

A
**Manual of Practical
Dactylography.**

BY
DR. HENRY FAULDS, F.R.Anthrop.I., etc.

**A Work for the Use of Students of the
Finger-print Method of Identification.**

Price - 2/- (Stiff Paper Cover) ; 5/- (Cloth).

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2004



DR. HENRY FAULDS, F.R.Anthrop Ins., etc.

“The person who wrote the first article on the use of finger-prints, and who forecasted the social usefulness, protection and industrial efficiency of their application.”

—Mr. A. J. RENOR, Pres. of International Assoc. of Ident.;
Supt. Bureau of Identification, Kansas, U.S.A.



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MANUAL OF PRACTICAL DACTYLOGRAPHY.

CHAPTER I.

What is Dactylography?—Includes prints of toes and feet—Its many utilities—Mirror image or Verso—Dactylite—Footprint clues noted in Early Times—Development of the human hand—Its aspects and adaptability—Supernumerary fingers or toes.

Dactylography is the scientific laying out of what is known about the patterns in the skin ridges or furrows of fingers and toes, and showing what practical application can be made of such knowledge for social purposes, such as personal identification, heredity, racial relationship, and the like.

The Greek word *daktylos*, from which the name is borrowed, can be taken to mean either a finger or a toe, and toes were described by that gifted people the Greeks as "fingers of the feet."

To the English Police Officer the study of toe-prints may, perhaps, not appeal strongly as likely to give much promise of usefulness in detection work, for nearly all of our people wear boots or shoes when going about their ordinary occupations, but in some parts of Ireland, and in warm climates generally, bare feet are quite usual at all times. Recognition, therefore, by foot-prints is quite a frequent occurrence in many countries where *Dactylography* is now studied.

Its Use for Civil Purposes.

But it must also be remembered that the detection of criminals is not the only function of our science. It is now coming yearly more and more to perform a most important service in the identification of dead bodies, in personal recognition for many civil purposes, such as registration of aliens, signing bank cheques, circular letters of credit, passports, and, quite recently, for the identification of infants in orphanages and the like, from early life onwards. It is in general use now in the U.S. Army and Navy, and of necessity a large number of trained experts are required to carry out its application on so large a scale.

Dactylography means strictly the study of *imprints* of skin patterns in fingers and toes, whereas *Dactyloscopy*, which is employed chiefly on the Continent and in South America, applies rather to the *direct inspection* of the patterns in fingers and toes themselves. The two terms are beginning, however, to be used interchangeably, as meaning a scientific examination of the imprints. It should be noticed, however, at the very threshold of one's study of this subject that much confusion still exists in untrained minds, and has even been found to affect the opinion of a judge, in that one sees the pattern of a finger tip as it is "orientated" or located in nature, when inspecting a finger directly, whereas you see its reverse or "mirror-image" when you look at the same pattern imprinted on paper. Such a mirror-pattern might con-

veniently be termed a *verso*, a technical term used for a coin when shown in reversed form, as in a plaster cast. Thus, a loop-like pattern, sloping to the right in the real finger itself, will be found to slope to the left in its corresponding *verso*.

A dactylograph means an imprint of fingers or toes, or of a single finger or toe, if it can be seen to be clearly of that nature and origin. If it merely seems to be somewhat *like* one, it should be described as a dactyloid "smudge" without prejudice in the case. As we shall afterwards find, such accidental smears of blood, etc., though looking like finger-prints, have often not had that origin at all.

Sometimes in important Police cases, impressions of fingers have been made on some soft or plastic material, such as clay, hot sealing-wax, putty, beeswax, soap, paraffin, pitch, varnish, and the like. Geologists have a useful terminal—*lite*, which might be used with profit in our science. Some years ago I suggested the word *dactylite* to express such an indented impression made by a finger or toe, by a hand or foot, on some soft substance. Thus, "The dactylite found on the piece of putty exhibited, exactly corresponds with the pattern of the suspect's right index finger."

Foot-print Clues in Early Times.

The Romans used the Latin word *vestigium* or *vestige* for a hand- or foot-print, having the value of a clue, or track, or spoor. Great attention, we may be sure, was paid in early times, as among savage tribes to-day, to note and estimate the value of these foot-print clues. What did they mean to the hunter or military scout? Were they the tracks of men, and what kind of men, and how equipped, and how numerous? Were they the tracks of beasts of prey or of objects of the chase? Had they been moving quickly, and how quickly? What length of stride had they? Did their pace show signs of fatigue or freshness? What were their numbers, and of what particular breed or variety?

All these points, the primitive man, hunter or warrior, like his savage successors now, noted with great ingenuity and precision, deducing most useful practical conclusions for their own food or safety, with exceeding swiftness and finality.

Before going into particulars as to the ridges and furrows of the skin which form the patterns on which such stress is now laid, let us first take a general view of the human hand itself, on which, indeed, volumes might be written. I can only offer here just a few observations as to how that marvellous organ or tool came to be. It seems to have had a long and most interesting history, if we follow its apparent evolution from lowly organisms.

In a Twentieth Century manual, *Dactylography* (published by Milner and Co., in 1912, and now out of print), I wrote (p. 49) :—

"Fortunately, the day has long passed away when it can be considered irreverent to enquire modestly as to who were one's ancestors. In a very true biological sense every human individual is known to have run through a scale of existence, beginning from the lowest mon-cellular organism, through something like a tadpole or salamander, into a vertebrate and mammal type, not easily to be discriminated from the undeveloped young of rat, or pig, or monkey. Now, if he is not in any way individually degraded by this actually demonstrable course of development, why should he be thought racially degraded by an honest scientific effort to trace the origin of his species from lowly animal ancestry? The process may be slower, but is no less determined by divinely appointed law. Our grandfathers believed that the Creator breathed into the organised and shapely form of Adam (= 'a man') a portion of the Divine spirit, by which he became a living soul, and



Impression of Right Hand of Young Gorilla, "Chloe," from the Zoological Gardens, London.

forthwith took his dignified place in nature. To me, the old story, when re-told in more modern and exact phrase, leads us to an entirely hopeful and inspiring conception of the origin and evolutionary destiny of our race."

Beginning, then, when our very early progenitors, like fishes, had inherited at least a backbone, and were entitled to the dignity of being called vertebrates, certain of their fins came at length to be arranged in symmetrical pairs, forming limbs something analogous to ours. Some fishes now can even crawl out of the water and creep about a little on land. Then there were shark-like fishes which began to have five-fingered fins, like the amphibians, frogs and lizards. Birds were probably at first something like lizards. Compare the scaly claws of each species which so resemble each other. But it is with the mammals that we, as human beings, are now concerned.

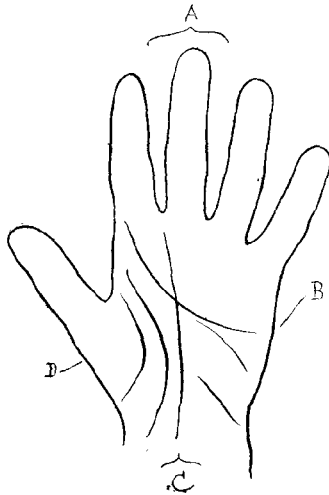


FIG. 1.—OUTLINE OF HAND (PALMAR SURFACE.)

A.—Distal end. B.—Ulnar side. C.—Proximal end.
D.—Radial side.

The Development of the Human Hand.

Our most primitive ancestors of this type seem to have been small gnawing creatures like rats, perhaps squirrel-like animals which fear of carnivorous enemies drove to the trees for refuge and for food. Their paws were useful not only for climbing out of danger, but with them they could clasp deftly objects of all kinds and shapes and tear off nuts and other fruits. Examine the pale hairless little human-like fingers of young rats!

Then came first lemuroids, little half squirrel, half monkey-like animals that live in trees. Then succeeded the lemurs still to be found in Madagascar, and which are very like monkeys. When you examine their hands and feet you find them patterned over with the skin ridges and furrows which are now to interest us. They resemble ours considerably, but are not so elaborate as those in the higher *anthropoids* (man-like

apes), the gorilla, orang, and chimpanzee. The hands of some individuals of these are really not to be distinguished from human skin patterns.

An adaptable hand for all kinds of grasping and touching, an expanding brain, and a flexible voice are the signs and implements of a developing social construction. The sense of touch in man and the higher mammals is finely intertwined with the power of varied and discriminative hold, pressing, and rubbing. In 1912 I wrote:—"The rugae in apes and men seem clearly to have served a most useful purpose in aiding the firm grasp of hands or feet, a very vital point in creatures living an arboreal life, as they and their racial predecessors are now presumed to have done. In that case, however, would not one pattern, a simple one, have done as well as any other? Here, then, great balancing principles of variation and heredity come into operation. The variety of patterns is immense, and for aught we know new ones may be being evolved at the present time." To this point we shall soon come and deal fully with the question of those distinguishing patterns. Before, however, taking up that intricate question, let us note the general outlines and characters of hands as a whole, and of fingers, joints, knuckles, and wrists. First of all observe, by trying all ways, what a variety of complex positions and motions can be got out of this organ for all kinds of mechanical work, such as playing musical instruments, writing with pen, or painting with pencil.

Then observe the creases on which palmistry lays such stress as fateful to their possessors. These folds, of course, have no such absurd relation to one's future career, but are simply due to such mechanical conditions as govern the creasing of well-worn pants or kid gloves. Still, a careful observation of those folds might turn out to be useful for recognition and ought not to be entirely ignored.

Outline Drawing of Hand.

The student of dactylography should at this stage practice making outlines of hands and fingers before proceeding to a minute study of ridges and furrows, and the intricate patterns they form. Any kind of cheap paper will do for early attempts, and even a good large school slate is very useful for the purpose, but does not retain the drawings. Get a friend or comrade, or some member of the family, to yield their hands for this purpose. The study will prove most fascinating, and, I am sure, will lead to some useful results in your experience. Begin with a slate. It is well to make the slate pencil you mean to use as slender as possible, so as to get it between the fingers properly and secure a good, true outline. A slim lead pencil, such as are inserted in pocket diaries, is useful in this way. Any pencil used should be held upright throughout or the outline will not be so true. You may, after a little experience, use aniline copying paper, tracing with the aid of a knitting-needle made somewhat smooth at the point. You may test your skill and accuracy from time to time by repeating your drawing with transparent tracing paper. Then place that outline above the previous one you have made and observe wherein they differ. Slight differences are sure to reveal themselves even when the tracings are done by a careful expert well trained to the work. After you have achieved the making of a small collection of such outlines, begin to note, for example, the fine tapering fingers of some people, the stubby, broad ends of others. Some are almost club-shaped, expanding at the tip, while others are lumpy or swelled at each joint from so-called gout or rheumatism. All such points may tend to help in a recognition, and, I think, should not be so severely ignored as they generally are by the official mind at the present day. They may not, perhaps, be deemed strong evidence, yet a person who was otherwise well disguised might very easily reveal

himself or herself, accidentally, by the unconscious display of fingers or hands.

After the outline has been made, the main creases of the palms might be inserted in the drawing.

In describing a hand, note the two sides or margins; that whence the thumb springs is called the "radial" side, from the revolving bone of the fore-arm lying on that side, and named the *radius*. The other, or outside, is named the "ulnar," from the *ulna* or main bone of the fore-arm which forms the chief hinge of the elbow.

Then the fingers come to be named in relation to the side of the body they belong to, right or left; thus, right thumb, index (fore-finger), mid finger, ring finger, little finger; and so with the left hand.

We speak of direction in relation to the body as *distal*, tending away from the trunk or wrist; or *proximal*, as lying next to it. In describing a body found with signs of injury, we might describe its condition by saying the distal end of the hand was crushed out of shape, but the proximal end was quite entire and uninjured. Or, again, we might report that a deep wound was seen beginning at the radial end of the palm and tailing off gradually towards the ulnar edge of the hand. Again, note those two terms as descriptive of the surfaces of the hand, *Dorsal* and *Palmar*. The first is descriptive of the back, and the second of the front surface.

Before we leave the consideration of the hand generally, one or two peculiarities which occur now and again may here be mentioned.

Sometimes two or more fingers are wholly or partly joined together, or merely webbed like a duck's foot. One may even come across a family now and again where son or daughter repeats the peculiarity in the same part of the same parental hand. This curious condition may also be found affecting the toes.

Similarly, extra or "supernumerary" fingers or toes are to be found, and even if they have been carefully removed by a surgeon the scar which remains may be sufficient to betray the original disfigurement. An extra little bud on the little finger is not very uncommon in infants, but nowadays such excrescences are generally removed before the child grows up. We read in Numbers (xiii. 32, 33): "All the people that we saw in it are men of a great stature. And there we saw the giants, the sons of Anak, which come of the giants." Dr. Porter, who explored the region thus referred to, has described what he saw, and has figured the roomy dwellings of that giant race in his work, *The Giant Cities of Bashan*. It is said that some of the present natives of the district are descendants of that old race of giants in Canaan of the time of Joshua. A writer, whom he quotes (Schofield), states that in the Lebanon Hospital, "I have seen one of the 'sons of Anak' with the twenty-four fingers and toes, and giant stature, that still distinguishes the once hybrid race; at any rate, in the belief of the people."

CHAPTER II.

Structure of human skin—Cuticle or Epidermis—Cutis or Derma (true skin)—Sweat glands and their secretion—Ridges and furrows—Sweat—Coloured sweat—Pores.

In the rapid survey of man's rise from a lowly animal stock which appeared in the previous chapter, nothing was said about the great fact that man is now not what might be called a hairy animal, although several parts of his body retain a hairy covering.

Great interest among naturalists attaches to the general direction of hairs in the arms, etc., of man, a condition which is taken to imply

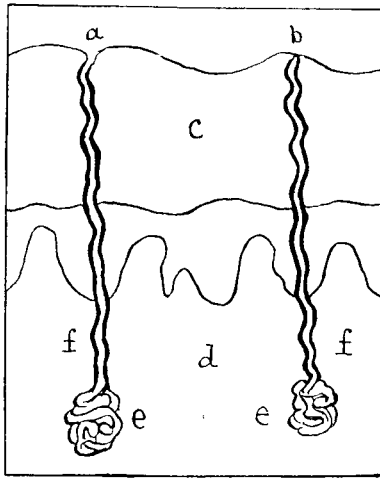


FIG. 2.—SECTION OF SKIN.

- (a) *Open pore.* (b) *Closed pore.* (c) *Epidermis or Cuticle*
(d) *Dermis or True Skin.* (e) *Sweat glands.* (f) *Sweat ducts.*

a previous early tendency, as in monkeys, to cling suspended to branches or to the nursing mother. The instinctive clinging strength of a newly-born human baby is very wonderful, as I have often in the practice of my profession had opportunities of testing.

Man must have begun to lose his furry covering at a very early period in his long ancestral history, and the proportion now remaining varies much in the different varieties of mankind. Compare, for example, the almost hairless face of the Chinaman with his near neighbour, the hairy Ainu of Japan. Some think that our civilised peoples are rapidly losing both hair and teeth, and that the loss is likely to accelerate.

The loss of hair is not, however, the only change which seems to

have taken place. As compared with the great anthropoid apes, the gorilla, chimpanzee, and orang, the skin of man is much more liberally supplied with sweat glands, into the use of which we shall now enquire.

The Sweat Glands.

Our earliest ancestors are supposed by many naturalists to have lived chiefly on or near the sea-shore. Then the sweat glands carried off much internal heat caused by the sun, and the race which adopted this method of foiling the assaults of that luminary survived where the average monkey most readily succumbed. When a body with a hairy covering becomes wet it is apt to fare very badly in the wind, the great and rapid evaporation chilling the internal organs, with serious results. A naked, hairless body dries more quickly, and is not readily so much injured, if at all.

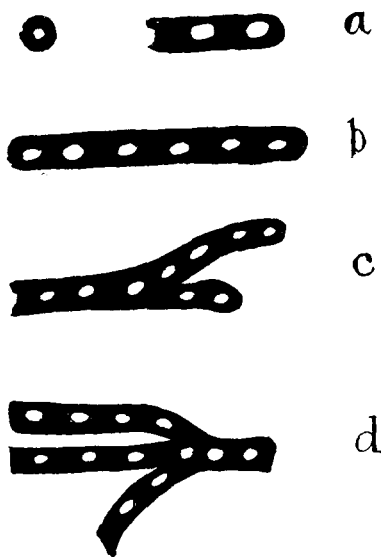


FIG. 3.—RIDGES AND PORES.

(a) Islands. (b) Ridge. (c) Fork or spur. (d) Junctions.

It is pointed out that the elephant and the mastodon show a similar relationship, in regard to their dermal covering. The great extinct mastodon, shaped like a monstrous elephant with enormous tusks, is familiar to us from specimens preserved in ice accidentally in Siberia, and from pictures left by its contemporary man of the cave dwellings. It was a hairy animal, with a long and shaggy covering, whereas its modern relative the elephant is practically, like ourselves, hairless.

The palmar surface of a human hand is furrowed nearly all over with little ridges, on the crests of which tiny openings occur, varying in shape and size, but permanently fixed in situation. These are mouths or outlets of certain fine tubes or ducts which lead downward through the surface skin or *cuticle* to the deeper leathery skin or *dermis* to numerous little sweat glands which extract the perspiration from the blood. Probably each sweat gland may at first have had its own

separate portion of ridge or furrow standing apart from the others. Such isolated pores are still of frequent enough occurrence and are called "islands." Generally, however, they run in ridges on which many pores are seen to open. Those pores vary from time to time, opening or closing, as sweat is being exuded or not. There are supposed to be some two or three millions of them in a human body, yielding an evaporating surface of about eight square inches, as has been calculated.

Mons. Edmond Locard, of Lyons, lays great stress for purposes of identification on these pores, which, he says, are not modified by age, use, or disease. They differ, he states, one from another in their dimensions relative to the crest of their own ridges, and in the numbers which occur in a given measured portion of a ridge.

If only a very small imprint or portion of skin is available for comparison with that of a suspect, the arrangement, number, size, shape, and so on, of the pores might give good evidence for identification.



*Fingerprint, with Enlargement showing Pores,
like a Railway map with Stations.*

A better method for obtaining a good view of pores, enlarged photographically, as compared with those obtained by printer's ink, is to use the special photograph paper recommended by Mr. Dunton White. This yields great clearness and precision of detail, without clogging. In Wilder and Wentworth's valuable work, *Personal Identification*, it is stated (p. 295): "We have in the sweat pores, with their great individual differences, and their persistence throughout life, an invaluable series of individual features, which can be employed to advantage in cases where the record is too incomplete to show a definite pattern, or too fragmentary to make out even the ridge details with certainty. As compared with one case where definite finger patterns are left upon the premises, there are dozens where only the marks of a few ridges can be obtained, and these often of other parts of the hand than the finger

bulbs. Such fragments may be often identified by poroscopy, if we have for comparison the prints of the corresponding parts of the hands of suspected persons." Certain parts of the hand are more apt than others to come into contact with objects being handled, and a close search for such imprints may often yield results of value even when the imprinted area is exceedingly small. A careful scrutiny of the part of the suspect's hand likely to have been used may reveal identical groups of pores.

A few sentences may now be devoted to the sweat which is exuded from the pores. It is a watery fluid containing salt, which in tropical climes, when dried by the sun, may be seen glistening like hoar-frost on the backs of coolies. When travelling behind two jinrikisha men in Japan this curious sight was often observed by me. The sweat as a rule does not contain any oily or greasy substance, but recent observations show that some such element enters the pores from without sometimes and disconcerts the surgeon in his effort to keep out poisonous infection from his wounds after operation. The natural oiliness of all human skin comes from a different set of glands called sebaceous. In the hand, while the sweat pores occupy the palmar surface, chiefly the sebaceous glands occur mostly on the dorsal surface. A good reason exists, for the sweat helps the palms to grip a tool or other object, while greasiness would make it slip. A labourer almost instinctively spits on his loof when he lays hold of a spade or pick-axe. He would never dream of smearing it with grease. The natural oiliness of the human skin, although very slight, we shall find to be of great importance to criminal investigation, as a man often leaves invisible traces of his tell-tale fingers which can be made to reveal their patterns by methods presently to be described. A curious matter in connection with this portion of our subject is the occurrence, now and again, of

Coloured Sweat.

In my *Guide to Finger Print Identification* (p. 65) I have alluded to this subject called *chromidrosis* thus: "A blackish ooze takes place in some hysterical cases. More striking is the class of cases in which the colouring matter is derived, like the bright colours in the plumage of parrots, from copper, and in some cases from iron. Workers in copper have been found subject to it. The sweat is generally of a bluish colour in those cases. Red sweat has been observed in lock-jaw.

"A kind of saffron colour I have found to be not very uncommon in some classes of malarious cases. One lady I attended had an extraordinary temperature during some of the attacks, the thermometer recording 110 degrees Fahrenheit. With a temperature of about 104 degrees Fahrenheit she did not seem to be really unwell. I took good impressions at one of those times with the yellow-coloured sweat. Ordinarily, however, sweat does not help, but hinder, impressions from being made. A case of blue sweat came under my treatment quite recently. There was no history of copper poisoning."

CHAPTER III.

Origin of ridges—Herbert Spencer's view—Patterns in fingerprints—Purkinje and his classification of patterns—Some patterns alike when reversed or inverted.

Just after I had laid my plans for using finger prints for identification before the leading authorities, scientific and legal, Mr. Herbert Spencer interested himself in the theoretical aspects of the matter, and in a luminous paper on the Factors of Organic Evolution he tried to explain the natural origin of the ridges in a passage which I quote below. The article appeared in the May number of *The Nineteenth Century* for 1886.

Mr. Spencer says:—"Continuous pressure on any portions of the surface causes absorption, while intermittent pressure causes growth; the one impeding circulation and the passage of plasma from the capillaries into the tissues, and the other aiding both. There are yet further mechanically produced effects. That the general character of the ribbed skin on the under-surfaces of the feet and inside of the hands is directly due to friction and intermittent pressure, we have the proofs: first, that the tracts most exposed to rough usage are the most ribbed; second, that the insides of hands subject to unusual amounts of rough usage, as those of sailors, are strongly ribbed all over; and third, that in hands which are very little used the parts commonly ribbed become quite smooth."

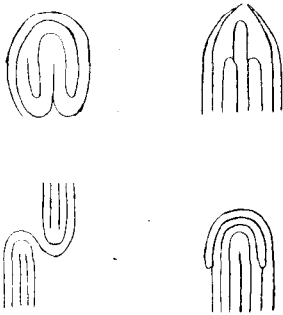


FIG. 4.—DESIGN-LIKE PATTERNS.

It may be urged against this explanation, what any practical officer dealing with finger prints in every-day life must have observed, that constant or very frequent friction, or the application of great heat, as in handling hot metal plates in certain trades, abrades or flattens and almost wipes out the patterns. I have observed this quite frequently in the hands of domestic servants. But it must be admitted, I think, on the other hand, that after a slight period of cessation from that particular employment, the original pattern of the ridges would come up again in full detail with all its original qualities.

Another problem arises, however, which is not so easily solved. The application of intermittent pressure and the like, may very well help to account for the ridged and furrowed surface of palmar aspect of hand and the soles of the feet, but why should those lines run into patterns, often of much complexity, and sometimes even assuming the aspect of curiously complex artistic designs?

Then, again, why do similar patterns naturally occur under all sorts of dissimilar conditions? You meet them in the stripes of the tiger and of the zebra, in the spots of the leopard and of the ocelot, and on the eggs of many birds. Sometimes it may be alleged that they serve a

protective purpose of making the animal resemble its environment, as the tiger lurking in the tall grasses of the jungle, or the leopard crouched amid the shadowy foliage of a tree, while the mother bird had been supposed to recognise its own brood by the marking on the outside of the egg shell. Yet there are similar markings in the grain of woods, in the veining of leaves, and in the spots and stripes of flowers. The barks of some trees often display the very patterns that are so useful and interesting in finger prints. You see similar figures on the skins of scarlet-runner beans and on the backs of mackerel. So with sand under the sway of tidal waters, the ripples of which seem to repeat themselves in the ridges of the sand, as we find, too, in the desert under the sweep of arid winds; or powdery snow on a frozen lake under a dry East wind. Photography shows furrows exactly like those of finger prints in the overflowing lava of a volcano.

Now, as the Chinaman from early days has put studs in the clumsy wheels of his ox-cart to keep them from skidding, our civilised moderns groove and furrow the india-rubber tyres of their motors in all sorts of fantastic patterns with the same motive, and with one result, that such a motor can be traced for miles through a most intricate path by the pattern *vestiges* of its wheels.

Purkinje (1787-1869) was practically the first to notice those forms in the ridges of the fingers, and he projected a rough classification of them. When I first began to write on the subject I knew nothing of his little Latin college thesis, of which very few copies only were likely to have been printed, and only three are now known to be in existence. But although I had neither seen nor heard of it, I was particularly familiar with the fine work he had done in relation to the nerves of touch occurring in the fingers chiefly, and I suggested to several scientific authorities the desirability of a search among his *unpublished* papers. At length, to the surprise even of his best admirers and disciples, the work above alluded to was found. It contains not, however, the remotest hint or suggestion for utilising the existence of those patterns for the purpose of personal identification. He classifies the different forms occurring in this way:—

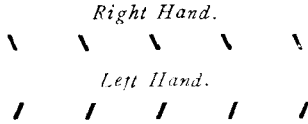
1. *Transverse curve.*
2. *Central longitudinal stripe.*
3. *Oblique stripe.*
4. *Oblique loop.*
5. *Almond shape.*
6. *Spiral.*
7. *Ellipse.*
8. *Circle.*
9. *Duplicate whorl.*

Special attention need not now be given to this classification, as practical needs have developed more scientific methods of grasping an immense number of diverse patterns under classes or groups which can be readily overhauled when attention requires to be given to them.

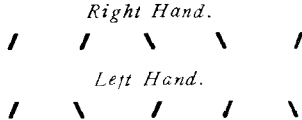
The type of patterns we are looking for occur chiefly in the last joints of the fingers on the palmar surface, but others very similar occur in several other parts of the palm itself. They are not concerned in the usual official records of finger prints, but one or more might spring into importance in a particular case if they were thought or suspected to be mistaken for particular finger prints on the register of some noted criminal, which, especially if dimly printed, they might happen to resemble.

In many cases both sets of fingers when printed show patterns similarly sloping, upwards to the left in the right hand fingers and upwards to the right in the left hand fingers, showing mirror pattern agreement.

Again, it is perhaps much more common to find the slope vary from finger to finger. The normal arrangement, as printed, may be crudely shown, in a diagram, thus:—



Irregularities of all kinds occur, as thus:—



Sir Francis Galton, who took up the subject of finger prints, after I had brought the method of identification by that means under the notice of Scotland Yard, in mentioning the effect of simple reversal of patterns by lithography, photography, and the like, makes a useful remark which has a wider application in our present studies. He says in his *Finger Prints* (p. 71-2):—"It is worth recollecting that there are twelve capital letters in the English alphabet which, if printed in block type, are unaffected by being reversed. They are:—

A, H, I, M, O, T, U, V, W, X, Y, Z.

[A correspondent has pointed out that the letter Z is incorrectly included in Sir F. Galton's list of letters quoted in this chapter. The quotation was correct.]

Some symbols do the same, such as:—

* + - = : .

These, and the letters **H, O, I, X**, have the further peculiarity of appearing unaltered when upside down."

We shall see the importance of this when we come to examine the syllabic system of classification, which I made to rest on the fact that some finger print patterns had been found by me to possess this very peculiarity, a fact of great practical importance when you are called upon, if possible, to identify a single finger smudge with a given record.

Before glancing at some of the more intricate patterns which may come before us in the course of our studies, let us first note a few points of practical importance about the elements which go to compose them.

It is a great mistake to conceive of such lines as being anything like mathematical lines in their purely ideal perfection, perfectly straight, having length without breadth, and so on. They have thickness and have not all the same thickness, nor can we depend on any one line retaining the same thickness throughout its course. In addition, it must be remembered that in printing from the living flesh and blood fingers of a human being, the breadth of the ridges will widen out under increased pressure, while the width of the corresponding furrows will tend to become less.

Dots occur, quite simple dots, and are called islands, as we have seen. A dot may be lengthened into a line, and these lines may be straight or curved, may run into loops or bend into bows or arches, or yield outlines like tents or deltas or circles or spirals.

CHAPTER IV.

Recognition or identification by various means—By bodily features—Personal peculiarities—Deformities or diseases—Mannerisms—Tattoo marks—Photographs not quite reliable.

In a Report issued in 1894 on the best means available for identifying habitual criminals, we read:—

“As there are some criminals who ought never to be sent to prison, there are others who ought never to be released; and when this distinction is established and provided for by legislation, it will be of even greater importance than at present to have an exact record of each criminal's offences.”

Aids to Personal Recognition.

Now, the first step in this direction must surely be to make certain that the man or woman to whom the different offences are attributed is the same man or woman, however disguised by aliases.

Facial physiognomy is of great importance, and needs better systematizing in its study, of which more anon. Colour of hair, although easily altered, gives marks worthy of attention. A short time ago, while waiting for a train at Stoke-on-Trent Station, I counted 304 people passing me, of whom 53 had fair hair, 3 very fair, 123 brown, 123 dark brown or black, 2 red or auburn, and I found somewhat similar results at another time.

Bertillon examined 4,000 criminals, whose eyes were coloured thus:—

33.2 per cent., brown.
22.4 per cent., dark.
32.4 per cent., yellow or red.

Grey or blue do not seem to have been mentioned.

In examining eyes of ordinary (non-criminal) patients I have been surprised to find how many have the two eyes somewhat unlike in colour. A record of, say, right eyes only would thus be defective and misleading. Blue eyes at birth gradually change in many people to darker colours.

Gait is often very characteristic and not very easily disguised, especially if the observer is behind the person suspected.

Wily old Nadgett, in Dickens' *Martin Chuzzlewit*, says of the villain, Jonas Chuzzlewit: “I knew his walk and that it was himself disguised.” The late Sir Henry Irving could not easily transform his gait, which was very characteristic, and suited his great part of Mephistopheles, with his hoof-like stalk.

Peculiarities and Mannerisms.

Then, again, many persons have one or more striking peculiarities or mannerisms that are very difficult to efface or veil even by the cleverest disguise. Such are wens or tumours, mother's marks, tattooed designs, crooked legs, missing limbs, and other diversities or deformities. A wen or other tumour may, however, be so deftly removed by an experienced surgeon that little or no trace remains to show where it had once been. The lack of such evidence of the tumour itself or of

any scar that it might be expected to leave has been, indeed, from time to time, as records show, an effective bar to the recognition of the suspected person. Convicts who have been branded with a number have burned away the skin to get rid of the marks.

Scars of an extensive and deep nature, and especially on the face, often yield good evidence for identification. In Germany before the Great War the extensive prevalence of duelling led to an exaggerated vanity amongst students desirous of having such ornamental scars, and to a very specialised surgery, skilful in the remedy or amelioration of them when they were disliked. The Tichborne claimant (Orton) said the scars that had marked him had faded away.

The Bow Street runners, or Robin Redbreasts (who wore red waist-coats) were trained to the use of their eyes and faculties generally in remembering customers who had once passed through their hands.

An illustration to Dickens' account of Mr. Pickwick's adventures, by "Phiz" (Hablot K. Browne), gives a grimly humorous but luminous impression of official portrait painting in pre-Victorian days. The great explorer is sitting on a hard chair surrounded by an unsympathetic bevy of staring keen-eyed warders. It would not be easy to "look pleasant" in such circumstances.

We are told that Thomas Gainsborough, one of England's greatest portrait painters, when a boy once happened to see the face of a thief peeping over a garden wall. The young artist drew so accurate a portrait of the scamp that he was easily recognised and placed under arrest. There can be no reason why a young Police Officer should not cultivate any natural gift he may have in this direction. It might now and again be of the greatest practical service, not only in criminal cases, but in tracing persons who have disappeared, perhaps from loss of memory or the like.

In olden times it was an important function of a shepherd to be able to identify the individual sheep in a numerous flock, of a herdsman to know the faces of the cattle in his herd. Travellers tell us, too, that the ewe in Australia can easily recognise the plaint of its own little lamb amid the bleatings of an immense flock. This notion of personal, individual recognition has from early times played an important part in the working of our social mechanism.

Now, there is to be considered first, the general recognition of the individual as such, and then, the perception that even, if disguised, he is of another stock or cult. He may be a negro, a Chinaman, a Scotchman, a Jew, and he may be known as such by many little signs, such as colour of skin, frizzy hair, angular eyes, shape of boots or of hat, accent or brogue. Such means of recognition are of immense service during war to defeat or detect espionage, and in time of peace for the arrest of disguised offenders who may have been previously convicted and can be shown to be dangerous enemies to an orderly society.

A case is mentioned of a girl sold wrongfully as a slave, who was, after twenty years' slavery, identified by means of two small moles on the inner side of her left leg, and as a result she was freed.

Tattoo Marks.

All over the world, down from earliest times, the custom of tattooing has had a prominent place in human customs. Sometimes it seems to have been done to avert from its subject some mystic evil influence, often, perhaps, with a more general religious significance, sometimes from vanity as a method of personal adornment where clothes were parsimoniously used, and in Italy and elsewhere as a secret symbol or bond of fraternity among the enemies of orderly society. In our own country its employment seems to have degenerated into a rather frivolous and childish amusement of an ignorant class. But, whatever its origin or motive,

now, in the hands of the expert criminologist, it may serve a useful turn as an aid to personal recognition. I do not intend to enter on that tempting subject here, but I am quite sure that the elaborate and extensive designs to be found on the bodies of some Italians and on many people of the Far East could be made to yield infallible proofs of identity in certain circumstances.

The problem in medical jurisprudence of how effectively to identify old and dangerous criminals became more urgent as the coming of steam led to extensive and rapid migrations from one country to another, especially of the classes whose identity it was of the greatest importance to make sure. A curious ancient example of a son's prudent desire to secure identification of his father's body, should anything happen to him on a journey, is contained in an ancient papyrus, which records that the son wished to stamp a recognition mark on the body of his sire. It is mentioned in *The Classical Review* for November-December, 1920, p. 179.

Photographs Not Reliable.

Photographs were at first expected to be most valuable in this respect, but have proved in some respects rather disappointing. Indeed, they have often been found most treacherous and misleading. Even when taken and printed off perfectly from both a scientific and an artistic point of view, the human subject may be found not only to change like a chameleon, but to change with great rapidity, not only in figure, but in face, colour of hair, shape of nose, and especially in expression, and in the case of a clever criminal this latter is often greatly under voluntary control.

I once studied the face of a pretty, modest, young lady, who in a moment of disappointment or other emotion suddenly revealed in her face the living portrait of her old father, a Dutch professor of rather unattractive appearance, whom, at other times, she did not at all resemble.

One has only to look over an old family album, or to compare the portraits of celebrities done at intervals of time, to see that for judicial purposes the evidence of photographic portraits does not always yield good proof of personal identity. I do think, however, that better attention to the conditions of light, and so on, would yield better results than are usually obtained by the present official methods. Camera traps have sometimes been set for burglars, and afford brilliant material for the writer of detective stories.

CHAPTER V.

Some early notices of fingerprints and footprints—Recent references in general literature—Scrutinising footprints for clues—Odyssey seeking for Ajax—"Satyr" of Sophocles—Daniel the Prophet in "Beland and the Dragon"—A Chinese banknote.

We have seen that in the study of dactylography footprints as well as handprints are to be included, although in practice we have now more to do with bootprints than with the imprints of bare feet, and, indeed, a good deal of our industry might well be nowadays spent on the scrutinising of the patterned prints of *motor tyres*.



SCULPTURED STONE FROM
BRITTANY.

Now, significant footprints can be traced very far back in geological history—long before man appeared upon the earth.

The palæontologist, who gives himself to the study of the ancient life of our world, reads on dried slab of clay or shelf of crusted sand the vestigial traces of monstrous, lizard-like creatures, the tracks of birds' claws, scrawlings of beetles, and pads of small rat-like mammals. He can from these markings, which are often very clear and precise, like a Sherlock Holmes deduce some shrewd and valid conclusions as to what kind of creatures they were, how they lived, and in what kind of surroundings. And when man himself did actually come to stay he was not slow to notice these patterns in mud or sand. The Chinese even tell us that they first learned to make letters by noticing the imprints made by the feet of birds.

The fact that early peoples, like the savages of our own day, can often argue to sound conclusions as to the sources of footprints and as to the physical and other conditions of their living sources is vouched for by many excellent authorities. Just as an ancient shepherd knew his sheep by their faces and voices, the Arab of the desert is said to identify the footprints of his own camels and those of his intimate neighbours. An Australian traveller tells that on pointing out a suspicious footprint to a native he, after a swift glance, replied: "Him white fellow call tiger."

Modern Bushmen are said to make hand imprints on the walls of their caves at the present time. Professor Sollas, writing about the men of the old or rough age of stone weapons—the Palæolithic period—says: "Impressions of the human hand are met with painted in red in Altamira, but in other caves also in black, and sometimes uncoloured on a coloured ground. These seem to be older than any of the other markings"—*Science Progress*, April, 1909.

We hear a great deal now about ancient notions about fingerprints, but when my first communication was published nothing was known on the subject by the leading librarians and scientists in Europe and

America. Immediately afterwards, as Schlaginhaufen pointed out, there was a lava flow of literature on fingerprints.

In Sergi's valuable work on *The Mediterranean Race* occurs a curious figure, which by permission of Walter Scott Co., Ltd., we here reproduce. It occurred to me after I first published on the subject that the lineations might be reminiscent of fingerprints, although the learned author had not likely thought of it at the time he wrote.

In ancient India handprints, made in red and white sandal wood, were used on walls for decorative purposes, but I never saw any examples of them while living in India. I once attended a lecture by a learned expert on house decoration in India, who illustrated his theme with multitudes of interesting examples of all kinds, but he did not seem ever to have heard of handprints having been used there for such a purpose.

Much has been written about their use in China and Japan for purposes of identification, but while living there, and a member of the Japan Asiatic Society, and intimate with most of the archæologists there, I could never, after many diligent enquiries, discover any definite evidence of such a fact. I have asked for authentic examples before 1880, and have not yet obtained access to one.

When we come to our own times we find two methods of personal identification which came into notice close towards the end of last century: that of fingerprints and that of bodily measurements.

While the first of these methods has yearly gained in influence and efficiency, the latter has gradually receded from official favour as being unreliable. It has its uses, however, as a subordinate and accessory measure, and should not be overlooked by the student of Personal Identification.

Allusions to Print Marks in Literature.

Before explaining the claims and methods of the fingerprint method, let us glance at the statements made by careless or unlearned writers in the daily Press that the system has come down to us ready-made from a remote antiquity.

It is a very common thing for such writers to quote an obscure or ambiguous phrase translated from some ancient writer of eminence to show that a particular recent doctrine or discovery was known to antiquity. Thus, Aristotle seems to tell us that Democritus held that the earth turned around on its own axis, so as to cause day and night, while it also revolved around the sun, but it was very many centuries before this conception came to be proved and adopted as a scientific truth.

So with the early supposition that fire was motion, a doctrine which is now firmly established as scientific.

Frequent allusions occur throughout literature to thumbprints and fingermarks, and people now read into them a firmer meaning than probably they had at the time

Charles Dickens makes very frequent reference to such marks simply as defacement and dirt, and so with Thomas Hardy.

Pepys, in his Diary, says: "Before sermon I laughed at the reader who in his prayer desires of God that he would imprint His word on the thumbs of our right hands, and on the great toes of our right feet."

In Bulwer Lytton's novel, *The Caxtons*, says Mr. Squills, the apothecary: "Hands and tongue, sir, these are the instruments of progress." "Mr. Squills," said my father, nodding, "Anaxagoras said very much the same thing before you touching the hands."

Scrutinising Footprints for Clues.

A most fascinating example of the very ancient practice of scrutinising footprints for clues is contained in the story by Sophocles of the mad king Ajax slaughtering innocent cattle under the hallucination that they were human foes. Athena is introduced as telling the astute hero Odysseus how she had seen him prowling about dogging an unseen foe, scrutinising the newly-impressed footprints as with the keen scent of a Spartan hound. He is supposed to have been trying to deduce the direction of the steps.

The *Satyr* of Sophocles, recently brought to light by exploration, tells how Hermes is supposed to have stolen the cattle of Apollo, making them walk backward to the cave in which they were hid.



Impression taken from the Nose of a Cow (by favour of Mr. C. L. Enos, Superintendent, State Bureau of Criminal Identification, Canon City, Colorado, U.S.A. The Patterns are used for the identification of cattle as property, and have been serviceable.

In Virgil's account of the Harpies which persecuted Aeneas and his crew while escaping from the siege of Troy, he says: "They left their foul vestiges (= footprints) behind."

The outspread hand, with its five fingers, was used in Morocco to avert the evil eye, but as this was felt to be rude the expression "five in your eye" was substituted.

Dr. Ph. Vogel, of Leyden, has pointed out that the same method of averting the evil eye was used in India. Palm marks were made with blood, and when widowed women went to sacrifice themselves with their husband's corpse on the fiery pile they made marks on the gate of the palace with hands steeped in vermilion.

A good detective story based on the observation of footprints is contained in the apocryphal book *Bel and the Dragon*, believed to belong to the period of Darius or Xerxes—not of Cyrus as usually described. Cyrus the Persian, however, is said to have then been king and the prophet Daniel lived in honour with him. The Babylonians had an idol, Bel (or Baal), whose miraculous feeding was very costly, namely, every day twelve great measures of fine flour, forty sheep, and six firkins of wine. Daniel was no idolater, and the king resented his refusal of worship to a really living and national god, saying: "Seest thou not how much he eateth and drinketh every day?" Daniel told his wrathful majesty that he was being deceived, and that Bel was but an image of brass and clay which could not eat or drink anything. The king's ire was great, and he told the priests that if they did not explain matters clearly they should have to die, and that, on the other hand, if they could show that Bel himself did really consume these provisions Daniel should die as a blasphemer of the national god.

Daniel then, the story goes, challenged the king to the test, asking to have the temple floor strewed with ashes, to set the table with full fare as usual, and to shut and bolt the door, sealing it with his royal signet. This was duly done. The priests, however, had contrived a secret entrance to the room under the great table, which fact was known to Daniel. At night, then, the seventy ecclesiastics, with their hungry wives and children, crept in by the concealed passage and soon cleared the table. Next morning Daniel pointed triumphantly to the display of betraying footsteps of priests and people. There was anger on the king's part and a general slaughter of the idolaters.

In my first communication on the subject of fingerprints (*Nature*, October 28th, 1880) I had said: "I have heard since coming to these general conclusions by original and patient experiment that the Chinese criminals from early times have been made to give the impressions of their fingers, just as we make ours yield their photographs. I have not yet, however, succeeded in getting any precise or authenticated fact on that point." Since that time I have made many strenuous efforts to gain accurate information on the subject, and especially to have dates authenticated. A Chinese banknote, supposed to go back a good while, was printed by the late Sir William J. Herschel. Its date is stated, however, in the title to the plate, as 1808. I sent it to be examined by experts at the British Museum, who stated conclusively that the note itself contains no date. I shall be glad to return to these alleged Far Eastern cases of a careful use of the system in criminal identification, but it is too complicated to enter upon more fully in these pages.

CHAPTER VI.

Origin of identification by fingerprints—Mons. Bertillon's anthropometric method—Sir William Herschel's fallacious claim—Syllabic classification of fingerprints—Effect of mutations in classification methods.

We have seen how in the last decade or two of the previous century a stage had been reached in the development of legal recognition, when some new and more powerful methods must be devised to secure trustworthy evidence for legal identification. Two systems sprang into existence pretty closely together: the English system of fingerprints and the French system of bodily measurements.

The latter method, although later in public announcement, first came into use, namely, in France, in 1883. It is not necessary to discuss it here, but I may just quote from Sir Edward Henry's work on *Fingerprints*, the report of General Strahan, R.E., Surveyor-General of India, and Mr. A. Pedler, F.R.S., for some years head of the Bengal Meteorological Department.

They inquired, in 1897, into both those systems, and their opinion is stated briefly here: "In conclusion, we are of opinion that the method of identification by means of fingerprints, as worked on the system of recording impressions and of classification used in Bengal, may be safely adopted as being superior to the anthropomorphic method*—(1) in simplicity of working; (2) in the cost of apparatus; (3) in the fact that all skilled work is transferred to a central or classification office; (4) in the rapidity with which the process can be worked; and (5) in the certainty of the results."

Confusion With the "Bertillon" System.

When the fingerprint method was first adopted by the English Government it was so clumsily blended with the French system that even now British Pressmen—usually well-informed—glibly write of the wonderful Bertillon method of thumbprints!

A high official of the U.S. Police once sent me a cutting from the *New York Times* of August 2nd, 1914, which contains what the writer no doubt believed was an impartial account of the origin of the system. Here it is: "LONDON, July 25th.—The method of identifying criminals by means of their fingerprints has long been associated with the name of the late M. Bertillon, Chief of the Identification Bureau of the Paris Prefecture of Police. It would seem, however, according to a book written by Sir Edward Henry, the Head of the London Municipal Police, that this system was discovered in India, where the natives make their autographs that way, by Sir Francis Galton, developed by him, and then perfected by the author himself." The article from which this is quoted, as we can see, originated in London, and it would not be easy to concoct another to contain quite so many errors in so small a space.

Sir Edward Henry ascribes the method in his book to the late Sir William J. Herschel. Sir Edward writes (*Fingerprints*, ed. of 1905,

*The system of bodily measurements sometimes called after its founder, "Bertillon's Method."

Specimen Form

COUNTRY Japan SEX ♂

RACE of ^{Father} Amo
 (Mother) Japanese

COLOUR of Eyes Brown

Specimen of HAIR to be attached here

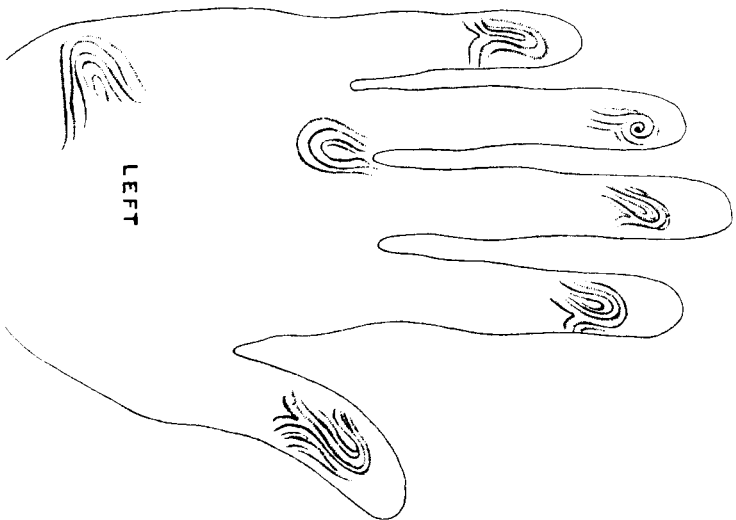


Remarks

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Facsimile of Copperplate Form (designed in 1875) by Dr. Faulds) for Identification Register. Forms for both hands were done. The original copperplate by a Japanese artist is in the Library of the Royal Faculty of Physicians and Surgeons, Glasgow.

p. 4): "But no departure at any time previously made is comparable in importance with the systematised labours in this direction of Sir William Herschel, of the Indian Civil Service. Finding false personation prevalent in all the Courts, he determined to introduce the use of finger impressions in the district of Hooghly, in Bengal, of which he was then in executive charge, as a means of fixing identity, and accordingly insisted upon executants of documents admitted to registration affixing their finger impressions in the Register of Admissions. He submitted a report to the Government advocating the adoption of this system throughout the Province; *but the subject had not then been sufficiently popularised* [my italics], and his recommendation met the fate of many other good suggestions, and was not acted upon." Here a *single* finger impression is mentioned. It is not easy to learn at first hand what really Sir William J. Herschel did in the matter. He wrote at once, on seeing my first contribution in *Nature* on this subject, to say that he had been doing fingerprints for judicial purposes for many years in Bengal. Some time afterwards a pamphlet, for *private circulation* only, appeared. On application I was denied a copy by the printer, but a good while afterwards I obtained one which surprised me very much. It contains a blotched hand—repeated on the cover—containing not a single useful finger lineation. In the correspondence with me in *Nature* the Baronet grants me full priority of publication, and not having had an opportunity of knowing what he had done then I was ready to suppose that he had independently hit upon the discovery. I withdrew the concession for the reasons I have stated in a brochure called *The Hidden Hand*. Only a few copies are now left, and I shall be glad not to have occasion to return to the subject.

Method of Classification.

We are now more concerned to have a clear understanding of the method itself, its aims, and the validity of the evidence it affords for personal identification.

Let us look at it, then, from the practical point of view.

The ten fingers of a convicted person are carefully imprinted and securely recorded in their proper serial order. It is not enough, although it might sometimes help, to show that a given finger smudge accords well with one finger of the ten in the case of an old offender in a convict prison. The two imprints, while closely accordant, may not, after all, belong to the same finger or to the same person. The right mid-finger of John Doe, for example, may happen to be very similar to the left fore-finger of Richard Roe. There is no reason in the world why it might not be so, as unrelated fingers do chance to resemble. It is useless to tell us that no two fingers can ever be found alike. This is a pure dogma, based on fictitious experience, and cannot be a true deduction from evidence, especially when we take into account the ambiguity of some patterns due to imperfect printing. But when we come to deal with the imprints of the whole ten fingers in serial order on the official records all those fingers must agree seriatim—each to each.

Now the immense evidential strength of the method is based on an arithmetical principle, which I shall try to simplify a little for those unversed in such problems. It is not at all difficult to understand, and can be made quite plain to anyone with common sense who is possessed of a little patience.

Our alphabet has 24 letters. Very well, suppose it has been confined to the three letters a, b, c, and also suppose that books were printed in the ordinary way, but with only words of three letters, then this would

happen, and all the words we could frame out of our limited range of letters would be limited to those in the following table:—

aaa	baa	ooo
aaO	boa	oaa
aoa	baa	oao
aoO	boo	ooa
aba	bbb	oab
abO	bab	oba
abb	bob	obb
aOb	bba	obo
aab	bbo	oob

Or to look at it from another standpoint. Take our Arabic numerals, of which with zero (o) there are 10. Now this happens to correspond with our own numbers of fingers, and there are good reasons for supposing that the Arabic conception grew out of the fact that primitive people counted on their fingers, as many uncultured living races do now. Now suppose we arrange ten empty spaces which any one of those fingers may be made to occupy, thus:—

| | | | | | | | | |

If you confined yourself to the same three letters a, o, b, but allowed groups (or words) of ten letters, there would be room for an immense variety of arrangements. Now with the ten Arabic numerals in ten successive places the increase of possibility is increased quite immensely and might have this value expressed numerically:—

9,999,999,999

or more than one thousand millions.

But, again, in place of the ten Arabic numerals, if you were to place one letter of our alphabet of 24 letters in each space you would have a quite incalculable room for variety. Of course, if the numbers did not vary in succession automatically, as does the mechanism, say, in printing Treasury Notes, there would not be the same means of ascertaining the exact value of a probability in a particular problem of identity. Curiously erroneous ideas have been formed and expressed on this part of the subject, but for our present purpose these may be disregarded.

Even when some fingers resemble, as they often do, without being nearly identical, the register enables you to look them up and compare them readily. The ultimate arrangement, indeed, as we shall see, is simply that of an ordinary English dictionary, which any school child can turn up easily when he wants to find a word in its usual alphabetical order.

CHAPTER VII.

Fingerprint classifications—Registration of records—Aim of particular systems—Criminal identification—Insurance—Recognition of dead—Banking—Passports—Rules, with examples of their application—Consonants and vowels in the syllabic system.

When I laid the system of fingerprint identification before a leading Detective-Inspector from Scotland Yard, officially deputed to look into the system, he told me that there would be no use of going minutely into the matter of classification till the system itself had been approved, adopted and legalised. I had offered to work a small bureau, free of expense, in order to test its value and practicability, but my offer was not taken advantage of. I mention this because some have not understood how it came afterwards to be ignored. The classification has since had many rivals, that of Galton, followed soon by a modified method by Henry, then came further modifications by Messrs. Wilder and Wentworth, and quite recently by Mr. Renøe. There are other systems, to which also I may afterwards refer, if space permits.

What is the object of classification in such a science as this, applied as an art? Surely, in this case it is to have our records arranged in so convenient and orderly a manner that we can get to the individual card with ease, rapidity, and certainty.

Fingerprint Registration.

The first point to consider is: What special aim is before that particular department? Is it for a life insurance company or bank for whom a three-finger register of one hand may seem to meet their business wants, or is it a Naval or Military bureau, which would have to include all fingers of both hands—a ten-finger register—of every man during the whole period of service, and perhaps inclusive of pensioners for life?

It is quite possible that if the system of general fingerprint registration were to be established, as many authorities in the United States of America now contend that it should be, both hands and feet might be imprinted, although it seems to me that the public inconvenience would perhaps counterbalance the advantages of such a system. We now are concerned with the application of the ten-finger system to the class of convicted offenders against law.

It is unnecessary here in these chapters to deal with the various points noted in the official form, but notice the stress properly laid upon having the fingers imprinted in their own proper serial order, and having evidence on the form itself that this has been carefully secured. It might otherwise possibly happen that a forefinger of Jones might correspond with an index finger of Smith, and a wrong conviction ensue.

I wrote thus in *Dactylography* (Milner and Co., 1912): "To ransack—unaided by a scientific method of classification—the register of an army containing some 500,000 soldiers would involve the search of a much larger number of cards or sheets than 500,000, according to the duration of regular service, and other possible conditions. To do this would obviously be quite as hopeless and futile a task as groping for a lost needle in a huge hay-field. The problem was to find a system which

would facilitate the search in a *high degree*. Any mere slight assistance would still leave the essential problem unsolved."

Some have been anxious to have the recording sheets fall into fairly equal bundles under classification. In a system according to an alphabetic arrangement this is not required, and would not in the least degree assist, even if carried out quite methodically.

Classification Rules.

Let us now consider a few simple rules that require to be observed when we get to work.

1. No distinction is made as to capital and what printers call "lower case" letters. Syllables, such as bo, ad, m₁, and so on, give greater scope for a large register than single letters of the alphabet, and hence are chiefly used. Those syllables should be kept few, simple, compact, and pronounceable.

The vowels have the Italian sound, and are always pronounced in the same way. No syllable should contain more than four letters at the utmost.

2. When a doubt arises as to the proper syllable—of any two—to be adopted, the earlier letter of our alphabet takes precedence.

3. When the core of a pattern seems to contain two or more groups or clusters of significant lineations, choose for the index syllable that on the right side of the imprinted pattern, or, if that is difficult to determine, next, that which is highest in position. In such a case reference to orientation or position has in view the usual or official pattern in the register.

In dealing with a dactyloid smudge of unknown origin, the various possibilities may be tried, assuming relative order of position, as above.

4. When spaces or figures, such as ovals or circles, are described as "large," that means wider than the space occupied by two average lineations in that fingerprint.

5. When a finger-pattern has been permanently defaced or obliterated by injury or disease, the missing mark may be denoted by an asterisk (*). If the finger itself is missing, by deformity or mutilation, the asterisk may be encircled with an O. A special compartment of the register might be kept for the reception of such cases.

6. Badly printed or obscure patterns should be held in reserve under a special register classified according to probabilities, aided by cross-indexing, and receiving special attention from the higher experts. Official patterns badly printed should at once be repeated, if possible, before confusion arises.

Dealing now with the syllabic system, let us first see how the CONSONANTS are dealt with, remembering the principle that, with the view to identifying single fingerprints as evidence, we have to ignore actual orientation in our classification.

The consonants are arranged thus, in pairs:—

b p	g k	s z
d t	f h	(ch) j
l r	m n	q (o)

Let us now begin by sampling a few of the simpler specimens of paired consonants, leaving the vowels for subsequent consideration.

B and P.

These two consonants are used singly to denote a simplified pattern resembling a *bow*.

B is the form of a bow with one simple lineation, or if two or more lineations blend into one, those are found on the *left* side as printed—when the convexity of the curve is upwards.

P, again, is such a bow, never single, but with one or more blended or joined lineations on the *right* side, with the same position of the curve.

Invert such a figure and the reading is not affected.

D and T.

Those two characters represent pear-shaped or battledore-like figures with the following distinction:—

T denotes such a figure free from attachment to surrounding lineations. D stands for a similar figure fixed by its stem as by a root.

Reverse the position of those figures and the index quality is not affected.

K and G

represent spindle-shaped forms like the last, but having *two* stems—one at each end, instead of one only. When the figure is moored or rooted by one stem it is denoted by K; when fixed at both ends or free at both ends it comes under G. Position does not affect the meaning value of these figures.

V and W.

These letters stand for spirals—sometimes called “whorls,” a term used by botanists in a different sense.



W is a spiral in which, if you try to trace its course from its centre outwards, the pointer goes round as a clock-hand turns, or as one looking towards the south perceives the sun to cross the sky.

V, on the other hand, is a spiral figure which, traced in the same way from within outwards, leads the pointer like a clock-hand going backwards, or, as it used to be called in sorcery, *widdershins*—an unlucky course. Alteration in position, again, makes no difference in indexing those two characters.

M and N

denote figures in outline resembling mountain peaks. M suggests something like the usual tent-like outline afforded by a volcanic mountain, with its changing curve. The bow, represented by B and P, has a uniform curve. N, though somewhat similar, ends with a rod-like form, suggesting a flag-staff on a mountain peak.

Invert either of those typical forms and they read just as before.

A curved cliff-like form, like a breaking wave with curling crest, may be indicated by the Spanish letter ñ.

L and R

denote loops, in the axes of which curvatures are apt to occur.

L is a loop, the axis of which is *straight*. R is one of which the axis is *curved* or crooked.

“Axis” means the direction or general course of the loop figure, which you can find by drawing a line through its length centrally. Inversion does not affect their classification.

S and Z.

Those two letters indicate certain rather troublesome figures of a sinuous, wavy or zig-zag type, often intricate and confusing, and always demanding careful attention from the expert.

S includes all *purely* sinuous or undulating figures.

Z is used to denote those figures of this type that contain at least one distinct angularity in the pattern.

Here, again, relative position is of no consequence in the classification.

A few sentences remain to complete the explanation of the syllabic system of fingerprint classification so far as concerns the consonants used. We come now to the paired C and J, but in this particular case Ch is used instead of C simply.

Ch and J.

One might have maintained severe uniformity by retaining C simply, which is not otherwise required, but this character in English is so variable in its consonantal value that it seemed likely to be safer in every way to adopt the combination as ensuring uniformity of pronunciation. Ch, therefore, is sounded as in "cherry," while j is sounded as in "jerry." A hook with one limb shorter than the other is the figure which both of these characters represent in finger-patterns. The distinction of one from the other is this: When the shorter leg of the imprinted hook is turned to the left the pattern is represented by j; when it turns to the right, by ch. When those figures are turned upside down the distinction between them is still maintained. In those two characters no attention is paid to the slope of the figures.

O and Q.

O is, of course, a vowel, and will require to be dealt with as such when we come to discuss the vowels more particularly. It is, however, brought in here as one of a pair with Q, because these two letters are so nearly alike, in capitals. While both stand for circles or ovals, O also stands for little round *opaque* dots or ovals, while the figures which Q stand for are not only always *hollow*, but are also invariably larger.

How is this question of size, then, determined so as to lead to a clear decision? Simply in this way—a circle, oval or ovoid (egg-like) shape of pattern is called "large" when it occupies, as printed, a space wider than two average lineations of that particular fingerprint in which it is found to occur.

If any doubt is felt in any such case, the general rule governs, and O, which comes before Q in alphabetic order, has precedence.

X.

This is a well-known algebraic symbol and can be made in dactylography to yield good service by standing for something at present unknown or undetermined.

If a large residual number of such cases were to occur in any given collection of fingerprints they would generally be found, I think, to allow of some kind of rough sub-classification, at least, as a temporary expedient. This would apply to cases of an obscurely printed or only partially printed pattern, or in cases in which the paper or other fabric or substance on which it had originally perhaps been clearly impressed had become more or less destroyed by damp, rot, rust, and the like. Sometimes, as we shall learn, the pattern may be revived or restored by chemical or other means, when the classification would then follow the ordinary method herein employed.

F and H.

These two consonants occupy an intermediate place in our system of records between vowels and consonants, and thus can be explained better, perhaps, somewhat further on in this book.

The consonants, then, are now seen to form something like a skeleton system which the vowels help to fill up and to which they give some expression.

The Vowels, A, E, I, O, U.

A.

This vowel is used to indicate that (1) a pattern is very simple, consisting, for example, of a series of almost parallel lines, a condition which occurs now and again, but is rather rare; or (2) that it consists of an *empty* loop, bow, mountain, spiral, etc. Suppose the thumb of the right hand yields a plain set of lines running, like the furrows in a ploughed field, in almost straight parallel lines, without any complications, such a pattern would be denoted by A simply in a five-finger register, without the aid of a consonant, as, for example, a-bra-ka-dab-ra. If, however, the inner lineation was a somewhat bent or curved loop without dots or other contents it would come under ra. A similarly conditioned mountain or tent-like curve, again, would be coded as ma; if by a bow-like curve with a single line or a doubled line on the *left* side of the printed figure it would be denoted by ba; but if with two lines joined, on the *right* side, by pa. A here rather denotes *lack* of any vowel.

E.

When we find in the core or interior of some loop, bow, or other pattern, a group of not less than three short detached, perhaps *irregular* lines or dots, this is to be indicated by the use of e with the ruling consonant, as, for example, te, re, me, we, and so on.

I.

This vowel stands for *one* simple detached line, or not more than two such parallel lines in the heart of an encircling pattern. Thus inside of a bow it is coded as bi, within a spiral as wi or vi, according to the course of its rotation, as previously described.

O.

This letter, as we have already seen, stands for a *little* oval form or circle, or for a round or oval-shaped opaque dot in a core. If the circle or oval is *large*, on the other hand, extending, that is to say, over a width occupied by two average lineations in that particular example of pattern, then it is to be treated as a consonantal form Q. If it contains one, or at most two straight lines, we read it as Q; if with two or three irregular spots as Qe, and so on.

U.

This letter indicates a fork having two or more prongs within the core of the pattern, those prongs *pointing towards* the concavity or inner side of the bow, loop, etc. A single prong or spur standing out like a twig from a bough is to be distinguished from such a fork. As a rule such forms are to be treated as hooks coming under j or ch, already described.

Y.

This character stands for a similar fork to that above described, also with not less than two prongs, but those *turn away from* the concavity of its environing loop, bow, spiral, etc.

Thus far, we have now surveyed the various symbols to be employed and it will now be for the student to practise diligently in analysing the patterns found in nature into a somewhat severe diagrammatical form, printing or drawing them as clearly and as simply as possible, with regard only to the lines of practical importance for the needs of classification. Then one should try to find where each should go in a first consonantal classification: b, p; m, n; ch, j; l, r; v, w. After this can be done with some confidence try to seek out the proper vowel to go

with each, remembering the vowelless form a. If such simple exercises are practised carefully for a little while, the rest of the study which follows will come to be much more simple and attractive.

Combinations of Letters.

Besides the direct combination of simple vowels and consonants (which arrangement of itself gives immense variety to the index registers), a great number of diverse and very distinctive syllables may be formed by combinations of two or more consonants, while some few of the vowels may be treated as long or short, by marking them with an accent, as \bar{e} , \check{e} , where the patterns require further discrimination.

Here, just by way of sample not requiring further elucidation at present, are a few of such combinations, which prove most useful in large collections of prints:—

bra, spo, art, $\bar{p}\bar{r}\bar{i}\bar{d}$, $\check{p}\check{r}\check{i}\check{d}$, $\check{n}\check{u}\check{t}$, $\bar{n}\bar{u}\bar{t}$.

We need not at present enter into a detailed examination of those complex characters till we have met with some of the practical complexities of identification by the fingerprint system. By this method of using a syllabic index arranged in alphabetic order, however, the most extensive register can easily be gripped and kept in regular order, needing no other index or guide than its own essential and inherent structure.

If the register sheets or cards—and stiffish sheets are in practice found to be better than cards—are kept in their proper sequence, there should never be any real difficulty in finding the document sought for if it is in the collection at all.

It would naturally be the duty of someone to attend to the order of sequence in the registers, which always tend to get disarranged in the hurry of a search, but that person need not at all be an expert in fingerprint lore. A nodding acquaintance with the English alphabet will do.

Some examples now of the development of the syllabic method may here be adduced. A preliminary point must be well noted. It is this: Suppose we decide that the core of a particular pattern being studied is to be coded as belonging to b, for example, and a vowel form, say o, occurs just within the inner lineation, shall we decide to code the pattern as bo or ob? After some hesitation I decided in favour of bo as the most convenient of the two, for the following reasons:—

(1) It retains as the significant and leading element that which the consonant denotes; that is to say, the most notable fact about the pattern is that it is a bow or a modified one, b or p; or that it is a spiral, winding clock-wise or the reverse, and so comes under v or w.

(2) After that matter is settled the vowel may help, if necessary, to form still other variant syllables by the addition of some prominent blended lineation or “characteristic,” so that we might for a really capacious register meet with such forms for a single finger in the series as vow, pad, dil, lod, etc.

CHAPTER VIII.

Other systems of classification—Galton—Henry—Klatt—Vucetich—Windt—Wiider and Wentworth—Bertillon's method found unreliable.

Some two years ago the Hon. Trevor Bigham, C.B., Director of Criminal Investigation, was reported to have said that "no satisfactory way of classifying single fingerprints had yet been discovered." The syllabic system which was considered in our last lesson was made known by me in outline to Scotland Yard, and some years later to a Committee of the War Office, the Home Office being represented by an Under-Secretary, but the question was on neither occasion carefully or fully gone into, and the question of *single* fingerprints did not then receive any attention whatever from the Authorities. Yet the syllabic system when fully developed—as I intended from the first that it should be—grips the individual fingerprint very firmly in the way required. You have just to collect all the right fore-fingers, say, or all the left middle-fingers, by means of their representative syllables, and the search should not then be immoderately difficult.

In the practical needs for identification a single finger smudge often suggests some professional criminal of a certain type, and these, for this purpose, might easily be kept in special registers showing each finger in its syllabic class, or only the particular fingers deemed necessary to be treated in this special manner.

Space will not permit me to describe the different systems that have sprung into existence within the last decade or two with the view of classifying fingerprints in official records.

Mr. Galton—afterwards Sir Francis—early devised a method, after a very short study of the subject, and with a limited collection of examples. It was ingenious, but never seemed to me to be quite practical, and the initial twist has been more or less inherited by subsequent experts, who have at last modified his plans almost out of existence. Galton never contemplated divorcing the records of fingerprints from those of bodily measurements projected by Bertillon. His notion also of having them done up in similar bundles, like chocolate cakes, was decidedly amazing on the part of a mind really of high scientific power. His work at the time was quite unduly appraised, but the long and laudatory notice, contained in *Nature*, to which he was a frequent contributor, contained not a solitary phrase as to his work on *fingerprints*. A little bare justice in this illucrative field of research might be vouchsafed now and again to unpaid workers.

It would be superfluous, perhaps, here to try to summarise the system devised by Sir Edward Henry, and based on that of Sir Francis Galton. Henry's work, *Classification and Uses of Fingerprints*, is published by Eyre and Spottiswoode. His method is that adopted by Scotland Yard, and, of course, should be carefully mastered by anyone aspiring to be employed as an expert in the official system adopted by Scotland Yard. While this is so, the studious Police officer who masters the syllabic system should be able to accept employment as an expert in fingerprints for such work as the Army or Navy, for the passport system as it is now likely to develop, and for such purposes as bank cheques, orphanages, and the like.

I have the desire and intention, however, to follow up this elementary

course with an illustrated exposition of the various methods now in use. It is only in this way and by comparison and criticism that we shall be able ultimately to reach a stable and cosmopolitan system, which the existence of such an influential society as the International Association for Identification should do much to accelerate.

Inspr. Klatt, of Berlin, in 1903, devised a system of classification which follows my own original arrangement so far, of all the ten fingers in serial order, combining some of the details of Henry's system with others elaborated by Herr Windt, of Vienna. Details are given in *Daktyloskopie* by Kamillo Windt, K. K. Polizeirat in Vienna, and Siegmund Kodiček, Magistratssekretär in Vienna. The work is in German, is well illustrated, and was published in 1904, at Vienna and Leipsic, by Wilhelm Braumüller.

A name which deserves high honour in our science is that of Juan Vucetich in Argentina. In 1901 at La Plata he published in Spanish a report of a conference held at the public library there on the subject of the system of dactyloscopy, which, as we have seen, denoted the study of the ridges directly. Again in 1904 he published a *Comparative Dactyloscopy* in the same language. In Argentina, through the influence of Vucetich, identification is a general civil requirement, and criminal prosecutions follow as a subordinate element. A good citizen possesses a valuable certificate of identity vouched for by fingerprint evidence, and he forfeits it on behaving badly. On September 1st, 1891, Vucetich claims to have made his first identification by this method in a criminal case, just eleven years after I publicly proposed the system in *Nature*.

In connection with the subject of single fingerprints, which is of importance in many ways, as we have already seen, Mr. T. G. Cooke, who travelled in Europe last year, makes some very useful and interesting observations in the *Finger Print Magazine* for March of this year in regard to Belgium, where Vucetich's system is in use for the primary classification. Says Mr. Cooke: "In Belgium it is an offence for anyone to use an alias. For this reason very few attempt this means of covering up their identity, and the alias file in the Belgium bureau is very small.

"When an arrest is made outside of Brussels the subject is asked if he has ever been arrested before. If he admits that he has, they simply take both a rolled and a plain impression of his right thumb only, and send this, together with his name, to the Brussels bureau. *His record is first searched for under his name* (my italics). If this is found, the fingerprint record can then be located, as the name record card bears the fingerprint classification. In case the name record cannot be located the prison holding the suspect is notified by wire, and a ten-finger set of prints is requested. Because of the law against using such aliases, and the heavy penalty imposed for such an offence, this plan of taking the impression of only the right thumb of all subjects who have been arrested before works out very satisfactorily. In our country, where most criminals have anywhere from half-a-dozen to twenty-five or thirty aliases, this plan would not work at all."

The Brussels bureau is in charge of Mons. Th. Borgerhoff, Directeur au Ministère de la Justice, while Mons. Gonne, Administrateur Directeur-Général des Prisons et de la Sureté Publique de Belgium, directs the identification bureau.

In Germany the administration is more divided, the larger cities having their own systems and records.

I should like to have entered into some of the recent changes—for the better, some of them—made by Messrs. Wilder and Wentworth, Mr. Reno, President of the International Association for Identification, and Chief-Supt. Collins, but space will not permit.

Before leaving this section of the subject I should like to quote a passage from a recent contribution by Mr. G. B. Wardle, late Superintendent, Bengal Police, to the very interesting *Detective Magazine* (March 16th). He says: "In certain branches of criminal science there have been occasions when India was in advance of the Home Country, a notable instance being the classification of fingerprints. I am, I think, correct in stating that the system of fingerprint classification now in use in Scotland Yard was employed by the Criminal Investigation Department in Calcutta some years before Sir Edward Henry introduced it in England." The date is not given, but it would not seem to be related to the late Sir William J. Herschel's rather mythical work done officially in Bengal from 1858 onwards.

Sir E. R. Henry, in his *Finger Prints*, says the system "was introduced into England and Wales in July, 1901, where the results obtained have been most satisfactory, the number of identifications made during the year ending 30th June, 1905, being more than ten times greater than the largest number of recognitions effected by the anthropometric method." It thus took twenty-one years to establish in England what was accomplished in Argentina in eleven, and not much more in some other lands.

CHAPTER IX.

How to examine clues—Securing and protecting exhibits—Study of footwear—How trails are followed—Taking casts of footprints—Prints of bare feet—Necessity of guarding against fallacious and spurious prints—Prints made from blood, syrup, grease, oil, etc.

Much of the previous instruction given in these lessons is important, and even essential, to be before the mind of the expert who will have to do with the keeping of records and with the orderly arrangement and classification of them for reference in cases requiring identification. His knowledge of fine details must be extensive and exact, for he must be ever ready to meet and face other experts who might be called as witnesses on the other side in a court of law, perhaps in an important and keenly-contested case. But there is a large and important field for more every-day practice, which lies open before the ordinary Police Constable on duty on his own beat.

A question of simply identifying a person found dead may arise, in which there may be no suspicion whatever of any crime having been committed. Again, the officer whose attention may have been called to some act of lawlessness may notice something which suggests that the evil-doer may have left footprints or fingerprints behind to testify against him. It is in such cases as these that the ordinary Police officer, while on duty, may show his intelligence and alacrity.

Footprints Evidence.

Just after a fresh fall of snow very perfect footprints (or bootprints) may often be traced for some distance along, say, from an open or shattered window. The observant officer who has previously given studious attention to such appearances, or "vestiges," as the ancients called them, may now find his studies on the verge of being appreciated and rewarded.

The footprints, by the details they yield of foot-wear, size of shoe, stride and tread, etc., may perhaps reveal that more than one person has been associated in the suspicious transaction, perhaps as pursuer and pursued; and the characters, perhaps even the social quality, even in some few cases the nationality of the agents, may be revealed to a certain extent, by scientific deductions from very carefully observed facts.

But before proceeding to the more leisurely scrutiny that may be ultimately required, other steps may require to be taken besides that, perhaps, of urgent immediate pursuit of the suspects.

One of the first conditions imposed on the observer is to preserve intact in the very condition first observed—or as nearly so as is possible—the marks and indications intended to be used as evidence if a capture is secured.

In frosty, dry, clear weather prints in snow may retain their characteristics quite clearly for some little time, if preserved from the destructive curiosity of an eager public.

It is well at once to secure important and good specimens by protecting the prints from sun and warmth, from further falls of obliterating snow, or from rain. There is also in our climate the ever-present danger of an immediate and sudden thaw. It is therefore desirable to select at once at least a few of the clearest prints and of those fullest

of characteristic details. Get relief impressions of these in the way presently to be described, or failing the means to do this immediately, make the best pen-and-ink or pencil sketch, based on accurate measurements, and corroborated, if need be, by a fellow officer or some responsible citizen.

One of the best descriptions of such a study is contained in Charles Dickens' *Our Mutual Friend*, where the footprints of Mr. and Mrs. Lammle on their honeymoon betrayed that they had not walked arm-in-arm, nor in a straight track, but in a moody humour, the gentleman trailing his stick after him and the lady prodding little holes in the damp sand with her parasol.

If an extensive and successive series of footsteps can be traced it would be desirable to have a photograph—or, failing that, a careful drawing—showing their general chart of apparent progression; whether the person or persons were walking, running, or leaping; whether any one of them was a cripple, and, if so, of what nature were his steps—was he aided by a crutch or stick or had he an artificial foot, and so on. A careful map of the nature of his steps and their defects might be carefully portrayed by a skilful draughtsman.

The Study of Footwear.

Some study of footwear is desirable on the part of officers having such duties as a possibility in their day's work. A hasty glance at the advertisements in a daily newspaper may readily convince one that the patterns on the soles of shoes are now almost as full of variety as the ridge patterns of the fingers and feet themselves. One might very readily succeed in bringing home the purchase locally of some *new pattern* or type of shoe-sole to a store where the purchaser might perhaps be remembered and identified.

Then, again, the actual wearing of shoes is often very individualistic, as evidenced by its effects. One person grinds away the tips of his boots at the toes, both or one only; another wears down his heels on one side more than on the other, and within those types there are great varieties of detail as to the appearances left from long wear.

Again, a boot-sole has perhaps just been patched or a new heel put on, and the style of repair work has often marked characteristics that the skilled craftsman can recognise and identify.

Corns and bunions often leave quite independent identifying flaws on boots or shoes. That somewhat uncommon complaint, "hammer-toes," in my observation generally leaves very characteristic bumps on the uppers of a worn pair of shoes.

When impressions of bare feet are in evidence, of course, the ridge patterns and creases of the sole may lend valuable testimony for identification. As has been already noted, such cases are comparatively uncommon in this country, but they do occur, and even in higher circles a somnambulist might leave bare-foot tracks quite numerous and definite enough to tell a clear story of midnight wanderings.

Following the Trail.

Sir Robert Baden-Powell a short time ago gave the following hints to scouts in the art of following the trail, or in tracing vestiges. "You should begin to learn by making a piece of soft ground quite smooth with a roller, or by sweeping it over with a brush. Then make your own footmarks by first running, then walking, across it, and notice the difference between a walking and a running spoor. Then you can practise in the road by smoothing a few yards of road in the same way, and later on examining it to see what men, women, animals, or carriages have gone past, which way they were going, how many there were, at what pace, who passed first and who last, and so on.

“Notice any peculiar prints about a foot-track so that you could recognise it again if you met it somewhere else.”

An important fact to be kept in view by the Police investigator of such cases is that—as in an old story contained in Wilson's *Tales of the Borders*—a person of criminal tendencies may appropriate the shoes of an entirely innocent person for the purpose of shunting the deed off from his own shoulders to those of the person whose foot-gear he has appropriated.

A curious case, illustrative of this point, with an important variation, appeared last year in the daily Press. O'Donnell, an ex-Service man of Salford, took a pair of boots from a drowned man, wore them, and tied his own worn-out boots to the corpse. The Police believed the body to be that of one Lambert, but the father of the latter noticed that he had shabby boots, whereas his son had been wearing a good pair. A bunch of keys in his pocket led to his identification.

Cases have been found recently of footprints left by early or Palæolithic man, as in a cave in the department of Ariège, and a suggestion was made that they were probably vestiges of some kind of religious dance, the strain being on the heels chiefly or entirely.

It might be possible, on the basis of the principles just expounded, to unravel the intricacies of this very ancient dance.

Sir Leonard Dunning, at a Police inspection, said recently: “In justice to themselves, they [the Police] must take a better position in society than hitherto. New conditions had brought about fresh requirements from a Police officer. Every Policeman must keep himself up-to-date, never remaining satisfied with his skill or knowledge. There's was a profession in which, to the last, a man had not finished learning.”

We have seen that even bootprints may be made to yield good evidence for identification, assuming always that the person suspected has been wearing his own boots and has not subtly adopted those of another person in order to save his own skin and incriminate an innocent person.

When such a vestige is found we have also seen that it must be protected from sunshine, rain, and other footsteps. This is often done by covering the footprints with upturned empty soap-boxes, crates, baskets, or the like, as a temporary measure.

Taking Plaster Casts of Footprints.

Afterwards casts may be carefully taken by means of plaster of Paris. This requires a little practice on the part of a beginner, and one might well begin by making casts of the ordinary soles of boots of different patterns, first impressed in plastic clay or the like and greasing or oiling the surface of the impression before passing in the fluid plaster of Paris. The oil may be made to run over the whole surface of the pattern, or with a soft brush it may be gently painted on in a very thin coat. Pour off all superfluous oil. Almost any kind of oil will do if not too thick. When the impression is on a moveable surface, as a wooden board or a tile, or slate, the oil may be poured obliquely into the cavity of the imprinted pattern and tilted gently to and fro till the surface has been thoroughly well greased, then let the superfluous oil run off as completely as possible. The impression, if in such a position as to be capable of removal and transmission as an exhibit, should then be carefully packed in a firm, shallow box arranged so that no friction or pressure is likely to obliterate or damage the pattern. Sometimes such an impressed print is found on a smooth paving-stone or tile, or on a brick, or bit of wax cloth, or linoleum, and may turn out to be very good evidence for identification.

When bare feet have yielded their vestiges, the imprints or dactylites should be dealt with just as is done with fingerprints, but this point will be dealt with fully hereafter. Oriental people, especially craftsmen,

often use their feet, and especially their big toes, as we do our hands and fingers. This the Japanese carpenter does with great skill, and their stockings or socks invariably provide a *separate* cover for the great toe, so that its action may not be impeded.

If a succession of bare footprints can be traced—as in the case of a supposed somnambulist who is missing—an effort should be made to secure a good *series* of prints in successive order.

Although this may seem a little outside our province in these lessons, one should not be blind in such a search to *associated* evidence of other kinds. For example, a year or two ago footsteps were traced leading through a bank of special flowers in bloom. The peculiar pollen of that particular kind of plant was found richly adorning the trousers of one or more of the suspects, and the microscopic evidence was of such a precise kind as to be conclusive.

The patterns of fingers of old offenders clearly printed on the official registers by experienced specialists are often very different from the dactyloid smudges which the Police Constable may be the first to detect at some scene of crime. The official print shows all the lineations—or should do—equally clear and distinct. The accidental vestige of a finger or hand, however, may not be well printed; the ridges may in part be blocked up or the important part of a distinctive pattern may not be imprinted at all; but one must try to make the best of it, and it is often surprising how much may be made out of an obscure print if carefully observed and studied.

Such impressions may, as we have seen, turn out not to be human fingerprints at all, and I have seen many cases where a smudge looks at first very like a fingerprint and may afterwards turn out to have had quite a different origin. Such genuine accidental smudges may have been quite unknowingly printed from the finger or hand of some evil-doer, by means of blood, ink, paint, or simply dirt from some mechanical employment, as engine-man, gardener, and the like. Such prints are often made, as I have observed, in books obtained from public libraries, on glass, wood, metal, on a knife or other weapon, or key, or leather purse, or wine-glass, tumbler, or bottle, on a white wall or on a wooden or linoleum-covered floor, or on a japanned cash-box.

Besides impressions similar to those made by ordinary printing-type, fingers and hands may leave relief impressions—*dactylites*—in sealing-wax, beeswax, paraffin candles, pitch, clay, putty, varnish, soft paint, and many other substances used in the purposes of every-day life.

If care is taken from the moment of discovery in case of crime, good photographs may usually be obtained from any of those materials, and those can afterwards be enlarged by official experts. The varying conditions under which they have to be made to secure accuracy as exhibits will involve careful consideration in each case.

Cases of imperfect or blurred printing often arise from “fluff,” bits of grit in ink, small blood-clots, hairs, etc. Again, the supposed print may reveal lines which may turn out to be due to cuts or scratches. Some may have originally been deep enough to obliterate the ridges and cause slight and permanent scars, which might assist in determining an identification.

As I wrote in 1905: “A case of bad obliteration of the special patterns might be in itself a suspicious circumstance, and is now of somewhat frequent occurrence. If accidental, the fact would be parallel to the case of a person who had lost one or more fingers.”

Fingerprints Made With Blood.

If an opportunity occurs one might do well to study the different appearances of fingerprints made with blood in different conditions. Good imprints are often made by watery blood, as when an evil-doer

has attempted the difficult task of removing every trace of blood from his fingers. Fresh blood from a living source tends to clot, and however good may the imprint made seem at first to be, little clots block up many distinctive parts of the pattern just where lucidity is most desirable.

Again, old semi-putrid blood has peculiarities of its own, but may yield very good impressions.

When frozen meat came in I got some amusement by telling the household one day as I came in that I saw they had been trying it. I had seen one or two drops of blood in a condition that I thought revealed its origin on the door-step as I came in. I was quite right.

My first case of identification of this kind was made in Japan, and was published in 1880. It was a trivial case, and was simply that of a medical student in my hospital who had been drinking rectified spirit, flavoured with a little *syrupus simplex*. He had left some very pretty complete fingermarks on a measuring glass.

A short time afterwards an attempted burglary took place in the same hospital. A man whom I trusted greatly was generally suspected, but after careful scrutiny I found sooty handprints on one of those beautifully smooth white plaster walls the Japanese make. They quite differed from those of the suspected man, and clearly belonged to an entire stranger to the establishment. The ridges were not shown at all on the clotty soot-marks, but the general contour of both hands, repeated once or twice, were quite conclusive.

CHAPTER X.

Examination of finger smudges—Preparation of exhibits—Fallacies to be guarded against in fingerprint research.

When an Officer has encountered what seems to be a fingerprint in a case of suspicion, it may at first be a question whether the mark made by grease, syrup, ink, blood, etc., or impressed in relief on wax, paraffin, pitch, varnish, or the like, is, after all, really a fingerprint. It might possibly have been made by a stain or smear from the sleeve of a twilled garment, as I have more than once found to be the case after investigation. A cross-section of a wilted stem of a tree or bush yields a very similar appearance to a fingerprint sometimes, with lines and circles, and especially when impressed on a plastic substance like a paraffin candle or half-dry varnish.

Let us meanwhile, before making such a careful scrutiny as may be necessary, simply deem the mark to be a suspicious "smudge" of as yet unknown quality. It may perhaps even turn out to be the imprint of a monkey's paw or foot, or that of one of the large anthropoid (man-like) apes, gorilla, orang, or chimpanzee, for sometimes these have been found to yield imprints quite indistinguishable from a human fingerprint by the best experts.

Examination of Smudges.

How, then, is such a smudge to be examined?

If there are several apparent lineations to be distinguished, however faint these may seem, it is worth while, and may be quite necessary, to examine the mark minutely and most carefully.

My own near-sighted, or myopic, eyes enabled me till within the last year or two to distinguish the smallest details in a fingerprint unaided by glasses without the slightest difficulty. Now, however, I find, as many do, a magnifying glass of about $1\frac{1}{2}$ to 2 inches focus a very great help in unravelling intricacies.

In order to get a correct view of the details of the pattern, if one can at all be traced and to "match" it with the official imprint, if that is before you, the best way is this:--

Have little sheets in squares or circles of good crown glass ruled in two ways with diamond scratches, either according to the English system of inches or in millimetres on the metric system.

(1) If squares are used, the sheet of glass should be divided as a map of London is often done to show districts. The margins are marked off in letters one way and in figures the other, one direction A, B, C, and so on, while the other runs 1, 2, 3, etc.

(2) If circles are used, these should be at equal spaces from the centre concentrically arranged, and sub-divided radially as with the spokes of a wheel, those sections being denoted by numerals. You can then recognise and fix the position of any particular detail or characteristic, and mark it down in a diagram for future use. Such diagrams might be made beforehand, and should be in use officially and readily obtainable. You recognise the position of a particular detail, such as an island, junction, or fork, by relating it, say, to square A (left to

right), section 3 (up and down) in that square, and so in the circle form, the detail would be described as near apex of section 5 or base of section 3, for example, or as proximal (to centre) or distal.

You can thus be enabled to compare the two imprints in question very closely, by getting the exact position, if the points really do correspond; or, if not, their want of accordance can be readily demonstrated.

When you have recognised some details, say, of a triple-pronged fork, then you can begin to examine very carefully the number and arrangements of the pores on the ridges. Sweating, or its utter absence, tends to alter the size and shape of the pores as imprinted, but they retain in a wonderful manner their relative position in each little detail of the most complex pattern. In making a scrutiny turn the scratched face of the glass plate downwards towards the print.

I have found in my own personal experience very satisfactory results at this stage from having a card or thin metal plate with a tiny window in it cut neatly. By bringing this opening to bear on the important and critical focus of the pattern, easy comparison of one pattern with others which look similar may be made, and one is greatly aided by the fact that all irrelevant details are excluded from view, and do not distract attention.

As a further means of assistance in this ultimate scrutiny, and still using the same window to start from, it is helpful to make diagrams—not mere pictures—of the salient details presented by that segment of the pattern. Those diagrams, reduced to their ultimate linear qualities, tend to look rather like the Runic letters found in this country sometimes in ancient remains.

There are many practical points at this stage which would demand much space for their full elucidation. I can only now mention the more usual and urgent ones.

In my *Guide* (1905) I pointed out the necessity for caution in respect to a matter that I find is sometimes left open to great risk. "In all these varieties of loops, whorls, etc., the designs—if we may call them such—are not only various in themselves, but occur in the most varied positions. It is in this respect that care must be taken to discover whether a particular pattern coincides with some other in such a way that the coincidence is one of position and not a mirror repetition of a pattern which may occur in other parts of the palmar surface than the last joint of the fingers, often called finger-tips." Not only, however, might a mirror pattern be mistaken in this way for its original converse, but an actual—non-mirror—pattern might be found possibly to repeat one found in another part of the hand, and so form the unfortunate basis of a false identification. One can readily see that, if a particular smudge is supposed to resemble closely the pattern of John Doe's right fore-finger, it might possibly be a print even from some other part of his left palm, or even from one of his feet. It is well, therefore, to try and secure corroborative evidence, if possible, that the mark is that of an impressed *finger*, perhaps of a particular hand, as in grasping some tool or weapon, if a particular finger is in question. Lines often ignored by even the expert official mind, while not helpful towards direct identification, may indicate that the mark in question is that of a *finger*, and strengthen the evidence.

In such imprints, besides the core near the tip of the finger, there are often straggling patches imprinted between the wrinkles, not yielding characteristic details, perhaps, but along with the marking of wrinkles over the joints and between them, showing that a finger has been there when the core-like pattern was being imprinted.

Another snare in which the inexperienced Officer might be caught is the veiling of important patterns—in part, at least—by defective print-

ing. Of course, if the smudge is a mere accidental vestige left by some crook in a hurry, we do not look for it to yield evidence of artistic care in the production.

Simple central patterns are of quite frequent occurrence, such as circles or ovals. Now, if these are printed at all hazily, in whole or in part, the very elements or details yielding evidence of characteristic quality may have been quite veiled or obliterated.

It is even so in ordinary printing of books, especially when we have to deal with old books or manuscripts. We know how very varied are the different editions of Greek or Roman classical writers, and even the copies of Holy Scripture, copied with care and handed down with veneration, are found to show considerable diversity. Now, in such cases the scholar, whose duty it is to determine the correct reading of the author, expects to find some rational meaning in the letters forming seeming words. In fingerprints, however, we have no such aid. In some manuscripts the question to be decided may be not as to a word, but only as to a single letter. Is **C** to be read as **C**, or as **G**? Is **E** to be read as **E** or as **B**?

It is thus in trying to decipher blurred fingerprints. Evidence of

SIMILAR CORES.



FIG. 2.



FIG. 1.



FIG. 3.



FIG. 4.

this kind has to be scrutinized with every vigilance, and doubtful cases should be discarded as scientific evidence of valid force.

Apart from the mere accident of bad printing, there are some patterns well-known to have a tendency to mislead the unwary as being liable to be read in different ways.

CHAPTER XI.

Some social effects of Dactylography—A successful case recorded by a police student—Examination of small sections examined and coded.

The annual convention of the International Association for Identification was held last September in Boston (U.S.A.). The Hon. Samuel Bates, who has had official experience, suggested the importance of a study of fingerprints in regard to personation at elections. Mr. Roscoe C. Hill alluded to the proposition to have postal employees fingerprinted. This, he said, had been done in New York City. "We all know that we register letters containing cheques and money which have very often been stolen. . . . A letter is now in the hands of the Postmaster-General of the United States seeking his authority to continue the fingerprint system in the postal service for the City of Boston. I think this is one grand chance for the adoption of the fingerprint system among the Government employees."

Mr. Bates, in his opening address, dealt with the notable decrease of criminals in the penal institutions of Massachusetts. That does not mean that the population has reformed simply, but there is a tendency to put evil-doers on probation, giving them a fresh chance to begin their life, and liberating them from prison as soon as they manifest a genuine intention of behaving themselves. While there are four thousand people in prison, sixteen thousand convicted prisoners are on leave outside on probation.

This is a very gratifying piece of evidence as to the reformatory influence, which may be expected from a frank admission of the civic importance of personal identification.

Fingerprinting and the Probation System.

The hon. gentleman went on to say: "The point I wish to make, and the connection this all has with your deliberations, is that if we are to pursue these two humane systems, if we are to make the most of our probation opportunities, if we are to let men out into the community in this humane and scientific way, it is absolutely necessary for our protection and the protection of society that we have a certain, safe and continuous system of identification for these men. We found in our organisation that we were absolutely unable to utilize to the full these two great ideas, these progressive ideas, unless we had backing up our prison records, unless we had in conjunction with all our other methods, the system of identification by means of fingerprints."

He then goes on to contend for the same means being used of recognising a citizen charged with an offence so as to avoid the indignity of his being thrust into a common prison before his guilt has been proven, and then keeping him there indefinitely till he has shown conclusively that he is not guilty. He goes on to express his belief that universal identification would be a great thing in preventing that evil: "I look forward to the time when it will not be necessary to imprison a single man, except possibly a murderer, or a man whose common daily habits make him dangerous to the community. I look forward to the time when it will not be necessary to deprive the unconvicted man of his liberty,

because of the ease with which he can be identified and the absolute impossibility for him to run away from that identification.

“For example, if it was possible to have in some central bureau, or a series of central bureaux, a record of every citizen in the United States, with his fingerprints, where could a man run to get away from that control? If you had that complete and absolute system of identification for every man, this imaginary prejudice or stigma that remains in the minds of some of our people against fingerprinting would be entirely removed, because every person, innocent or guilty, would likewise be identified. . . . Some such system of fingerprinting will do more to tear down the walls of some of the country jails which have disgraced the landscape of the United States for a hundred years than any other single thing that you could possibly do.”

A very diligent and successful “Police Student of Dactylography,” with the permission of his Chief Constable, has sent for publication an excellent burglary case which we here summarize, and reproduce the prints on a smaller scale.

My correspondent, who, like Mr. Bates, argues in favour of the more general use of fingerprint identification, relates the following very satisfactory case:—

“In a certain town in the North of England there had been an epidemic of crime in the shape of burglary and housebreaking. The local Police worked hard on every possible clue, but were unsuccessful until one night a Sub-Post Office was broken into, and the thief, having used a chisel to force the panel of a door, had taken hold of the panel with his hand to extract it from the door, and had thereby left his finger impression on it. This print on the panel was photographed and compared with several fingerprints of different thieves, and it was found to be similar to the right thumbprint of a certain man who had already been interviewed concerning the offence. This man stated, when interviewed, that he had left the town by train before the Post Office in question was closed on the night of the robbery, and denied knowing anything about it. The Police enquiries had proved that he had been seen at the railway station as if he intended travelling at the time he had stated, but there was nothing else to connect him with the crime except the fingerprint, which had not been investigated when he was interviewed the first time.

“Owing to this man residing some nine or ten miles away from the town, the Police had believed his statement until the fingerprint on the panel of the door had been found to agree with his right thumbprint. The Chief Officer of Police, on seeing the similarity of the prints, ordered the arrest of the man. When he was charged he replied that ‘he would rather say nothing,’ and the next day he said he thought the Police had made a mistake. However, when he was brought before the Justices, and had heard the evidence as to the fingerprint, he at once pleaded *guilty*. If it had not been for the fingerprint on the panel of the door this man would have gone unpunished. *If fingerprints can be used in Police cases for identification with such good results, why can they not be used generally with equal success?*”

In this case a small section of the print contains the successive lineations from guide lines 22 to 19, which read thus, in which I have suggested might be called Runes:—

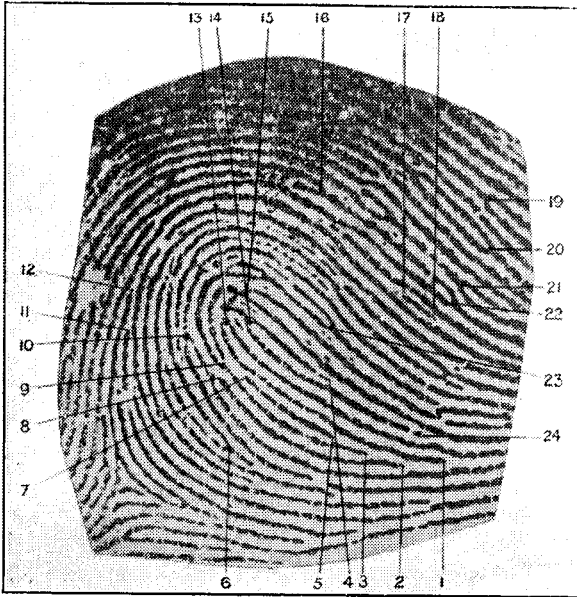
Y A I I Y I A

One can at once see how very unlikely such a collocation of details should be expected to recur. Yet, after all, this represents but a very small section of the enlarged print of only one finger of the ten. Then

the pores—like stations on a railway track—should agree. What an overwhelming proof of identity!

There can be no objection whatever while studying fingerprints to marking in red or other coloured ink characteristics or details, but I hold

PRINT OF RIGHT THUMB OF CHRISTOPHER X.



POINTS OF COMPARISON.

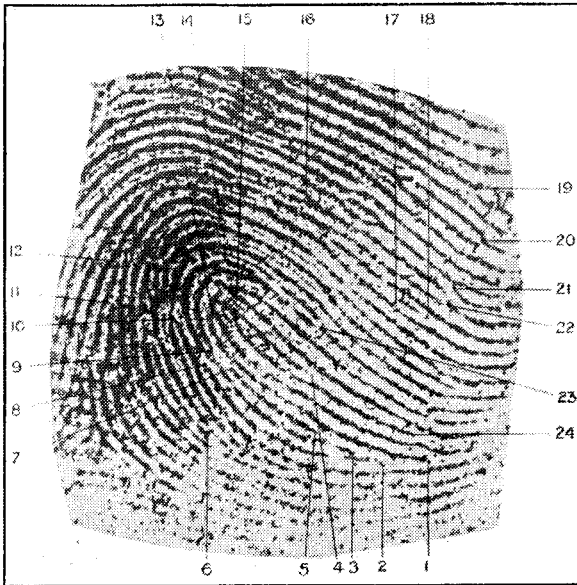
1. *End of line, one ridge from No. 24.*
2. *End of line, two ridges from No. 24.*
3. *End of line, between Nos. 1 and 2.*
4. *End of line running from centre core.*
5. *End of short line, three ridges from No. 4.*
6. *Meeting of two lines, four ridges from No. 7.*
7. *End of short line No. 5.*
8. *End of line No. 2.*
9. *Meeting of two lines between Nos. 7 and 8.*
10. *Meeting of two lines, next to No. 9.*
11. *End of line, four ridges from No. 10.*
12. *End of line, next to No. 11.*

there should not be any marking of exhibits coming before a magistrate, judge or jury—as seems to be common on the Continent, where even dim details are corrected and brought out with official pen or pencil, so as to lead to firm conclusions.

Many years ago I tried to show how useful this method of identification would be in the case of unknown persons found dead. This could

only, of course, apply where some general civic system of fingerprinting was in use. We have seen how effectively in Belgium it has destroyed the tendency of the criminal classes to hide their identity under the veil of an alias. It would soon do that effectively in this country. Some years ago a man was killed on the Great Western Railway at Slough.

MARK ON WOOD.



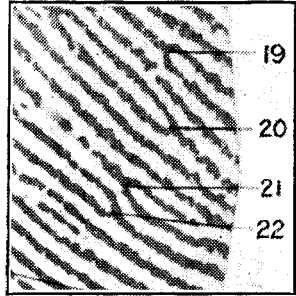
POINTS OF COMPARISON.

13. Meeting of two lines
14. Centre core and meeting of two lines Nos. 4 and 24.
15. Meeting of two lines, above No. 14.
16. Meeting of two lines.
17. End of short line No. 18.
18. End of short line No. 17.
19. Meeting of two lines.
20. Bottom end of lake.
21. Fork, two ridges from No. 20.
22. Meeting of two lines, next to No. 21.
23. Meeting of two lines, two ridges from No. 4.
24. End of line from centre core, one ridge from No. 1.

He had nothing on his person by which he could be identified. The local Superintendent sent his fingerprints to Scotland Yard, and, for some reason not stated, he was at once identified as one Walter James Downes, a farrier, of Deal. In the United States Navy many drowned soldiers and sailors have thus been identified, the system being in general use both in Army and Navy. Thus we read in a New York

journal: "The value of the fingerprint for tracing deserters or for finding out whether a recruit has enlisted before has long been recognised in the United States. But to-day it has assumed a greater significance as an invaluable means of identifying the American fighter, especially in the cases of victims of naval disasters. The Army, as well as the Navy, has its fingerprint bureau, and every man in the two Services has an etched replica of his thumbprint on his identification disc."

We can look forward now, I believe, with confidence to the time when a large number of experts will be wanted to operate the various bureaux required for the various public services, such as Banks, Railways, Post Office, Army and Navy, besides the Police, while it now seems to be but a question of time—not a very long time—when the general community will be fingerprinted just as they are now registered at birth.



CHAPTER XII.

Equipment required for practical study—Lens—Paper—Marked glass plate—Compasses or Kew micrometer—Flexible curve—Curve Rule—Coloured pencils.

The equipment for ordinary fingerprint work, such as one might be called upon to do who was not a special higher expert in the Police Force, is neither extensive nor expensive. A beginner ought, if possible, however, to get the following materials, etc., adding others as they may be called for in more advanced work.

1. For most people a small magnifying lens of from $1\frac{1}{2}$ to 2 inches focus is useful. They are generally mounted with a folding arrangement to protect the lens when not in use from being scratched.

2. Paper of almost any smooth variety may be used, but care must be taken to keep the sheets clean. Greasy or other marks are apt to be conveyed inadvertently when handling, and might give rise to wrong identification.

3. An ordinary pair of school compasses will be found useful, but the "Kew Micrometer," invented by the late Sir Joseph Hooker, is well worth its moderate price. It has the useful quality of rendering measurements at the same time in both our ordinary English system of inches, and fractions thereof, and the metric or decimal system generally employed on the Continent, and coming more and more into use among our own scientific workers. It is a great convenience in reading or scrutinizing prints and reports from foreign countries where only the metric or decimal system is recognised.

4. For the method of encircling suspected smudges, either before or after enlargement, and measuring from one fixed centre by the Kew micrometer or by ordinary compasses, I devised a *disc* of glass about the size of half-a-crown or larger. In the centre is ground a conical pit in which one leg of the compasses is made to revolve. Precise centring is thus obtained without any risk of damaging the photographic or other exhibit by the sharp point of the instrument, which has free swing at the same time. These were prepared for me by Mr. Benjamin Franks, optician, Manchester and Stoke-on-Trent, and cost a mere trifle.

5. The use of glass plates scratched in equal squares or in concentric circles equally spaced has been already mentioned on page 47, and need not here again be emphasised. The scratched face ought to lie next the print when being used.

6. A thin sheet of metal or cardboard with an opening, or small "window," has also been recommended by me for use as excluding unnecessary detail during the scrutiny of a fingerprint.

7. For those trained experts who have to do with enlargements of fingerprints it may often be necessary to test the concurrence of curved lineations in two official exhibits similarly enlarged. At one time I used strips of plumbers' lead, placed edgewise on the curved lines to be compared. They could be flexed so as to show the various sinuosities, however complex they might be, but required very delicate

handling to be trustworthy, and, moreover, such leaden tapes cannot readily be made to retain the curves imparted to them. Copper wire is stiffer, and so far well, but it very readily warps off the original plane and the result is spoiled.

An excellent way is to draw on transparent or tracing paper a line corresponding in curvature to that seen beneath it in the enlarged fingerprint. The transparency can then be transferred and adjusted to the other enlargement with which it is to be compared, the curves of which should, of course, be congruent if the prints had the same original and have been enlarged to the same dimensions.

The instrument called "Flexible Curves," used by engineers and mechanical draughtsmen, is really exceedingly serviceable for this purpose. The pattern B, self-clamping, 12-inch size, is for most cases quite suitable. Other patterns are made also in sizes of 9 and 18 inches. The B pattern has a flexible steel strip, like the lead tape just mentioned. After the one curve, or series of sinuosities, has been adjusted to line correctly, the shape is rigidly retained by means of a stiff-hinged link-work arrangement attached by tabs.

This strip of steel should not be pressed down between two tabs, and when bending or straightening out the instrument one should do so bit by bit, beginning at one end and continuing onwards from there.

The "Curve Rule" is another instrument of a similar nature in which the curves can be firmly fixed and retained. It is sold by Mr. W. Harling, 117, Moorgate Street, London, E.C.2.

For the beginner not expecting to do high expert work the use of tracing paper placed over enlargements, as described above, will be found quite satisfactory. One might use blue pencil in the one case and red for the other with which it is to be compared. When one is expecting to be called upon for evidence in perhaps a contested case demonstration with the aid of the instruments just described might be found more convincing and intelligible to judge and jury. In personal study of the curving lineations, it is a good method to draw those lines in alternate blue and red pencil. It helps one's eyes in following the lines.

In dealing with such *approximate* curves as are to be found among the lineations of fingerprint enlargements, one is not to be supposed to apply strictly mathematical principles. The lines, unlike those demanded by Euclid of happy memories, have breadth, but alas! not quite invariable breadth. We must therefore clearly avoid treating them, as a beginner fresh from school or college is apt to do, as ideal concepts. The simpler terms, however, as used by a teacher of drawing, with the provisos already hinted at, will serve very well to guide one's efforts, or to explain one's own conception before a magistrate, or a judge and jury.

CHAPTER XIII.

Case of the two negro Wests—Tests of comparison—Value of Dactylography and Bertillonage Practical cases examined—Danger of obscure printing—"Pilar Amor" in Paris—Latent prints—Science and the status of Police.

In the last chapter we saw how the fingerprint method of identification tends to help the accused person by relieving him from captivity till he has been adjudged guilty of the offence with which he has been charged, and even after he has been convicted and has served his time the criminal whose future identification is secure may now be permitted fuller liberty and free scope to secure reform by honest industry.

There are other ways in which the service it renders to humanity can be shown, of which a few examples may now be given, all of practical interest to the Police official

A well-known journalist and author of high repute sent me, at the time of the first investigation, an account of a case in which an innocent man was, after great risk, ultimately saved from unjust punishment by the aid of the fingerprint system then first applied in that district of the United States.

Mr. Reno, Superintendent of the Federal Bureau of Identification, Leavenworth, Kansas, subsequently sent me copies of the official registers which give the bodily measurements according to the system of Mous. Bertillon, and the fingerprints of the five fingers of each hand.

Mr. Bert Wentworth, lately the leading Detective in the U.S. Service, and a great authority on the practical use of fingerprints, has also kindly furnished me with some particulars.

A coloured man named William West was wanted for a murder in Kansas. Now it happened that a young negro of that very name and of very similar appearance to the suspected man was in the local prison for some minor offence. At that time the method of bodily measurements was in great favour, and had been applied to the man in custody and to the afterwards convicted prisoner, and those measurements were found to agree very closely in respect to both of the two coloured William Wests. A few of the principal measurements are here given.

We may, for our own purposes, here call one man A, whose number was 3426, and the other, numbered 2626, whom we shall refer to as B. B is set down in the register as a miner, 21 years of age; while A is described as a farmer of 26. Each William West is stated to have been born in Texas.

The colour of the left eye—the only one described—is in each case said to be "deep maroon." In each the measurement of trunk was 913; cheek width 148; teeth of both were "full" and "good"; both had forehead "broad"; each had "black beard" and "black hair," and the build of each man was stated to be "tall and slender." The chins were similar. The similarity of the ears is not pointed out in the record, which I, as a student of anthropology, think is a most important element in personal recognition. To me, the photographs convey the impression that the ears were alike—that is to say, the corresponding

ears shown in the profile. The others, which are not shown, may have been different for anything one can tell.*

And now we come to some points that differ slightly.

A.		B.	
Head length	197	Head length	198
Height	78.5	Height	77.5
(= 5 ft 10½ in.)		(= 5 ft. 9½ in.)	
Left foot	282	Left foot	275
Forearm	502	Forearm	503
Right ear	6.6	Right ear	6.5

In this case four months seem to have elapsed between the measurements of the two persons. It may here be observed that it has been found repeatedly that the measurements of the same person often differ



“ A ” PROFILE.

“ B ” PROFILE.

slightly when night and morning measurements (in the same day) of stature are compared.

The differences between these two official measurements, no doubt taken with great care, are not great—that of the two left feet is the most notable.

Such natural differences as are here recorded come within the usual experience of officials who adhere to the system of Bertillon, measuring the same person twice, with that one exception, and it must be remembered, even in that example, that the figures are in the decimal system and indicate a very small divergence when put in fractions of an inch.

It is now believed that the two men were relatives, perhaps were very closely related, and, despite of the stated disparity of their ages, may

* In Prof. Breasted's *Ancient Times* a remarkable example of the care ancient Egyptian art took in such matters is contained in Fig. 63 (page 85), Portrait of Thutmose III, and an outline of the same monarch's mummy. The ears are closely alike.

have been twins. The register, however, makes a difference of four years to exist between them, which may have been due to the statements merely of the men themselves, rather than from anything that appears on the record.

Fingerprints were not so well understood and appreciated then—before the great European war—in the United States, but at last they were tried in this case, for the first time locally, with the result now to be stated.

The fingerprints in the photographic reproduction sent me are hardly free enough from the obscuring effects of mechanical processes and reduction of size to form a good subject for minute analysis to be reproduced in these pages. My own careful examination convinces me, however, that while there is a general similarity such as one sometimes finds in families, but not always or even generally in twins of the same sex,



“ A ” FULL FACE.

“ B ” FULL FACE.

there are no examples of convergencies even of small sections as seen through such a “ window ” as has been already explained.

Sometimes this similarity does happen to a limited extent in people quite unrelated, whose patterns may generally be quite discordant even to an untrained eye, but yet a characteristic or two may follow even in similar sequence. Even that is pretty rare.

I don't think any intelligent jurymen would doubt, after careful scrutiny, that these two sets of fingerprints could not possibly have been derived from the same person.

This case you may believe, did a great deal towards establishing in the official mind of the United States the superiority of the English fingerprint method to that of bodily measurements. Personally, I continue, however, to believe that many of these measurements, when carefully done by trained men, should still have some genuine value for identification, alongside of photographic portraiture, tattooing, and a study of the varied shapes of the human ear.

How the fingerprint method now holds its own in the United States

may be illustrated by a statement recently made by Mr. Clifford L. Grant, Chief of the Detective Bureau in the District of Columbia. He said that although he was at first sceptical as to the value of fingerprint identification, now "it would not only be ridiculous, but utterly unthinkable, to attempt to conduct any Police department, no matter how small, without a complete fingerprint bureau of identification"—a requirement which would include at least one officer competent for the expert work involved.

I feel quite sure that though our present parsimony of public money may amply be justified by the strain on taxpayers and ratepayers, when commerce gets its wings into action and our works begin again to hum and make honey, this will be found to be one of the most profitable modes of expenditure for social security and comfort in many ways and directions.

A wealthy American, it is said, has had tattooed on his back a very fine picture of the Nativity, which cost him £200 and some two years of penance in "looking pleasant" during the process. It seems to be a pity that his adornment cannot be openly displayed.

A fond mother is now known sometimes to have her child tattooed so as to secure its identification in life or death. How much better if infants at a certain stage were universally fingerprinted and registered!

The State of Argentina, which in this respect is now one of the foremost in the world, is replacing the *Matador* by *El Identificador*.

In my work *Dactylography* (1912) I wrote: "Early in 1904 an office in Bradford was broken into by smashing a glass panel in the door. Some cash and postage stamps were secured by the robber. On one piece of glass a single fingerprint had been imprinted accidentally, which was found by the Police to be that of a suspected person whose impressions had been officially secured some time before. The offender was duly charged with the crime and convicted. The photographs in this case were reproduced in *The Strand Magazine* of May, 1905, one being the enlarged impression found on the piece of glass, and the other that of the supposed corresponding impression, which was that of the prisoner's left thumb. Those fingerprints resemble, but their mutual likeness is by no means quite conclusive and convincing."

Mr. Mallet, the author of the "Fingerprints which have convicted criminals," however, says: "The reader will see how precisely similar are the impressions, and he will be interested, with the aid of a microscope, in seeing how exactly the almost countless ridges and characteristics of the thumb are faithful doubles." The patterns are both enlarged so greatly that not even a lens is required for their discernment, and the "countless ridges" do not run above forty. The two figures are not equalised in their enlargement, and comparison is made unnecessarily difficult, but when made the curves for some reason cannot be got to agree. The officially registered impression affords clear lineations, but that on the bit of glass panel is muddled and smudgy. On the whole I should not call it a good example of this kind of identification.

A second case given is that of an imprint on a small box which had been used for containing homœopathic remedies. Some cash had been stolen on a certain Saturday night, and on Friday the delinquent was captured and convicted by means of his fingerprints. The reproduced photographs show the pattern to be somewhat simple, and, allowing for a certain inevitable faintness due to indirect reproduction, the evidence is good of its kind. A pattern of somewhat greater complexity would have afforded much stronger evidence. The chances of a single

fingerprint of very simple design, so to say, being repeated in the case of another person, is not to be ignored, and if the suspected smudge is obscure the evidence ceases to be of much value.

Of the third case mentioned we are assured that "without the fingerprint it would have been impossible to convict." Now, the enlarged imprint of the suspect's right middle finger has been printed quite clearly, and has good, unique characteristics, but just where these would be most useful for identification the lines in the suspect's smudge are fatally blurred and useless for comparison.

A better case is that of a print on a drinking-glass—which was brought out in the way described below. The pattern was rather striking and the resemblance convincing. The prisoner afterwards confessed his guilt and assisted the Police to arrest another man and to recover some stolen property.

Such greasy or syrupy fingermarks can often be fetched out, as we saw, by powdering them—if on transparent glass, porcelain, crockery or the like, as on paper, by blowing or dusting over the smudge a fine light charcoal powder—that from lead pencils does very well—but if the surface on which they occur is dark then light carbonate of magnesia dusted on very softly brings out a white pattern on the dark ground—a *negative* image.

In many cases the best way to deal with smudges on glass, polished furniture, or metal, japanned ware, porcelain, etc., is to get a good photograph taken by an expert. Space will not allow me to develop this point in detail, but some good practical directions for those who read German are to be found in *Daktyloskopie*, by Windt and Kodicek, Vienna, 1904. By placing paper of dark hue behind the fingerprint on a transparent surface, and modifying the light in direction and intensity varyingly, good results may be obtained. Sometimes coloured powders are found, when lightly dusted on, to bring out hidden or "latent" prints. Quite a variety of these have been tried with results of different kinds, according to the medium originally imprinted modified by chemical reaction. This would require an elaborate article by itself.

The really intelligent and incorrigible crook, after filling out his time, does not now go to the useless expense of a new beard and wig. He changes his style of hat, shoes, and clothes, adopts new mannerisms, perhaps a local brogue, practising them very carefully, and, above all, whenever he goes into action he wears gloves.

A man was apprehended at Blackpool for making a false registration. He smiled when it was observed that he had his first finger covered up, saying it had been badly hurt. It was found that there was nothing the matter with the finger but the existence on it of a tell-tale pattern. He was found to have had several convictions in Canada and the United States.

Mons. Bertillon had once in hand a curious case of a foreign youth, who got the name in Paris of "Pitar Amor," and who spoke a mysterious hitherto unknown language. Bertillon had him before a learned magistrate, Mons. Roty, who had made a serious attempt to study this extraordinary tongue. Bertillon suddenly came into the room and told that official that he had now got the scamp. He had somehow managed to get his latent prints, and now told the subject of investigation that he was one Agostino Rinaldo, of the Austrian Tyrol. The lad burst into tears and confessed all, saying that he had made up a jargon of Italian slang and German, aided by his own imagination. The magistrate, who had been treating him sumptuously, was greatly astonished, and became the laughing-stock of Paris for a day or two, as he had laid himself out seriously to master the language.

Shortly after blending fingerprints with his own system Mons. Bertillon wrote me generously to say that the addition had increased their sense of security against false identification.

And now, in drawing my pleasant task to a conclusion, I should just like to point out how the Police officer who has to stand between the austerity of law and the individual citizen, is fast assuming a position like that once occupied by the physician ("medicine man") and the priest. Natural law has come rapidly to the aid of that which man, for his own social purposes, has made. We have seen how in Belgium the convenient alias has now become rare. The crook who the Germans say *lange finger machen* (=makes a long finger) is getting to be very modest in displaying that useful if sometimes soiled organ. As the late Mr. Davidson said, in his *Mammon and His Message*:—"The gloves of party, of culture, of creed wherewith men hide their fingerprints lest they should be caught in the act of being themselves, I decline to wear." Well, the honest, effective man needs them not. True social service, the note of up-to-date saintship, is to be one's real self. Every baby, of whatever rank, comes into the world with its little heraldic crest, like no other in the world, which it ought to be taught early and gravely never to dishonour or to betray.

It is found in the criminal records of our own country that the evil-doer in a tight corner goes back on his own mother's name. We cannot, after all, get away quite from our original strain, from our past experience, out of which is woven our present responsibility.

It is the sublime function of law and its officers to aid men to keep on the straight and narrow line, while ethics, inspired by religion, gives them steam to go forward to their higher destiny.

CHRONOLOGY.

1823.—J. E. Purkenje's graduation thesis: Classifies patterns, but made no proposal for identification.

1880.—Henry Faulds laid his project of identification by fingerprints before Charles Darwin and other scientific and legal authorities. On October 28th of the same year he published in *Nature* a contribution on the "Skin-furrows of the Hand."

1881.—Alphonse Bertillon in a pamphlet announces his anthropometric system of identification (i.e., by bodily measurements). In the same year *The Times* (August 5th) refers to the first entry on the subject in the U.S. *Index Medicus* as thus:—" (Faulds, H., 6—On the Skin-furrows of the Hand, *Nature*, London, xxii, 605.)"

1882.—(August) Fingerprints used for identification in an expedition of the U.S. in Mexico.

1886.—Faulds after return from Japan urged his method on various authorities, including Scotland Yard.

1891.—Juan Vucetich, in Argentina, made his first Police identification by the fingerprint method.

1894.—" Mr. Asquith's Committee " recommended a system combining fingerprints with Bertillon's method.

1897.—Fingerprint system, associated with that of Mons. Bertillon, adopted in British India.

1900.—Identification private service by use of fingerprints founded by Dr. Laveleye in Belgium.

1900-1.—" Lord Belper's Committee " recommended adoption of fingerprint method in England. No report published.

1901.—Ten-finger in serial order method adopted in England, as first proposed by Faulds.

1902.—" Mr. Brodrick's Committee " considered same method in relation to recruiting. Faulds the only expert called. No report published.

1905.—*Guide to Fingerprint Identification*, published by Faulds. Now out of print.

1914.—Edmund Locard, of Lyons, emphasises the permanent location of pores as giving proof of personal identity in *La Preuve Judiciaire par les Empreintes Digitales*. [Lyons, A. Rey.]

GLOSSARY TO MANUAL OF DACTYLOGRAPHY.

- ACCIDENTALS--Nondescript or irregular patterns in class "composites."
- ANTHROPOID--Of the great man-like apes (gorilla, orang-outang, and chimpanzee).
- ANTHROPOMETRIC.--Of bodily measurements.
- ANTHROPOMETRY.--Science of accurate bodily measurements.
- ARCH.--A bow, a curved lineation, or set of them, without backward turn.
- BERTELLONAGE--Alphonse Bertillon's method of identification by bodily measurements.
- BIFURCATION.--Fork-like splitting of lineations.
- BLUR.--A smudge, or smeared imprint.
- BOW.--A curved lineation of bow-like form.
- BULB.--The pad of a **finger-tip**.
- CHARACTERISTIC.--A distinctive element in a fingerprint pattern, such as fork, island, spiral.
- COMPOSITE.--Patterns composed of blended elements.
- CORE.--The heart or central portion of a finger-pattern.
- CREASE.--Lines which show the folding of the palmar surface of a hand.
- CUTICLE.--Surface skin or Epidermis.
- DACTYLOGRAM.--A finger-pattern (applied generally to similar patterns on any part of the skin).
- DACTYLOGRAPH.--A fingerprint.
- DACTYLOGRAPHY.--The science of fingerprints.
- DACTYLITE (or DACTYLOLITE).--An impressed finger pattern in relief, as on wax.
- DACTYLOSCOPEY (= DACTYLOGRAPHY).--Strictly applied, means a study of finger-patterns *directly*.
- DELTA.--A triangular figure frequently found in finger-patterns.
- DERMA (or DERMIS).--The true or leep skin.
- DETAIL.--*See* Characteristic.
- DIGIT-AL.--A finger or toe; adjective.
- DORSAL.--Applied to back surface of hand. *See* Palmar.
- EPIDERMIS-IC.--The surface skin.
- EPITHELIUM.--Scaly surface skin.
- EXHIBIT.--An article to be shown as evidence in Court.
- "FLEXIBLE CURVES."--An instrument for measuring and comparing enlarged curved lineations.
- FORK.--Any **Y**-like figure with two or more branches.
- FORMULA (*pl.* FORMULÆ).--The alphabetic signs used to denote finger-prints.
- FURROW (= SULCUS).--A groove between lineations.
- HOOK.--A **J**-like figure in any position, and curved either way.
- INDEX FINGER.--The finger used in pointing; the forefinger.
- JUNCTION.--A blending of lines, as in a railway map.
- LINEATION.--A line in a finger-pattern.
- LOOP.--A curved line returning on itself.
- MICROMETER.--A kind of compasses used for fine measurements, in inches and millimetres simultaneously.
- MIRROR PATTERN.--The exact image of a given pattern reversed, as in a mirror.
- NEGATIVE.--A print in which the ridges are white and furrows black, as when smoked glass is used. (*See* Positive.)

- PALMAR.—The front surface of the hand; the palm.
- PAPILLA (*pl.* PAPILLÆ).—Elements in a ridge where touch organs are found.
- POCKET LOOP.—A variety of imperfect loop.
- POROSCOPY.—Method of observing location of sweat pores.
- POSITIVE.—A print which ridges are black and furrows are white. (*See* Negative).
- PRIMATES.—An order of animals, including Lemurs, monkeys, apes and man.
- RADIAL.—The thumb side of the hand. (*See* Ulnar.)
- RECOGNITION.—An identification.
- RECIDIVIST.—A relapsing or incorrigible criminal
- RIDGE.—A line of skin tissue, elevated, with sweat pores.
- ROD.—A straight lineation like a rod.
- ROLLED PRINT.—A fingerprint taken not by direct impress, but by a rolling motion, so as to give a large area.
- RUGA (*pl.* RUGÆ).—A ridge.
- SEARCHER.—One who seeks the register for former records.
- SEBACEOUS.—Of the greasy exudation from some skin glands.
- SMUDGE.—A blurred or dull imprint; an apparent fingerprint, not yet examined.
- SPOOR.—Vestige, trace, footprints, etc.
- STAPLE.—A figure like an inverted **U**, thus **∩**.
- SUDOR.—Sweat, perspiration.
- SUDORIPAROUS.—Of sweat-yielding glands.
- SULCUS (*pl.* SULCI).—A skin groove or furrow.
- TWINNED LOOP.—Two adjoining loops in a core, complementary in position.
- TENTED ARCH.—An arch shaped like a tent or volcanic mountain.
- TERMINUS.—A distinctive point within or without a core.
- “TUNING FORK.”—A figure shaped something like a **Y**, but with curving branches.
- ULNAR.—The little-finger side of the hand.
- VERSO.—An imprint which is the reverse of its original fleshy pattern, as in the print of a coin.
- WHORL.—A flat spiral figure.
- WIDDERSHINS.—The reverse of a clock-hand's movement.

On Chapter IX.

Section I.

1. Make smooth a patch of ground and get put on it imprints of a person walking and running. Comparisons may be made of several such imprints.

2. Transfer carefully from a layer of fine, evenly-spread chalk powder a footprint or bootprint to a sheet of brown paper the surface of which has been made slightly greasy or sticky.

3. Collect block prints from advertisements of shoe-sole patterns now in use and on sale. Try to classify them.

4. Observe the wearing away or distortion in worn shoes of people well-known to you, and study—without offence—the effect of gait in these cases.

Section II.

1. Get a boy or woman, wearing the boots of some man you know, to walk over a piece of prepared ground so as to leave footprints. Compare the prints as to lightness, spread, length of tread, and so on.

2. A good way of making casts from imprints of feet or boots on clay or damp soil is to dry the prints carefully by holding over them a red-hot iron. Then sprinkle into the hollow shavings or hard paraffin, heating again with the hot iron. Repeat the process until the cavity is filled up, avoiding the making of air bubbles. When the mass is cool it will be found to be a perfect cast.

3. Make light prints from fingers slightly and evenly greased with oil, butter, lard, etc., on clear glass. Turn the print about in different lights, and the pattern will probably show up well; or, if not, place dark-coloured paper or cloth behind, or paint the back of the glass with Brunswick black. If the print still remains latent or obscure, dust it over gently with dark powder such as may be made by grinding graphite—that is, the black “lead” of pencils—or powdered mercury and chalk sold by chemists, or very finely powdered charcoal. This brings out a *positive* picture of black ridges with white furrows and pores.

4. Having made some “Runic” diagrams, as already described, try to reproduce one or two correctly with their pore-openings properly located. Thus you get something like a railway map with its junctions and little white stations dotted along the line.

On Chapter X.

Section I.

1. Wash carefully the finger selected to be imprinted; then grease the surface of the pattern ridges by impressing the finger firmly and evenly on a smooth piece of oily or greasy paper or on a greasy plate. Butter, oil, lard, or margarine may be used. It must form only a very thin coating or film. Take several impressions on different qualities of smooth paper for comparison.

2. Dilute some copying ink with about an equal part of clear water. Then float some invisible greased impressions, keeping the imprinted side upwards. Again, taking other impressions wet repeatedly the *back* of the print by means of an artist's soft hair brush dipped in the diluted ink. After drying, this can be done repeatedly a few times, when the imprint will become more and more clearly visible.

3. Make some greasy fingerprints on a clear blacking polished or lacquered boot, or on a piece of japanned tin. Dust on the spot *very lightly* some *light* carbonate of magnesia, to be got cheaply from any chemist. Blow or shake off the superfluous powder, when the pattern

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