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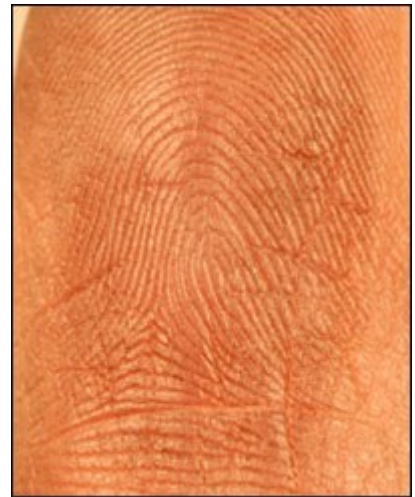
Are one's fingerprints similar to those of his or her parents in any discernable way?

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Glenn Langenburg, a Certified Latent Print Examiner at the Minnesota Bureau of Criminal Apprehension, explains.

Yes, there is an inheritable quality to fingerprints. Pattern types are often genetically inherited, but the individual details that make a fingerprint unique are not. Humans, as well as apes and monkeys, have so-called friction ridge skin (FRS) covering the surfaces of their hands and feet. FRS comprises a series of ridges and furrows that provide friction to aid in grasping and prevent slippage. FRS is unique and permanent--no two individuals (including identical twins) have the exact same FRS arrangement. Moreover, the arrangement of the ridges and features do not change throughout our lifetimes, with the exception of significant damage that creates a permanent scar. The term fingerprints refers to the FRS on the ends of our fingers.



Fingerprints have a general 'flow' to the ridges that translates into one of three major pattern types: a whorl, loop or arch. It is possible to have just one, two or all three pattern types among your 10 fingerprints. The important thing to remember about pattern types is that an individual cannot be identified from fingerprints by pattern type alone. To make an identification, an examiner must look to the next level of detail: the specific path of ridges and the breaks or forks in the ridges, known as minutiae. Other identifying features such as creases, incipient ridges (nascent ridges found in the furrows) and the shapes of the ridge edges are also useful for identification purposes.

Early pioneers in the field of dermatoglyphics (the study of FRS patterns) demonstrated a strong correlation between the inheritance of fingerprint pattern and the overall size, shape and spacing of the ridges. The identifying ridge features, however, are not inheritable, which is what makes every fingerprint unique.

Why are patterns inherited, but not the identifying ridge features? The reason lies in the timing of fetal development: two critical events in the formation of FRS collide during weeks 10 through 15. Fetuses develop smooth volar pads--raised pads on the fingers, palms and feet--because of swelling mesenchymal tissue, which is a precursor of blood vessels and connective tissues. Around week 10, the volar pads stop growing but the hand continues to grow. As a result, over

the next few weeks, the volar pad is absorbed back into the hand. During this critical stage, the first signs of ridges begin to appear on the skin of the volar pads.

The spacing and arrangement of these early ridges (known as primary ridges) is a random process, but it is dictated by the overall geometry and topography of the volar pad. If the primary ridges appear while the volar pad is still quite pronounced (a characteristic described as a 'high volar pad'), then the individual will develop a whorl pattern. If the primary ridges appear while the volar pad is less pronounced (dubbed an 'intermediate volar pad'), then the individual will develop a loop pattern. Finally, if the primary ridges appear while the volar pad is nearly absorbed (a so-called 'low volar pad'), the individual will develop an arch pattern.

The timing of these two events (volar pad regression and primary ridge appearance) is genetically linked: pattern type is influenced by genetic timing (inherited from your mother and father). The exact arrangements of the ridges, minutiae and other identifying features, however, are random and not genetically linked (and thus not inheritable).

Evidence of this comes from studies of fingerprints from identical twins. Identical twins share the same DNA and, therefore, presumably the same genetic developmental timing. The fingerprints of identical twins often have very similar size and shape pattern types. The identifying characteristics are different, however. The table above lists the coefficients of correlation between size and shape of fingerprints found in one study.

This demonstrates that you are more likely to share pattern type with your family members than an unrelated individual, but your identifying FRS features will always be unique.