B68 Fingerprint Ridge Drift: An Undescribed Phenomenon

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After attending this presentation, attendees will be informed about a newly discovered phenomenon named ridge drifting. Attendees will learn how to identify this feature that has never before been described.

This presentation will impact the forensic science community by introducing a new feature that describes changes in the topography of fingerprints that has previously gone unnoticed.

Fingerprint distortions have been described in the literature as being the result of applying a non-uniform pressure during deposition, combined with the inherent elasticity of friction ridge skin and the curved anatomy of the finger. In addition, fingerprint image deformations can also occur as a consequence of camera lens defects or are caused by the visualization/development process. These alterations of the fingerprint topography and of the acquired image are usually considered during a comparison process between a latent and an exemplar (inked or scanned) fingerprint.

The aforementioned distortions are characterized by: (1) being caused by an extrinsic force or action; (2) affecting entire areas of the deposition (or its image); and, (3) altering the overall flow of a series of contiguous ridges. In consequence, the ridges are "artificially" deformed, modifying the minutiae/ridge pattern and hindering comparisons. Unlike these identifiable types of deformations, a visual phenomenon that modifies the fingerprint at a ridge scale is described here and named "fingerprint ridge drift."

In an experiment to determine the degradation patterns of latent fingerprints, a sequence of impressions (eccrine and sebaceous) were deposited on non-porous surfaces (plastic and glass) by applying similar pressures for the same lengths of time. These were aged under three different light conditions (direct sunlight, shade, and darkness) for a period of six months, visualized with titanium dioxide over different time periods, and photographed. No further treatment or manipulation was performed on the samples. Photographs of fresh fingerprints were then compared with all of the aged prints. The analyses revealed that under certain environmental conditions, an individual ridge could randomly change its original position regardless of its unaltered adjacent ridges. This modification produced a change in the distribution of minutiae in the fingerprint at that specific location.

Currently, the causes of this phenomenon are not well understood. It is hypothesized that it could be the result of either: (1) a microscopic movement of the ridge over the non-porous surface by a diffusion (sliding) effect; or, (2) a process of degradation that affects only specific locations along the same ridge (selective degradation). In both cases, it would be a process exclusively associated with the intrinsic natural aging process of a latent fingerprint. At this time, the second option seems the most plausible. The study of superimposed fingerprint images has shown an apparent unchanged location of the affected ridges but a modification in their appearance.

It has been demonstrated that: (1) fingerprints from the same person can be slightly different if the factor "time" is included; (2) ridge drift occurs at random and has a very localized affect; (3) it is an intrinsic phenomenon not caused by external actions; and, (4) there is no obvious correlation between environmental conditions and ridge drift. To be confirmed, this discovery will help explain the detection of certain dissimilarities at the minutiae/ridge level between an aged latent fingerprint and its exemplar counterpart. Collaterally, the identification of this phenomenon will help determine more accurate "hits," identify potentially erroneous corresponding points, and rethink identification protocols, especially the common criteria of "no single minutiae discrepancy" for a positive match.

Fingerprint, Ridge, Aging

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