.ca.us

SWGFAST
Membership
Current as of February 2001

David Ashbaugh
Royal Canadian Mounted Police

Jackie Eugene Bell
Federal Bureau of Investigation

Margaret A. Black
Orange County Sheriff Department

Mary A. Brandon
Portland Police Bureau

Robin M. Bratton
Michigan State Police Crime Lab

John D. Clark
California Department of Justice

Geraldine Eaton
King County Sheriff's Department

Deborah L. Fischer
Florida Department of Law Enforcement

Frank A. Fitzpatrick
Orange County Sheriff Department

Edward R. German
U.S. Army Criminal Investigation Lab

James B. Gettemy
Florida Department of Law Enforcement

David Grieve
Illinois State Police

Michael Grimm
Virginia Division of Forensic Science

Larry Hankerson
Bureau of Alcohol, Tobacco and Firearms

Daniel G. Hasty
Retired - FDLE

Charles P. Illsley
West Valley City Police Department

Vici Kay Inlow
U.S. Secret Service

James L. Johnson
U.S. Secret Service

Kenneth F. Martin
Massachusetts State Police

Walter W. McFarlane
Alaska State Crime Lab

Alan L. McRoberts
Los Angeles Sheriff's Department

Stephen B. Meagher
Federal Bureau of Investigation

Charles J. Parker
Texas Department of Public Safety

Barbara Kay Pase
Retired - FBI

Charles M. Richardson
Drug Enforcement Administration

Robert W. Sibert
Federal Bureau of Investigation

Kenneth O. Smith
U.S. Postal Inspection Service

Anthony R. Spadafora
Wisconsin Department of Justice

Jon T. Stimac
Oregon State Police

Lyla A. Thompson
Johnson County Sheriff's Department

John R. Vanderkolk
Indiana State Police Lab

Pat A. Wertheim
Forensic Ident. Training Seminars

Michael W. Wieners
Federal Bureau of Investigation

William Willis
Retired - FDLE

Mark J. Zabinski
Cranston Police Department

Rodolfo R. Zamora
Mesa Police Department

Ken Zercie
Connecticut Department of Public Safety