

But not alike at the fingertips

Within the first fifteen weeks of conception, a human foetus develops a unique fingerprint pattern, says S.Ananthanarayanan.

This pattern is unique to each individual, even identical twins, and remains unchanged throughout her life.

Friction Ridge Skin

The hands of humans and some primates, clearly because of their need to grasp and hold, evolved to have ridges and furrows that provide friction. The skin of the inner hand, known as FRS, has no hair follicles and no oil secreting glands, but the ridges are rows of sweat glands. The way the rows curve and curl is connected to the way the skin of the hands formed during foetal development.

Till about ten weeks after conception, the hands are hardly developed, but instead, the limbs swell with a kind of tissue that will grow into blood vessels and connective tissue. These bulges of tissue are called volar pads. At about ten weeks, the volar pads stop growing and the hands begin to emerge. Over the next five weeks, the growing hand envelopes the volar pads, which get absorbed and their skin folds into the ridged patterns that cover fully developed hands.

Unique pattern

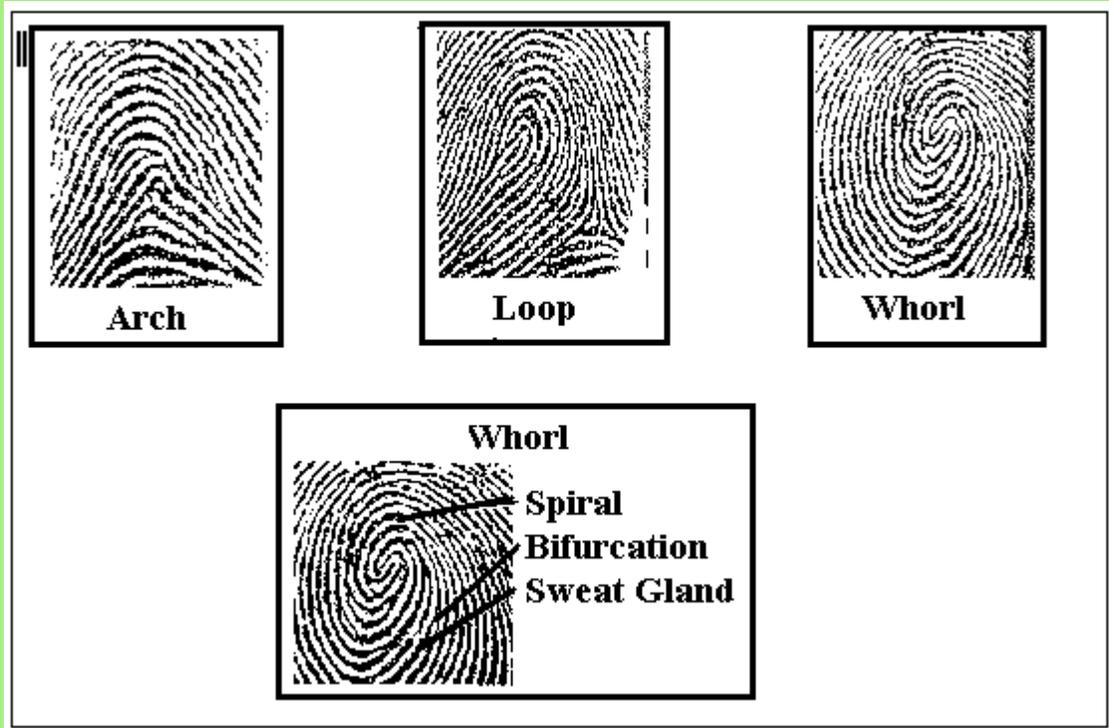
The exact times when the volar pads stop growing and the growth of the hands speeds up, or the extent of growth, vary from one individual to the next. This leads to different ways of folding of the skin into ridges and differences in the patterns that the ridges form. For instance, if the volar pads were pronounced when the first ridges formed, we have the 'whorl' pattern. If the pads were less pronounced, we have the 'loop' and with the 'low volar pads', we get the 'arch' pattern.

While the general shapes are influenced by the stages of development, the specifics are entirely random. Even with identical twins, the timings may be exactly the same and the general shapes similar, but in detail, all kinds of random things come into play. The foetal position, the disposition of the limbs, slightest temperature variations, all contribute and cell-level differences diverge into distinct patterns.

Dermatoglyphics

This is the study of Friction Ridge Patterns, or fingerprints. While individuals may have similar or the same general patterns of whorls, loops and arches, there are always differences in the details of '*minutae*'. These are the specific paths of the ridges and the forks or breaks in the ridges. Other details are creases, incipient ridges (nascent ridges found in the furrows) and the shapes of the ridge edges. A trained fingerprinter takes

measurements of several such features along different straight lines drawn across the pattern. The record, of different people, is always found to be different, except, occasionally, matching in one or two features.



The ridges themselves consist of sweat glands and they are moist with the secretion. The Ridges also bear grease and oil from other parts of the body. When the hands touch an object, they transfer an outline of the ridge pattern to the object touched. This 'latent' image of the ridges can then be developed or fixed with the help of coloured or opaque powders that stick to the outlines.

The return to fingerprints

Fingerprints are now being used like bar-code keys to identify authorised users of computers. The user places her finger over a sensor in the computer. The computer makes exact measurements along pre-decided axes and records the image a number of times. This becomes the 'signature', with more than one version being recorded to take care of chance variations.

When the user wants to log in, later on, she proffers her finger again, for identification. The software used assures a 1 in 50,000 security against a wrong person getting in and a 1 in 100 security against the correct person being kept out!
