



A Review; Timeline of Palm prints since beginning till now

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Abstract

Prints (palm & finger) have the historical role in human culture and represent a pivotal role in myth and ritual in certain cultures as well as in security related applications & in the current world climate; Now a day which become a intense subject of research due to its application as invaluable tools for investigators and forensics. Over the last few decades, personal identification is on focus and discussed in details with the confronted problems about their future identifiable system which is consequently the most important task. No single comprehensive study has yet been made of the historical role of palm prints in human culture; a considerable amount of information on prints is scattered in the anthropological and sociological literature as part of ethnographic treatments of culture throughout of tropic. In this paper the timeline of the palm prints have been studied since the beginning of the time up to recent.

Keywords:

Application; culture; identification; Prints; Palm

Introduction

Today, when identification of an individual through prints (Palm and finger) has proven their importance in the recent world climate; has a long history that started with the communication of indigenous people of having an intimate and direct relationship

with the identical resources in culture and business as well as in present and provide the sources of the past to expressing the things and interpretation and changed in the investigation to identifying the suspects in the modern era. Although a lot of methods and techniques have aroused with the time such as DNA fingerprinting, identification through hair, teeth, etc. which is considered the best identical and carrier of genetic characteristics and that never fail but the prints (Palm and Finger) which are unique, perpetual and universal are used most commonly used because of their reliability and as an inexpensive methods of identification. Prints (Palm) were firstly used in as a source of communication, devotional symbol and a sign for particular business which changed with the time and now a day become the most reliable and identical evidence to nab the suspects.

Timeline

Before the development of writing, early human may have created images to communicate with each others, Gods or to record the knowledge which were created to resembled and express the close reality because what type of words or thoughts an artist intended to communicate at first appearance were known. Dating from 30,000 and 17,000 years ago Abstract such as dots, hand prints, wavy lines may have been symbols for interpretation whose images are



stationed in caves of **Pech Merle** and **Lascaux** in southwestern France and the material found within the geographical area were used to create these images or epistle. Images which were made of perishable substances and are forfeited now, just a few of images among them have survived thousand of years (Berry J. & et al., 2001). Like so, the first wide-scale, modern-day use of fingerprints was predicated, not upon scientific evidence but upon superstitious beliefs. Over the extent of human history, the appliance of realistic images which were found in caves in form of paintings developed more convoluted, pictographs, cuneiform and Hieroglyphics (Kingston C.R., 1965).

Neolithic man initiate written communication as long as 20,000 years ago and the pattern of fine ridges on fingers, palm, sole and toes must have aroused interest because they graphically represented objects and interpretation in drawing on the wall of cave with their thumb prints, palm prints and fingerprints which are assigned as **Iconographs** now. Around 10,000 years ago, Palaeolithic site at Sebekian deposit Kom Ombo plained on the east bank of river Nile; first time it was noticed that primates have ridge details (Olsen R.D. & et al., 1987). Dame Kathleen Kenyon carried out the excavations about the house's brick of Egypt dated between 7000 B.C. and 6000 B.C. in his book "Archaeology of holy land" where a paltry portion of Palm prints on hardened mud was found and the wall's of brick were designed by hand in shape rather like a flattened cigar whose surface was impressed with pair of thumb. Shown in figure 2.1.2. (Jagerbrand Mikael & et al., 2007).

Although, the provenance of first systematic method for written communication is uncertain but the evidences found in artifacts proposed the beginning sometime after 3500 B.C. Pre- Historic Carvings initiate with the

earliest trace of finger prints which were impresses purposely in Mesopotamia dates from Cirea 3000 B.C. where same method of marking was used in making the Kings Store house which was implicated in the construction of the buildings of ancient Egypt (German E., 1999; Barnes Jeffery G, 2006). In ancient Babylon (1000-2000 B.C), fingerprints were used for business transactions on the clay tablets. In Nova Scotia, the picture writing of hand with ridge patterns was used. The evidential value of prints found in form of the official documents of China in 3000 B.C. where thumbprints initiate on the clay seal (Xiang-Xin and Chun-Ge, 1988) on one side to prevent tampering while another side bears the official documentation. The thumb impression was used for the identification of an individual which means prints started to be used for the purpose of personal identification. This tradition continued by 300 BC where potters used their prints to indicate the ownership. It was a definite example of reproduction of friction ridge skin for individualization and value of friction skin was understood prior by Chinese era (Laufer B., 1912).

A petroglyph stationed on a cliff face in Nova Scotia 1st Century A.D., depicts a hand with exaggerated ridges and whorls pattern (Finger) presumably left by the Mi'kmaq people and in 400 A.D. Grauballe men discovered a picture of hand with ridge patterns in Nova Scotia. A government physician in 14th Century A.D conceived the observation from the government documents (Which have fingerprint impression) in Persia that no two fingerprints were exactly alike.

In India the nobility to use the friction ridges as signature came in 1637 A.D when the defeated army of Shahuji Bhosle compelled to accept the phrase of peace with a written treaty followed by the impression of his hand



as a stamp (Sodhi & et al. 2003). It was supposed to be adopted from Chinese and that time it was only reserved for royalty (Sodhi & et al., 2003).

Quintilian an attorney in Roman courts (1000) manifestation the bloody palm prints whose meant were the identification and to frame a blind man for his mother's murder (Dillon D., 1977). Michael Scotts (1477) understood the earliest text on palmistry and published "De Physiognomia" in which he described the physiognomy (A pseudo science that premises the appearance and visible characteristics and reflects character & personality) of human body and hand (Fauld H., 1880; 1922).

In the late 17th century, when observation of the human skin initiated to publish; Dr. Nehemiah Grew was the first who observed friction ridges in 1684 and illustrated the patterns and pores on the hand in details which was published in "Philosophical transactions of the Royal Society of London (Ashbaugh, 1999; Lambourne, 1984). In 1685, Dutch anatomist Govard Bidloo published a book Anatomy of human body which consist of the details of skin, papillary ridges but deteriorated to abode individualization or permanence (Ashbaugh 1999; Felsher 1962) while during the same period in 1687, Marcello Malpighi figured out about the function, form and structure of friction ridge but didn't confer about the identification of an individual from ridges and published concerning the external tactile organ in which skin's surface was discussed and after him a layer of skin was named "Malpighi Layer" (Galton F., 1892).

John Evangelist Purkinji published a paper in 1823 in which the nature of fingerprints was conferred and proposed the classification system based on nine major types (Lambourne, 1984; Galton, 1892.). However,

he also deteriorates to perceive their individuality potential, yet his contribution is significant because these types of prints were precursor to the Henry classification system (Hershel 1916).

Sir Willam James Hershel (Chief magistrate of Hooghly district, Junipur) in 1858 was the first person who used the Hand prints on native contracts on a whim and without the logic toward personal identification. He had a local business man (Rajyadhar Konai), who impressed his hand print on the posterior of a contact. Shown in figure 2.1.5 (Sir Willam J. Herschel, 1916).

The native was suitably impressed and Herschel adopt a manner of requiring palm prints on the contacts in which later on the right index and middle fingers were replaced on the place of palm print. That time fingerprints were predicated but beside the scientific evidence over whembled as a superstitious beliefs and it was his personal conviction that prints are unique and perpetual (Chapel C.E., 1941; De Forest H.P., 1938). Paul Jean Coulier (1863) was the first person who observed that the latent prints can be developed on paper by iodine fuming and mentioned the potential for identification of an individual from intensified prints with the help of magnifying glass (Morland N., 1950).

Herman Welcker got the attention of everyone by studying the permanency of friction ridge skin during 1856 to 1897. He desired no attention rather then to overtures the assistance of prior claims of the friction ridge skin's permanency (Wilder & et al., 1918). Being the first person to study the persistence of friction ridge skin all attention goes in favor of Sir Willam James Hershel while Welcker is not generally named (Pearson K., 1914). Henry Faulds turn his interest in the friction ridge skin detail and



worked independently by collecting prints of both monkeys and people. Finally in 1880 Fauld wrote that friction ridges were unique to each individual, identifiable, classifiable and permanence, with the help of naturalist Chales Drawin (Lambourne 1984).

In 1892, Sir Francis Galton published the first comprehensive book on the nature of fingerprints and their utilization in crime prevention. The system was first used in India in 1858 by Sir William Herschel to prevent impersonation, but the credit was given to Sir Francis Galton to making its systematized for the identification of criminals. His system was officially adopted in England in 1894, and was further modified by Sir Edward Henry. Afterwards the studies have been conducted on fingerprint ridges mainly its types, classification, methods of lifting fingerprints, recording of fingerprints and materials used to develop fingerprint.

At the same time in 1892 Juan Vucetich, a researcher implicated the fingerprint classification system in a murder case of two children by their own mother (Francesca Rojas), an Argentine woman was convicted on the basis of fingerprint evidences; first time anthropometry was replaced with fingerprints (Block E.B., 1979).

Sir Edward Richard Henry collaborated with Galton in 1894 on a disposal of classification for fingerprints and with the help of Bahadur Azzizul haque and Rai Bahadur Hem Chandra Bose evolved Henry Classification system and published the classification and uses of fingerprints which was confirmed effective and used everywhere (Beavan C., 2001). Bahadur Azzizul haque and Rai Bahadur Hem Chandra Bose from were two Indian fingerprint experts from anthropometric Bureau Calcutta in 1897 whose were approved for a committee under the supervision of Edward Richard Henry to

report that fingerprints should be used for criminal classification records which later on became the world's first fingerprint Bureau.

In 1897-98, Comte De Saint-Germain published on the relationship of palmar apices and distal mount (Saint-Germain Comte, 1973). In 1902, Alphonse Bertillon was responsible for the first criminal identification who made comparison between the prints recovered from the scene of homicide against the prints of a criminal which were already filed and established a milestone for investigators (Rhodes H., 1956; Mccaughy M.W., 1922). At the same time period in 1902, H. Wilder started the comparative study on dermatoglyphics by producing work on methodology and morphology of palmar and planter surface (Whipple I.L., 1904).

In the early of twentieth century, Harris Hawthorne Wilder pioneered a comprehensive study on the methodology, racial variation and inheritance of palmar and planter surface ridge pattern as well as fingerprints and initiated to publish papers since 1902 and continued through 1916 which was the first serious study of palmer and planter dermatoglyphic (Wilder harris, 1902; 1904; 1916). At the same time, Inez Whipple- Wilder published first study of non- human epidermal ridges in 1904 (Inez L. Whipple Wilder, 1904).

Bonnevie Kristine Elisabeth Heuch studied about the papillary patterns of human fingers in 1924 (Bonnevie Kristine & et al., 1924) and explained the genetic inheritance of patterns, cell division embryology of dermatoglyphics and effectiveness of volar pads which affects the pattern type. He was the first to explain about the different growing rates, creates buckling which overturns ridges on the surface of skin and explained that basal layer of epidermal grows



faster in comparison of other epidermal skin. At the same time, In 1924; Kristine Bonnevie published the important study on the genetics of prints (Bonnevie Kristine & et al., 1924).

It was William Nicholson Jennings who took attention in United States for being the first person to record his own palm prints for such a long time since 1887 – 1937 and after the examination of recorded prints he noticed that they didn't change (Myrus H.J.II, 1942).

Professor Victor Balthazard presented the first statistical model basis on the Locard's Tripartite Rule for prints individuality in 1911. George Koestle was the person who took the specimen of suspect and compared the palm prints in 1917 in Betts case- Ohio which may had been the first conviction depraved solely on the basis of Palm print evidences (Fingerprint & identification magazine 1942). At that time identification from palm prints happened around. In another appliance of palm print; it was done in the identification of a criminal in 1918 that was a robbery and driver was murdered. Only a bloodstained letter which having the bloody palm print was found from the crime scene, this was later matched by two experts with the culprit's print and sentenced to death (Haward Hickson's stories, Accessed 26 February 2015).

In 1924, K. Bonnevie investigated the embryology of dermatoglyphics by conducting study on genetics inheritances in patterns while at the same time H. Poll and J. Danmeijer worked the distribution of dermatoglyphics amongst different races (hale A., 1952).

Harold Cummins coined the word Dermatoglyphics (Bettmann 1932; Schaeuble 1933) with the collaboration of Charles Midlo in 1926 (Norris M. Durham & et al.,

1990) which is used to this day to illustrating the scientific study (Cummins Harold & et al., 1926) of palmar and planter ridges of hands and feet. In 1929, Cummins published the most widely referenced paper on "Dermatoglyphic" to date together with Midlo and Wilder (Cummins Harold & et al., 1929). Over the years, Cummins and his collaborators published several studies related to dermatoglyphics and his famous book "Fingerprints, Palm and soles" bible of dermatoglyphics in 1943 to date (Cummins Harold, 1943), to which he dedicated to the pioneer Harris Hawthorne Wilder.

In 1934, in a burglary case; defendant's palm print was recouped from the windowsill of the breaking glass and the entry scene and the defendant contended that palm print (Beletti, 1934) was not sufficient to sustain a conviction (Else W.M., 1934). The court ruled that evidences were enough not to discharge the defendant and told that fingerprints and palm prints both are considered physical characteristics and can be used sufficient evidences (Fleischhauer, 1951).

An English palmist Noel Jaquin studied about the physiology of patterns (Jaquin Noel, 1934) and character traits of different patterns (Jaquin Noel, 1934) and finally in 1940 he concluded his studies (Jaquin Noel, 1940) which were further continued by Vera Compton who published his conclusion in 1951 (Compton Vear, 1951; 56). In 1952, Hale described the papillary ridges, structure, dermal papillae and characteristics of definitive dermal ridges were progressively formed.

Salil Kumar Chatterjee published his book "Finger, Palm and Sole prints" in 1953 and was best known/recognized from his article "Edgeoscopy" (Chatterjee, 1962) in which he conferred his theory for using specific ridge-



edge shapes to supplement fingerprint individualization and defined about the ridge shape including straight, convex, concave, angle and peak which used to assist the identification (Ashbaugh, 1999).

In 1963, Yusuke Miyamoto proposed Character trait recognition based on his observations on few philosophies and various types of prints (Miyamoto Yusuke, 1963). In an international symposium in 1967, Sarah Holt published his paper and convened to standardize dermatoglyphics nomenclature and structure while "the genetics of dermal ridges" was published in 1968 by Sarah Holt, who summarized her studies in research of the dermatoglyphics patterns in both palm and finger of discrete peoples which were normal and congenitally afflicted.

Dr. Eugene Scheimann mentioned medical palmistry in his work in 1969 (Scheimann Eugene, 1969) after the work of Hutchinson who talked about the collection of prints and its efforts in predations and interpretation. Hutchinson explored the meaning of palmar patterns and to make the use of unusual dermatoglyphics patterns that appeared on the palmar surface (Hutchinson B. Beryl, 1967; Narahai, 1983). Moenssens 1971 also contributed by giving the excellent treatise on the early history of fingerprinting.

To utilize the dermatoglyphics markings of palm and patterns; in finding the psychological characteristics (Beverly C. Jaegers, 1974) started with the work of two American scientists namely Beverly C. Jaegers and Fred Gettings in 1974. Beverly C.J. devoted her work to following the Penrose's work on palmar dermatoglyphics and fingerprints and hand analysis. By her observation she omitted two new patterns in Hutchinson namely proximal phalange and ulnar loop.

Dr. Michio Okajima from Japan published his observation of dermal and epidermal structures of volar skin (Malhotra, 1987) in 1976, in which appearance of smaller ridges in friction ridge impression was discussed and it was a contribution in the study of incipient ridges (Ashbaugh 1999).

Tiller I and Majewski F. (1978) studied the furrows and dermal ridges of hand in patients with alcohol embryopathy in that it was noticed that the palmar creases of alcohol embryopathy having several typical deviations and the distal palmar creases is generally sharply bent while the proximal transverse crease were hypo-plastic. (Tiller I. & et al., 1978). At the same time, Chattopadhyay P.K. and K.P.S. Kushwaha carried out the work on the dermatoglyphics approach to the problem of Rajput which was related to the population selected randomly in 1978. At present in 1978, Plato Chris C. worked on the dermatoglyphics and aging among the different age group of male and comprised the frequencies of discrete dermatoglyphics characteristics among them which indicated that the adult groups had very similar, progressively and significant dermatoglyphics frequencies.

"Paleodermatoglyphics" term was introduced by the Bartsokas (1982) to describe the utilization of palm and finger evidences and suggested that ancient Greeks were so fascinated by the prints of dermal ridges that they believed that the stars contributed to the formation of palm prints which in term distributed the destiny of an individual.

In 1984 Lacroix et al., Kimura and Kitagawa 1986, and Stevens et al., 1988 stated based on the palmar surface development at different foetal ages and saw the development of flexion creases by the thirteen weeks of gestation which are typically located in hand malformation in correspondence of underlying joint (Popich & et al., 1970).



Babler (1987) reported the prenatal relationships between the volar pad shape and epidermal ridge configuration which was associated with the pattern type and also suggested an association between the shape of distal phalanx and pattern type. In 1987, Russo E. Gualdi proposed a descriptive analysis of dermatoglyphics traits of the palm in Italian population in which sexual and bimanual differences were pointed out of Palmar surface with reference to occurrence of Palmar patterns.

In 1991, Paul Gabriel Tesla described the dermatoglyphics main line related to crime and insertions of palm with respect to character analysis. In 1992, Samudri Tilak M. Katakhar wrote an Encyclopedia of Palm and palm reading in that he conferred about the patterns and character aspects (Katakhar Samudri T.M., 1992).

Ashbaugh David R. Known for his extensive research on identification of friction ridges and for introducing the first time appliance of phrase ridgeology in forensic and ACE-V methodology. His book "Quantitative and Qualitative friction ridge analysis; An introduction to basic and advanced ridgeology" is fundamental and essential for forensic identification in that he explained the structure and growth of friction skin, examination of latent prints, so far from this advanced methods in ridgeology including Poroscopy and Edgeoscopy. Further, he also explained about the palmar flexion creases identification to solve several criminal cases where fingerprints were not present (Ashbaugh D.R., 1999).

Since the turn of twentieth century, modern investigators of palmistry have been expressing their interest in dermal ridges. A few of researcher influenced the model of individuality by representing statistical models such as Balthazard 1911; Bose 1917;

Wentworth and Wilder 1918; Pearson 1930; Roxburgh 1933; Amy 1946; Trauring 1963; Kingston 1964; Gupta 1968; Osterburg 1977; Stoney 1985; Champod 1995; Lockheed – Martin 1999; Pankanti and Prabhakar and Jain 2001; Neumann 2007.

Identification of authorship by using the lateral palm print was done by Ramesh Chaudhary and Sarat Kumar Pant in 2004 in which to fix the authorship standard samples were examined with photographic superimposition and with statistical study of the outline of lateral palm print with respect of writing line (Chaudhary R., & et al., 2004).

Prabhakar and Jain (2004) stated that fingerprints matching techniques can be placed into two categories; minutiae based and correlation based. There are some difficulties when using approach in minutiae based points accurately when the prints is of low quality while the correlation based method is able to overcome on some of the difficulties of the minutiae based approach which required the precise location of a registration point (Prabhakar & et al., 2004).

In 2009, Jain Anil J., and colleagues developed the latent palm print matching and based on them personal authentication could be done and used minutiae as a features to be compatible with the methodology used by latent investigators that is needed for the forensic application (Jain Anil K., & et al., 2009).

In 2010, Park Jin Seo and his colleague's studied about the improved analysis of palm creases in which a morphologic analysis of palm creases and the improved characteristics including all major and minor creases for the systematic classification were developed (Seo Jin Parl, & et al., 2010). Chandan Kumar Sinha and colleagues worked on the dermatoglyphics pattern to identify the left handed unique pattern and its biological



significance in 2012 and observed that there are some characteristics which may be unique in left hand in comparison of right hand.

A cross-Sectional study on the palmar dermatoglyphics in the relation to Carcinoma breast patients was conducted by Aprajjita Raizada and her colleges in 2013. In that study, the predominant finger tip patterns of carcinoma breast was examined (Raizada Aprajjita & et al., 2013).

Barros Rodrigo M., Faria Bruna E.F., and Kuckelhaus Selma A.S. described the morphometry of latent palm prints as a function of time in 2013 (Barros Rodrigo M., & et al., 2013) and represented a method that is able to detect the age of latent prints, and improved the forensic procedure. In 2013, Tom Cook and his colleagues identified the palmprints using palm prints minutia points and analyzed operational characteristics of palmar flexion creases and basis on the characteristics from crime scene 99.2% of palmar marks could be identified which is very effective (Tom Cook & et al., 2013).

Conclusion

Identification through prints (Palm & Finger) is one of the oldest and commonest form and out of the misconception that identification from prints are completely complicated while it has proved in the research and studies that identification of suspects never stops due to their complexity and intractability. The authentication of prints have proved and discussed in the timeline which makes it full proof evidence of identification.

References

[1.] Asano Darlene (1985); hands the complete book of palmistry, Japan publications, Inc., Tokyo & New York, Pp. 120-123.

[2.] Altman Nathaniel, Fitzherbert Andrew (1988); how scientific hand reading can change your life, the Aquarian press and thorsons publishing group, Altman Nathaniel, Scheimann Eugene (1989); Medical palmistry, health through hand analysis, Aquarian press, Thorsons publishing group, Wellingborough Northamptonshire, Pp. 57-74.

[3.] Ashbaugh, D. R. (1999); Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology; CRC Press: Boca Raton, FL, Ashbaugh, D. R. (1991); Ridgeology. J. Forensic Ident. Vol. 41 (1), Pp. 16-64.

[4.] Bonnevie Kristine (1924); Studies on palillary patterns of human fingers, Journal of Genetics, Vol. 15, Pp. 1-111.

[5.] Beryl B. Hutchinson (1967); Your Life in Your Hands, Sphere Books, Ltd., London, Pp. 89.

[6.] Beverly C. Jaegers; You and Your Hand 1974 Aries Productions Creve Coeur, Mo. and Hand Analysis, Fingerprints and Skin Patterns-dermatoglyphics, 1974 Aries Productions St. Louis, Brenner Elizabeth (1980); The hand book, Celestial Arts, Berkeley, CA, Pp. 79 - 88.

[7.] Brandon- Jones David (1986); Practical palmistry, CRCS publication, Reno NV, Pp. 132-137.

[8.] Block, E. B. (1979); Science vs. Crime: The Evolution of the Police Lab, Cragmont Publications, Babler, W. J., Plato C., Garruto R.M.m Schaumann B.A. (1991); Embryologic Development of Epidermal Ridges and Their Configurations. In Dermatoglyphics: Science in Transition; Birth Defects: Original



Article Series; March of Dimes: New York, Pp 95–112.

[9.] Beavan, C. (2001); Fingerprints: The Origins of Crime Detection and the Murder Case That Launched Forensic Science; Hyperion: New York, Berry, J. Stoney, D. A. (2001); History and Development of Fingerprinting. In Advances in Fingerprint Technology, 2nd edition.; Lee, H. C., Gaensslen, R. E., Edition.; CRC Press: Boca Raton, FL, Pp 1–40.

[10.] Bonnevie, Kristine Elisabeth Heuch (1924) ; Studies on Papillary Patterns of Human Fingers" in 1924, Journal of Genetics, Cambridge, Vol. 15, Pp. 1-111.

[11.] Barnes Jeffery G; History of fingerprints, national Institute of justice, Pp. 1-22.

[12.] Barros Rodrigo M., Faria Bruna E.F., and Kuckelhaus Selma A.S.(2013); Morphometry of latent palm prints as a function of time, Science and Justice, Pp. 1-7.

[13.] Cummins Harold, Midlo Charles (1926); Palmar and Plantar Epidermal Configurations (Dermatoglyphics) in European Americans, Am J. Phys. Anthropology, Vol.9, Pp. 471-502.

[14.] Cummins Harold, Keith H. H.; Midlo Charles, Montgomery R. G., Hawthorne Harris Wilder, Inez Whipple-Wilder (1929); Revised methods of interpreting and formulating palmar dermatoglyphics, Am J. Phys Anthropol., Vol 12, Pp. 415-473.

[15.] Cummins Harold, Midlo Charles (1943); Finger Prints, Palms and Soles An Introduction To Dermatoglyphics, The Blakiston Company, Philadelphia.Chapel, C. E. (1941); Fingerprinting: A Manual of Identification; Coward McCann: New York, Chatterjee, S. K. (1962) ;Edgeoscopy, Finger Print and Identification Magazine Vol. 44 (3), Pp. 3–13.

[16.] Cole, S. A. (2001); Suspect Identities: A History of Fingerprinting and Criminal Identification; Harvard University Press: Cambridge, MA. Cummins H., Midlo C. (1943); Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics; Dover: New York,

[17.] Champod, C.; Lennard, C. (2004); Margot, P.; Stoilovic, M.; Fingerprints and Other Ridge Skin Impressions; CRC Press: Boca Raton, FL, Chattopadhyay P.K., Kushwaha K.P.S. (1978); A dermatoglyphics approach to the problem of Rajput; Mankind Quarterly, part-1, part-2 , Pp. 186-201and Pp. 28-292.

[18.] Douglas Ray (1995); palmistry and the inner self, Blanford A Cassell imprint, Pp. 20-25 .

[19.] Dillon D. (1977); A History of Criminalistics in the United States 1850-1950, Doctoral Thesis, University of California, Berkeley, De Forest H. P. (1938); the First Finger-Print File in the United States. Finger Print and Identification magazine, Vol. 16,Pp. 16–20.

[20.] Dell, D. (1986); Munger, B. The Early Embryogenesis of Papillary (Sweat Duct) Ridges in Primate Glabrous Skin: The Dermatologic Map of Cutaneous



Mechanoreceptors and Dermatoglyphics. J. Comp. Neurol., Vol. 244 (4), Pp. 511–532.

[21.] Dillion, Y.; Haynes, J.; Henneberg, M. (2001) The Relationship of the Number of Meissner's Corpuscles to Dermatoglyphic Characters and Finger Size. J. Anatomy, Vol. 199 (5), Pp. 577–584.

[22.] Eugene Scheimann (1969); The Doctors's Guide to Better Health Through Palmistry, Parker Publishing. Pp. 59-76.

[23.] Else, W. M. and Garrow, J. M. (1934); the Detection of Crime, The Police Journal—London.

[24.] Fairchaild Dennis (1980); the handbook of humanistic palmistry, thumbs up publication, Ferndale Mich, Pp. 55-65.

[25.] Fitzherbert Andrew (1986); hands psychology, Angus and Robertson, London, Pp. 246-254.

[26.] Fenton Sasha, Wright Malcolm (1986); the living hand, Aquarian press, Wellingborough Northamptonshire, Pp. 42-45.

[27.] Faulds, H. (1880) ; On the Skin—Furrows of the Hand. Nature Vol. 22, Pp. 605.

[28.] Faulds, H. (1922); A Manual of Practical Dactylography. London: The "Police Review" Publishing Corporation Limited, Felsher, I. M. (1962); A Quick Look at Dermatoglyphics. Identification News, Vol. 12 (7), Pp. 6–12.

[29.] Gettings Fred (1965); The Book of The Hand, reprint 1968, Paul Hamlyn, Ltd., Pp. 115-119.

[30.] Gaensslen, R. E. (1983); Sourcebook in Forensic Serology, U.S. Government Printing Office, Washington, D.C. Gerber, S. M., Saferstein, R. (1997); More Chemistry and Crime, American Chemical Society, German, E. (1999); The History of Fingerprints, Galton F. (1892); Finger Prints; MacMillan: New York, Hawthorne Harris Wilder (1902); palms and soles, Annual Journal of anatomy, Vol. 1, Pp. 423

[31.] Hawthorne Harris Wilder (1904); Racial differences in palm and sole configuration, Am. Anthropologist, Vol. 6, Pp. 244-293,

[32.] Hawthorne Harris Wilder (1904); Duplicate Twins and double monsters (part only), Am J. Anatomy, Vol. 3, Pp. 426-472;

[33.] Hawthorne Harris Wilder (1916); Palm and sole studies, Biological bulletin, Vol. 30 ,Pp.135-172.

[34.] Hoffman Enid; hands (1985); a complete guide to palmistry, Para research, Inc. Glouster MA, Pp. 221-237

[35.] Hansen Darlene (1985); secreta of the palm, ACS publications, Inc. San Diego Ca., Pp. 22-27.

[36.] Hale A. (1952); Morphogenesis of Volar Skin in the Human Fetus. Annual Journal of Anatomy, Vol. 91 (1), Pp. 147–173.



- [37.] Henry, E. R. (1934); Classification and Uses of Fingerprints, 7th edition; H. M. Stationery Office: London, Hepburn D. (1895); The Papillary Ridges on the Hands and Feet of Monkeys and Men. Scientific Transactions of the Royal Dublin Society, Vol. 5 (2), Pp. 525–537.
- [38.] Herschel W. J. (1916); The Origin of Finger-Printing; Oxford University Press: London, Hirsch, W.; Schweichel, J. U. (1973); Morphological Evidence Concerning the Problem of Skin Ridge Formation. J. Mental Deficiency Res., Vol. 17 (1) , Pp. 58–72.
- [39.] Jaquin Noel (1934); The Hand of Man, Faber & Faber Ltd, London, 1934, Pp. 44-46.
- [40.] Jaquin Noel (1940) ; The Signature of Time, 1940, Faber & Faber, Ltd., London, Pp. 87-96.
- [41.] Jain Anil K., Feng Jianjiang (2009); Latent palm prints matching, IEEE transactions on pattern analysis and machine intelligence, Vol. 31 (6), Pp. 17-26.
- [42.] Jagerbrabd Mikael, Suemuran Kimberle (2007); Journal of ancient Fingerprinting Nr-1, Pp. 1-15.
- [43.] Kind, S., and Overman, M. (1972); Science Against Crime, Aldus Book Limited, Doubleday, US. Kingston C. R., Kirk P.L. (1965); Historical Development and Evaluation of the “12 Point Rule” in Fingerprint Identification. Int. Crim. Police Rev., Vol. 20 (186), Pp. 62–69.
- [44.] Kollmann, A. (1883); Der Tastapparat der Hand der menschlichen Rassen und der Affen in seiner Entwicklung und Gliederung (The Tactile Apparatus of the Hand of the Human Races and Apes in Its Development and Structure); Voss Verlag: Hamburg, Germany. Kücken, M.; Newell (2005); A. Fingerprint Formation. J. Theoretical Biol., Vol. 235 (1), Pp. 71–83.
- [45.] Laufer B. (1912); History of the Finger-Print System; Smithsonian Institution: Washington, DC. Locard E. (1914); La Preuve Judiciaire par les Empreintes Digitales (The Legal Evidence by the Fingerprints). De Médecine Légale et de Psychologie Normale et Pathologique (Of Forensic Medicine and of Normal and Pathological Psychology) Vol. 29, Pp. 321.
- [46.] Laufer, B. (1912); History of the Finger-Print System; Smithsonian Institution: Washington, DC, Lambourne, G. (1984); The Fingerprint Story; Harrap: London, Miyamoto Yusuke; Fingerprints, © 1963, translated by Saki Mochizuki and Michael Whittington, Japan Publications Trading Company, Tokyo, Japan and Rutland, Vt., U.S.A.
- [47.] Morland, N. (1950); An Outline of Scientific Criminology, Philosophical Library, NY, McClaughry, M. W.(1922) History of the Introduction of the Bertillon System Into the United States. Finger Print Magazine, 3 (10), 4.
- [48.] Myers H. J. II. (1938); the First Complete and Authentic History of Identification in the United States. Finger Print and Identification Magazine., Vol. 20 (4), Pp. 3–31.



- [49.] Myers H. J. II. (1942); supplemental History of Identification in the United States. Finger Print and Identification Magazine, Vol. 25 (6), Pp. 3–28.
- [50.] McClaughry, M. W. (1922) History of the Introduction of the Bertillon system Into the United States. Finger Print Magazine, Vol. 3 (10), Pp. 4
- [51.] Misumi, Y.; Akiyoshi, T. (1984); Scanning Electron Microscopic Structure of the Finger Print as Related to the Dermal Surface. The Anatomical Record, Vol. 208 (1), Pp. 49–55.
- [52.] Norris M. Durham, Chris C. Plato (1990); Trends in Dermatoglyphic Research, Kluwer Academic Publishers: Dordrecht/Boston/London, p. 6.
- [53.] Olsen, R. D., Sr. (1987); A Fingerprint Fable: The Will and William West Case, (initially published in: Identification News which became Journal of Forensic Identification, Vol. 11 (37), Kansas Bureau of Investigation. O'Hara, C. E.; Osterburg, J. W. (1949); An Introduction to Criminalistics; MacMillan: New York, Pearson K. (1914); The Life, Letters and Labours of Francis Galton, Volume I. London: Cambridge University Press, Plato Chris C. (1978); Dermatoglyphics and Aging, J. Gerontol, Vol. 33 (1), Pp. 31-38
- [54.] Robinson Rita (1993); health in your hands, A New look at modern palmistry and your helath, Mewcastle publishing, Van Nuys CA, Pp. 85-97
- [55.] Rhodes H. (1956); Alphonse Bertillon: Father of Scientific Detection; Abelard-Schuman: London,
- [56.] Raizada Apprajjita, Johri Vishwawas, Ramnath T., Chaudhary D.S., Garg R.P. (2013); A cross sectional study on the palmar dermatoglyphics on relation to carcinoma breast patients, Journal of clinical Diagn research, Vol. 7 (4), Pp. 609-612.
- [57.] Russo E. Gualdi (1987); Palmar dermatoglyphics in a sample of Italian Population, International Journal of Anthropology June 1987, Volume 2, Pp. 105-115.
- [58.] Saint-Germain, Comte C. de, (Valcourt-Vermont, Edgar de, 1897); The Practice of Palmistry for Professional Purposes, Chicago, Newcastle Publishing, London, reprint 1973.
- [59.] Supra Jaegers; You and your hand P. 30, Hand Analysis, Fingerprints and Skin Patterns-dermatoglyphics Pp. 43-44.
- [60.] Subrahmanyam B. V. (2001); Personal Identity. Modi's Medical Jurisprudence and Toxicology 22nd Edition. Butterworths, New Delhi, Pp ; 37-90.
- [61.] Sodhi G. S., Kaur J.; Indian Civilization and the Science of Fingerprinting. Indian Journal of Traditional Knowledge, Vol. 2 (2) 2003, Pp. 126–136.
- [62.] Sodhi G. S., Kaur J. (2003); World's First Conviction on Fingerprint Identification. National Crime Records Bureau Gazette, Vol. 15 (2) , Pp. 1–3.
- [63.] Sir Willam J. Herschel (1916); The origin of fingerprinting, Sinha Chandan Kumar, Meel Monika, Bayan Bituparna (2012); Using dermatoglyphics pattern to identify the left handed unique pattern and it



biological significance if any, World Applied Sciences Journal, Vol. 20 (8), Pp. 1107-1113.

[64.] Tilak Samudrik M. Katakhar (1992); Encyclopedia of palm and palm reading, UBS Publishers' Distributors, Ltd., New Delhi, Pp. 107-117 and 151-152

[65.] Tesla Paul Gabriel (1991); the complete science of hand reading, crime and mental disease, Osiris press, Lakeland, Florida Tiller I., Majewski F. (1978); furrows and dermal ridges of the hand in patients with alcohol embryopathy, Human Genetics, Vol. 42 (3), Pp. 307-314.

[66.] Whipple- Wilder Inez L. (1904); the Ventral Surface of the Mammalian Chiridium, Journal of Morphology and Anthropology, Vol. 49, Pp. 153-221.

[67.] White -Hellings Carol (1980); holding hands, the complete guide of palmistry, Academic press of G.P. gautam Sons U.S.A. and Toronto Canada, Pp. 57-60.

[68.] Webster Richard (1994); revealing hands, how to read palms, Llewellyn publications, Pp. 210-216.

[69.] Whipple I. L. (1904); The Ventral Surface of the Mammalian Chiridium. Zeitschrift für Morphologie und Anthropologie (Journal of Morphology and Anthropology) Vol. 7, Pp 261-368.

[70.] Wilder H. H. (1918); Wentworth B.; Personal Identification; The Gorham Press: Boston, Wijerathne Buddhika TB, Rathnayake Geetha K., Adikari Shamila C., Amarasinghe Subashini, Abhayarathna Prasanna L., Jayasena Ajith S. (2013); sexual dimorphism in digital dermatoglyphics traits among Sinhalese people in Sri Lanka, Journal of Physiol. Anthropol., Vol. 32 (1), Pp. 27.

[71.] Xiang-Xin Z., Chun-Ge L. (1988); The Historical Application of Hand Prints in Chinese Litigation. Journal of Forensic Identification , Vol. 38 (6), Pp. 277-284.

[72.] Zong Xiao- fan, Liscum Gary (1995); Chinese medical palmistry, your health in your hand, Blue poppy press, Linden Ave., Boulder Co., Pp. 26-30 .