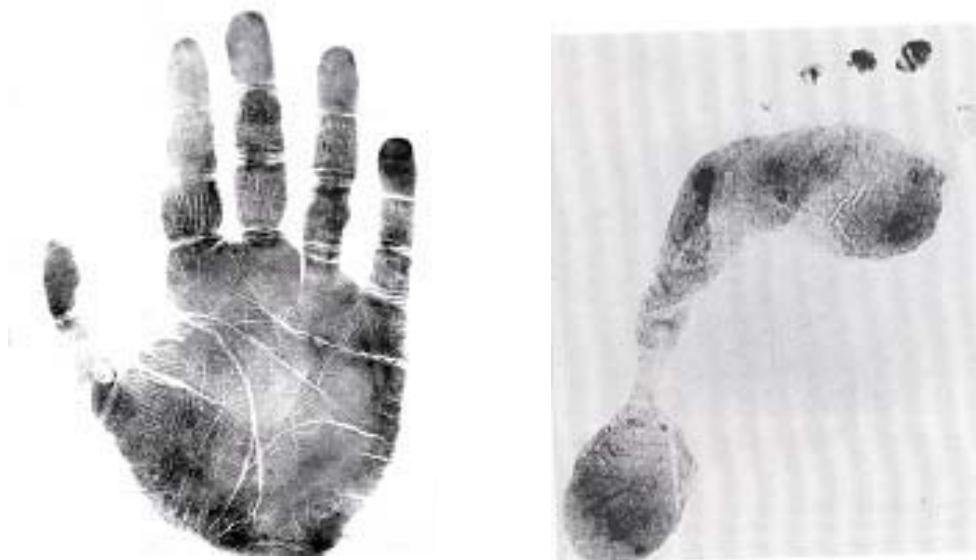


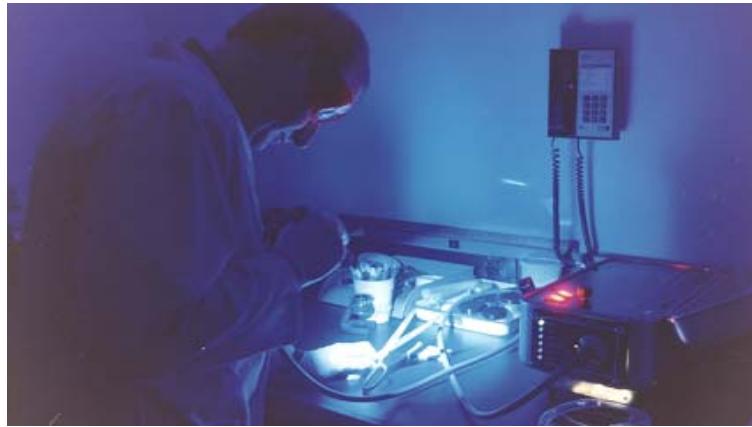
LATENT PRINT SECTION

For over 100 years, one of the most sought after pieces of forensic evidence has been the latent print – the residue left when bare fingers, hands, toes and feet come in contact with a surface. If properly recovered, the latent print can potentially lead a criminal investigator to the perpetrator of a crime and later be used as strong evidence against that individual at trial.

The skin that covers the underside of the fingers, hands, toes and feet is called friction ridge skin. Unlike the skin that covers the rest of our bodies, friction ridge skin is corrugated: a network of raised areas of flesh called ridges and the recesses between called furrows. Lining the tops of the ridges are thousands of sweat pores that, in most people, regularly emit perspiration. Biologically, friction ridge skin improves our ability to grip and gain traction. But, when it comes in contact with a surface, there is usually a transfer of perspiration and other contaminants the ridges have picked up (oil from hair bearing portions of our body, grease from food, etc.) onto the surface. The impression left behind is a replica of that portion of friction ridge skin that made contact. Because the impression is often not detectable with the naked eye, it is called a latent print. Latent means present, but not evident.



Friction ridge skin identification or exclusion is based on permanency and uniqueness, two principles firmly established by the biological sciences, most notably embryology, genetics, and anatomy. Permanency pertains to the fact that friction ridge skin, once formed and barring serious injury, will not undergo any fundamental natural change. It grows and ages as the individual grows and ages, and can become worn due to work, but the ridge characteristics used in identification will not change location or position and will continue to exactly reproduce itself. Uniqueness is created during the formation of friction ridge skin during fetal development by a wide range of random forces: timing events, stresses placed on fetal hand and feet tissue as it grows, distribution of cells, chemicals, disease, and countless other factors. These random forces insure that friction ridge skin is unique to the individual. Identical twins do not have the same friction ridge skin nor is friction ridge skin duplicated on the same individual.



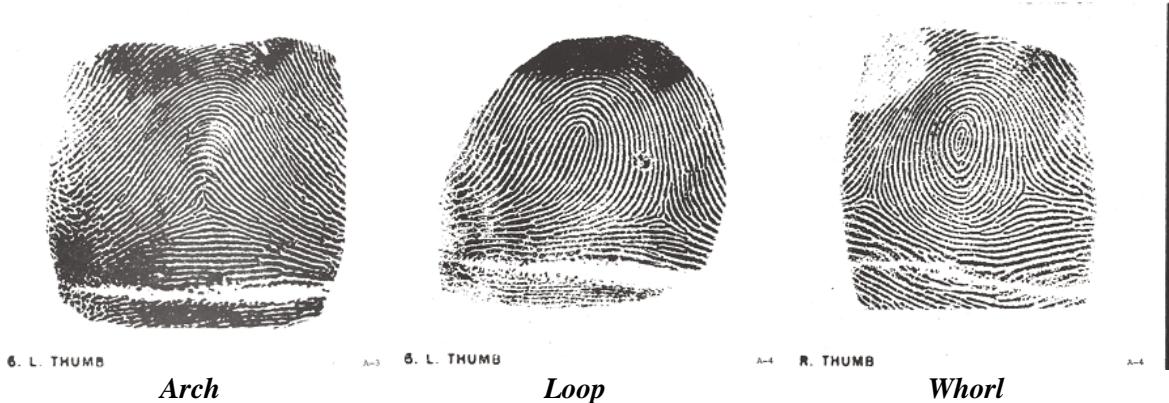
Forensic Light Source

The examiners of the Latent Print Section of the West Virginia State Police Forensic Laboratory receive thousands of pieces of evidence a year, collected from crime scenes by police investigators for the various law enforcement agencies throughout the state. The evidence is put through a variety of physical, chemical and electronic processes designed to reveal the presence of latent impressions. Some of the processes are old and familiar such as powdering – known to fans of crime dramas as “dusting for prints.” Others of more recent vintage are perhaps less familiar such as super glue fuming, ninhydrin, fluorescent dye stains, and forensic light sources. Latent prints are revealed when the chosen process adheres, stains, or reacts to constituent properties contained in the residue that makes up the impression. Choice of development technique or sequence of techniques is made by the latent print examiner or one trained in latent print processing. Factors involved in the processor’s decision will include the type of surface of which the item is made (absorbent or nonabsorbent, smooth or textured) and the condition of the item at the time it is being processed. Preservation of any developed latent prints is usually determined by the choice of development method and surface type with photography and “lifting” being the essential methods of saving a latent print.



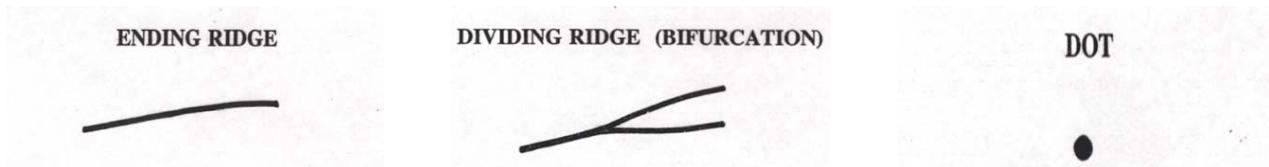
Dusting for Latent Prints

Once a latent print is developed and preserved, a latent print examiner will begin a study of the impression using a methodology called ACE-V, an acronym for analysis, comparison, evaluation, and verification. ACE-V mirrors the scientific method of observation, experimentation, development and testing of a hypothesis, and validation. A latent print **analysis** focuses on the clarity and content of a print (and this will vary from impression to impression) and is conducted on three distinct levels. *Level one* looks at class characteristics, or those traits that are common among us all, such as fingerprint patterns. That which we commonly refer to as a fingerprint is actually the friction ridge skin that is contained just on the first joint of our fingers. The ridges form patterns here and generally take one of three shapes: loops (the most common), whorls and arches (the least common). Additionally, fingerprints can consist of patterns that have traits of two or more of the three main pattern groups. Though ridges can form patterns in other areas of our friction skin (particularly the palms), the presence of a pattern in a latent print usually is an indication that a finger made the impression.



Level two looks at what the discipline calls Galton details (named after Sir Francis Galton, an early scientist/pioneer in the field). The ridges of friction skin are not continuous, but rather, contain numerous interruptions – the Galton details. These details are more commonly called “characteristics” or “points of identity” and consist of three basic types: ridge endings, bifurcations (a ridge that divides) and dots. These “characteristics” or “points” are randomly scattered during friction ridge skin formation and their position, like all components of friction ridge skin, is not duplicated from one individual to the next or from one finger to the next. Though a predetermined minimum number of points are not required in order to make an identification or elimination, the Galton details are usually instrumental when an identification is made.

GALTON DETAILS



Level three looks even closer at the ridges to ridge contour and edges and pore structure and placement. Needless to say, in order for an examiner to make observations on this level, the clarity must be of the highest order.

If a print is too smudged, blurred, contains an abundance of superimposed impressions or simply lacks ridge detail, then the print would probably be of no further value. However, if the impression contains ridge detail that is clear (or within an acceptable tolerance range for distortion), has a recognizable pattern and sufficient ridge minutia, then the print will be considered of comparison value. If clarity and content are sufficient, the impression is then **compared** to an exemplar containing friction ridge skin impressions made by a known subject. Class characteristics and minutia structure and placement are compared between the questioned impression and the known impression. An **evaluation** is then made as to whether the known individual's friction ridge skin is the source of the questioned. If there is sufficient agreement in class characteristics and the structural and positional relationship of minutia placement, then an identification is the result. If class characteristics are not alike or differences in the structural and positional relationship of minutia placement exceeds what can be accounted for by distortion, then the impressions could not have had the same contributor and an exclusion is the result. The analysis, comparison and evaluation are then submitted to a second qualified examiner for **verification**. The second examiner will conduct his or her own analysis, comparison, and evaluation of the latent print and will either validate the first examiner's opinion or disagree with that opinion.



The Automated Fingerprint Identification System (AFIS) – Latent Work Station

Many technological advances have been made in the latent print discipline during the past 100 years, but none more important than AFIS, or Automated Fingerprint Identification System. AFIS, is a computer system that is capable of rapidly searching fingerprint images through a

database of hundreds of thousands (and in the case of the FBI, millions) of fingerprint exemplars. Though search times will vary, most take only minutes. The West Virginia AFIS has two primary users: the Criminal Identification Bureau's (CIB) Records Section and the Forensic Laboratory's Latent Print Section. CIB uses AFIS as a portal for entering fingerprint, and now palm print, images from arrest fingerprint exemplars taken and submitted by the various law enforcement agencies throughout the state. Submissions can be of fingerprints and palm prints taken by traditional methods (ink) or by digital recording with the use of live-scan devices. Additionally, thousands of non-criminal fingerprint images (background exemplars for employment, licensing, etc.) are entered into the system each year. Together, the criminal and non-criminal exemplars create the AFIS database used by the Latent Print Section. Latent prints from crime scenes submitted by police officers or latent prints that were developed in the section that are of comparison value—meaning that they can be identified or eliminated—can be searched through AFIS in an effort to place a name to the crime scene print. Though the “I” in AFIS stands for identification, what the system actually does is present a qualified latent print examiner with a list of candidates possessing a finger or palm print closest in detail to the questioned latent print. The latent examiner will then conduct an on-screen comparison between these known images and the latent print and will decide whether there is a match or not. The biggest advantage of AFIS is to the criminal investigator with an unknown crime scene print and no suspects. Prior to AFIS, it would have been up to the investigator to first find a suspect. Now, the investigator can be provided a name. While it is important to remember that a latent print at a crime scene is not an indication of an individual's guilt, merely that individual's presence at the scene, it is also important for the investigator as a starting point for getting the investigation off the ground.

Once an examination has been completed, the latent print examiner will write and issue a report to the investigator explaining the results. Numerous times a year, the examiner will be subpoenaed by state and federal courts to appear and offer expert testimony. Additionally, examiners of the Latent Print Section will render assistance to the Office of the Chief Medical Examiner of West Virginia in identifying deceased individuals, provide instruction to all law enforcement officers in the state in basic fingerprint techniques at the State Police Academy, lecture on various discipline related topics at local universities, state colleges, and high schools and participate in our own continuing professional education by attending classes, workshops, and conferences specific to latent prints.

The work we do here rarely resembles the visually stunning and glitzy world of the folks who populate the TV franchises *CSI* and *NCIS*. And it seldom provides us with high profile cases soon to be featured on *The New Detectives* or *The Forensic Files*. The work we *do* perform, however, is an important component of the criminal justice system and is often intrinsically rewarding.

EDUCATIONAL REQUIREMENTS:

The current educational requirements for a latent print examiner in the West Virginia State Police Forensic Laboratory is a Bachelor's Degree from an accredited four-year college or university with a major in chemistry, biology, biochemistry, molecular biology, forensic sciences, or other natural sciences. Latent print specific training is conducted through apprenticeship study under a qualified latent examiner, combined with classes conducted by agencies such as the FBI and qualified independent instructors. The training mirrors the guidelines put forth by the International Association for Identification (IAI) and the Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGfst) and lasts approximately two years.

