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Classification of Foot-Prints

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CLASSIFICATION OF FOOT-PRINTS

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In recent years an increasing number of hospitals have been using foot-prints as a means of identifying the new-born babies and it has been found necessary to devise a suitable method of classifying the prints. This means of identification is very useful, not as a substitute for the usual methods, but as an adjunct. Classification and filing of the prints must be done in order that prints of a certain pattern can be found should occasion ever arise for absolutely establishing the identity of a baby. Identification of new-born babies is about the only use to which foot-prints have been put to date, but it is hoped that in the near future it will find a wider application as an aid or check on finger-prints.

Two methods have been proposed in this country, one by Cummins and one by Wilder. The Cummins method is not satisfactory because it is too complicated and requires a more perfect print than is usually taken. Wilder has proposed a good system of classification but it has only 1,760,000 theoretical possibilities and can be used to advantage in a file containing but a few hundred prints. The compartments become overcrowded very early.

In order to devise a simple method which would have a very large number of possibilities some points are selected from the finger-print system, some from Wilder's, with a few of my own added.

First Division—On the ball of the foot there are five pattern bearing areas. One is proximal to the great toe (the hallucal); three others lie lateral to the hallucal, below the small toes, and together form the plantar area; and the fifth, or hypothenar, is located on the lateral edge of the sole proximal to the third plantar area. Figure 2 shows the principal patterns of the hallucal area. The open field, or no pattern, is not given. The first plantar area lies nearest the hallucal. Here we find the open field (O), the upright loop opening distally (U), the inverted loop opening proximally (U), and the whorl (W). The hypothenar area contains principally loops (U), rarely a whorl or an arch. These five areas may be likened to the five finger tips. Let us give the value 16 to the hallucal area, 8 to the first plantar, 4 to the second plantar, 2 to the third plantar, and 1 to the hypothenar. The finger-print system considers only whorls

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but here values are taken of the loops whether upright or inverted. All patterns are read from the great toe toward the little toe regardless of the foot. The formula is expressed as a fraction with the right foot as the numerator and the left foot as the denominator. Using symbols for the individual patterns let us write the formula of the patterns in Figure 1: $\frac{\text{AOUUO.}}{\text{WUWOU}}$ The symbol of the hallucal pattern is placed at the left. If the loops are given the values indicated above and the whorls are disregarded, we have $\frac{\text{16-0-4-2-0,}}{\text{0-8-0-0-1}}$ or added together, $\frac{22.}{9}$ The value of 1 is added to each figure and we have $\frac{23}{10}$ as the first division. As 32 is the highest number, there are 1024 possible combinations in this set of figures.

Second Division—The symbols of the hallucal patterns are written in capital letters. The formula thus far would then be $\frac{23\ \text{A.}}{10\ \text{W}}$ The second division has 25 combinations.

Third Division—This deals with ridge counts at the cores of the patterns. At the core of each loop there is one innermost ridge which makes a complete loop and may or may not contain ridges more or less straight. Only those ending "free" are to be counted. If they join the loop, they are not "free" and are disregarded. Figure 3 shows some typical examples of the various counts. The following rules are to be observed: (1) Only free ridges are counted. (2) Islands (very short ridges) are counted as ridges. (3) When two ridges come together to form one free ridge all ridges enclosed by them are disregarded and a count of one is given. (4) As frequently happens, there are two or more innermost loops. In this case the most lateral loop is taken as the core. (5) In the hallucal B and C patterns the most proximal loop is the core. (6) No count is made on ordinary, seam or central pocket whorls. (7) The twin loop and lateral pocket varieties of the hallucal whorls have two cores. The count is taken of the most lateral or proximal core as conditions may indicate. If it is impossible to determine which of the cores is most lateral, the count is taken of the proximal one. (8) The proximal end of the plantar whorl core is the only one counted. (9) All counts of nine or over are recorded as nine.

In the prints under discussion we find that the hallucal patterns are $\frac{A}{W}$. The A pattern has a ridge count of 6, but an ordinary whorl cannot be counted. The third division is, therefore, $\frac{6}{0}$ and the formula so far is $\frac{23\ A\ 6}{10\ W\ 0}$.

The *Fourth, Fifth, Sixth and Seventh Divisions* are computed in the same manner as the third. If counts are taken of the remaining patterns, we have $\frac{23\ A\ 60240.}{10\ W\ 08003}$ The third, fourth, fifth, sixth and seventh divisions have a total of 100,000 possibilities.

Eighth Division—The hallucal whorls "wind up" either in a clockwise (c) or a counter-clockwise (cc) manner. This condition is indicated by small letters. The hallucal whorl on the left foot "winds up" counter-clockwise and the complete formula is written $\frac{23\ A\ 60240.}{10\ W\ 08003cc.}$ The eighth division offers 9 combinations.

Ninth Division—This deals with the type of hallucal whorls other than the ordinary whorl. The ordinary whorl is not mentioned but should a seam (sm), central pocket (cp), lateral pocket (lp), or a twin loop (tl) be found, the appropriate symbols are placed after the eighth division. There are 25 subdivisions possible here.

By multiplying together the number of combinations offered by each of the divisions, it is found that the file may be subdivided into 576 billion compartments, enough for ordinary purposes.

When one comes to file the prints it will be found more convenient to place the print with the smallest number nearest the front of the file drawer and the larger behind it. The numerator is considered before the denominator, and the various divisions in order.

In order to test out this method of classification a file was made containing the prints of two thousand individuals and it was found that 1816 compartments contained prints. There was one pair of prints in 1763 compartments, two in twenty-seven, three in thirteen, four in five, five in three, six in two, eight in one, eleven in one, and twenty-seven in one. The simple patterns AOOOO, WOOOO, AOUOO and WOUOO are very difficult to subdivide and pile up very quickly. Also, they are the most common patterns.

As space does not permit a detailed discussion of the various patterns on the sole of the foot, the reader is referred to writings

on the subject by Cummins, Wilder, and Montgomery, should he desire further information.

Comment

The subject of personal identification is not only a very interesting one, but one of vital importance. It finds a place in civil as well as criminal matters. Who has not, at one time or another, been requested to prove his identity beyond doubt? Features and appearance can be altered, signatures and credentials forged, but friction-ridge patterns remain unchanged throughout life. The classification of finger-prints is well developed and firmly established. Little attention, however, has been paid to foot-prints until recent years. Foot-prints are taken of new-born babies because it is easier to secure them than finger-prints. The ideal thing would be to take foot-prints of each child at birth and file them with the birth certificate or in a central office against a future need.

The classification outlined above has been tried out in a file of two thousand and found to be very serviceable, but a very large collection may need further subdivisions. These may be added as required. It is especially useful in a small file because as much or little of the formula can be used as is necessary to keep the compartments from overcrowding.

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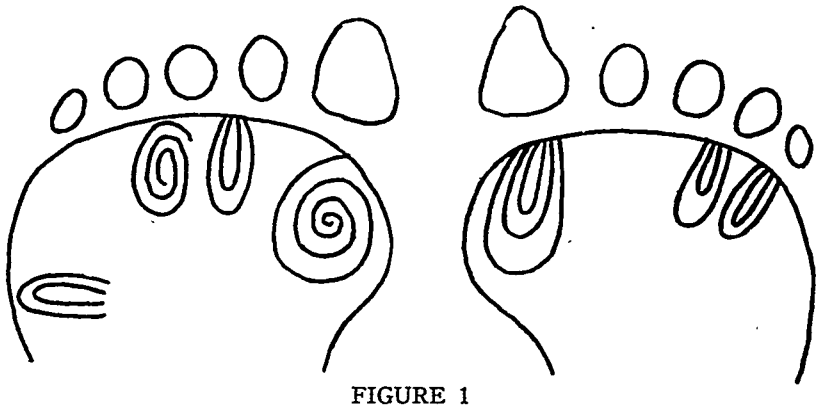

FIGURE 1

A diagrammatic representation of a pair of prints. Formula $\frac{23\ A\ 6C240}{10\ W\ 08003\ cc}$ Derivation of the formula is explained in the text.

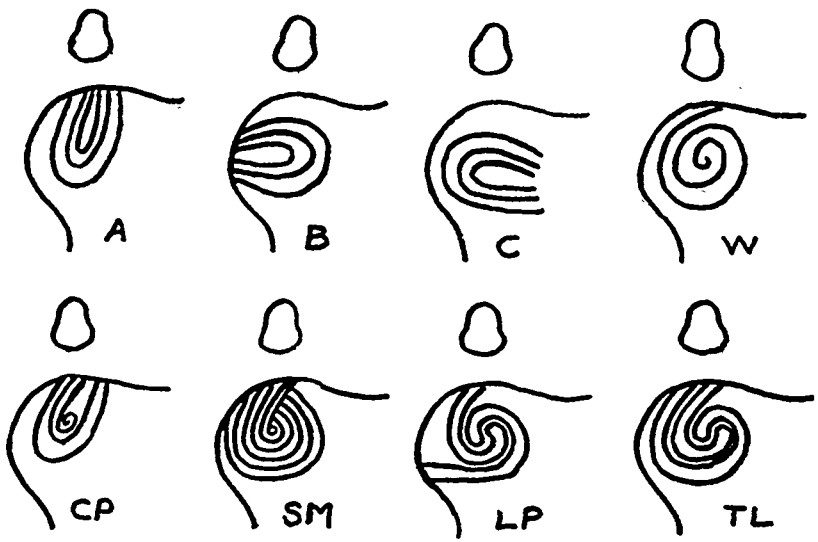

FIGURE 2

Hallucal area patterns. The open field, or no pattern, is not shown.

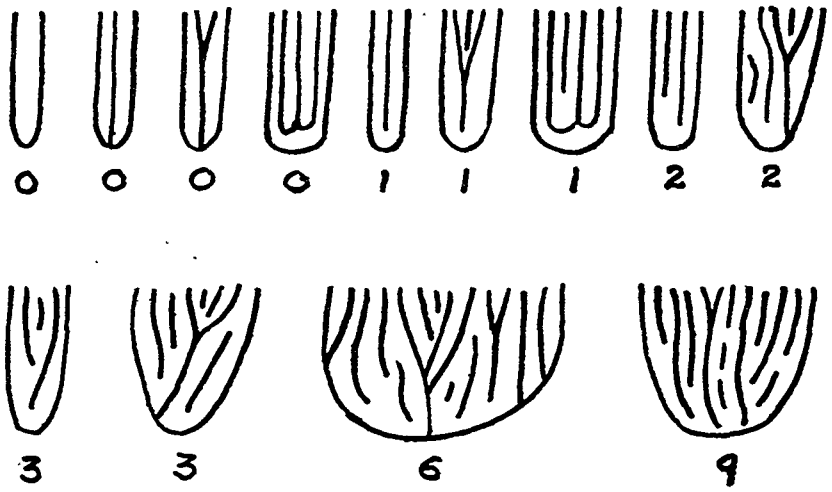

FIGURE 3

Illustrations of various ridge counts at the cores of the patterns. The numerals in each case indicate the count given.

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