F4 Fingerprint Science

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After attending this presentation, attendees will have a more skeptical attitude toward testimony concerning fingerprints.

This presentation will impact the forensic science community by bringing more science into fingerprint analysis and testimony.

To what extent are statements and testimony about fingerprint evidence supportable scientifically? This study presents a statistician's view to answer this question.

With respect to whether each of the fingers on each person's hands are distinguishable from each other's, there is good evidence that fingerprints are partially, but not wholly, determined genetically; however, there are not good models of the joint genetic-environmental process leading to fingerprints that might permit one to address the problem. With respect to the empirical claim that identical fingerprints have not yet been found on distinct people, this presentation illustrates shows that it would require approximately 500 comparisons per second since the Big Bang to compare the fingerprints of every pair of people now alive.

Recent work does reveal that fingerprints are quite stable over time, barring severe accidents or other maiming.

Generally, the Automated Fingerprint Information System (AFIS) is used to winnow a database of possible donors down to a handful that the analysist studies; however, the AFIS is proprietary, so the analyst does not know what similarity measure is used, and hence cannot testify about its properties. Also, there are several different AFIS entities, which can and do provide different results. Consequently, the analyst cannot be confident that the handful of "most similar" fingerprints to the mark from a crime scene is actually the most similar. The database to which AFIS is applied may or may not contain the actual donor. The training of fingerprint analysts does not include training as a criminal sociologist, so a fingerprint analyst is poorly placed to opine on the probability that the source's fingerprint is in the database on which AFIS is run.

A fingerprint analyst is well-advised to study the mark first, and to list the minutiae and other facts about the mark to be looked for in the handful of prints from AFIS. Suppose one of them coincides with the mark on most or all of those indicia. The general literature encourages the analyst to then claim near certainty that the mark was made by the donor of the similar ten-print. Certainly the coincidence of marks allows the analyst to claim that the set of possible makers of the mark is reduced, perhaps drastically; however, there is no scientific principle that allows the analyst to estimate the size of the remaining group, and, in particular, no criteria supporting the reduction of that group to a single person.

While these findings do not support fingerprint evidence as it is now testified to in court, there is still valuable circumstantial evidence from fingerprints in the exclusion of many possible donors. Hence, the hope is that fingerprint analysts will testify more modestly in the future.

Fingerprint Uniqueness, AFIS, Fingerprint Testimony