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A STUDY ON FINGERPRINTS EXAMINATION IN CRIME SCENE INVESTIGATION

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Abstract

Fingerprint Examination, as a specialized branch of forensic science, is concerned with analyzing fingerprints for the purpose of identification in criminal investigations, and this field has seen substantial development over time. Since every individual possesses fingerprints that are both unique and permanent, they have long been regarded as among the most reliable methods of biometric identification for prisoners, offenders, and suspects under the Prisoners Identification Act, 1920. Within forensic science, the examination of fingerprints entails working with latent prints, comparing them against known records, and confirming identity. Fingerprint technology has evolved considerably—from manual identification methods to automated systems such as AFIS (Automated Fingerprint Identification System)—thereby speeding up the matching process and improving the accuracy of criminal profiling used to identify inmates and other accused individuals.

The legal and ethical dimensions concerning the admissibility of fingerprint evidence under Section 45 of the Indian Evidence Act, 1872, are also explored, underscoring the necessity of maintaining reliability and precision in this area. Moving further into the subject of fingerprint databases, this study offers a comprehensive examination of both state and national frameworks, addressing their implementation as well as the obstacles associated with them. The real-world applications of fingerprint investigation highlight how essential unique finger impressions are to criminal inquiries, and how fingerprint databases contribute significantly to crime detection—particularly when used alongside other forensic techniques.

The discussion concludes by emphasizing emerging trends and prospective developments within the field, while encouraging ongoing research and progress for further refinement. Overall, this comprehensive study on fingerprint examination seeks to deepen understanding

and raise awareness of the vital role fingerprints continue to play in modern criminal justice systems.

Keywords: Fingerprint analysis, Individual Identification, Forensic evidence, crime scene investigation, criminal justice system.

1. Introduction

Fingerprints are frequently discovered at crime scenes on various surfaces—glass, metal, paper, and more—and can serve as critical evidence linking suspects and victims to the location of a crime. To keep accurate records of offenders, law enforcement and correctional institutions rely heavily on fingerprint databases like the Automated Fingerprint Identification System (AFIS). These systems catalog and store fingerprint information, enabling authorities to track offenders, review their criminal backgrounds, and identify patterns of repeat offenses. This thorough documentation strengthens investigative work and boosts the overall effectiveness of the justice system.¹

That said, fingerprint examination does come with its own set of challenges. How accurate and reliable the results turn out to be depends on several factors: the quality of the collected prints, the circumstances under which they were gathered, and the level of skill and experience the examiner brings to the process. This overview aims to highlight the profound value of fingerprint analysis in helping law enforcement agencies solve crimes and hold offenders accountable.²

2. HISTORICAL DEVELOPMENT OF FINGERPRINT ANALYSIS IN INDIA:

India's journey in fingerprint science and forensic laboratories reflects a rich legacy, spanning from colonial-era innovations to today's cutting-edge investigative tools. The practice of using friction ridge patterns for identification is remarkably old — records trace fingerprint-based examination back to China's Qin Dynasty (roughly 221–206 BC), with both Chinese and Roman societies relying on such markings in ancient times. Historical accounts, including "The Volume of Crime Scene Investigation – Burglary," describe how handprints served as trial evidence long before modern forensics existed. India's own breakthrough arrived in 1897,

¹ Colin Beavan, *Fingerprints: The Origins of Crime Detection and the Murder Case That Launched Forensic Science* (Hyperion 2001).

² John J Dilley, David D Makin. *AFIS: Automated Fingerprint Identification Systems*, 2006.

when Sir Edward Henry, then Inspector General of Police in Bengal, devised the Henry Classification System.³ This framework allowed fingerprints to be organized and catalogued methodically for identifying offenders, and under Henry's direction, authorities began keeping individual criminal files built around impressions of all ten fingers. The system didn't stay confined to India — it went on to become the global benchmark for fingerprint-based identification.⁴

As this classification method took hold, fingerprint use within India's justice system grew quickly. Calcutta became home to the country's first fingerprint bureau in 1897,⁵ where the Henry system was put into practice to compile criminal records — a milestone that shaped India's broader identification infrastructure. Credit for developing the underlying classification approach largely belongs to Indian researchers Hem Chandra Bose and Azizul Haque. Even earlier, in 1877, Sir William Herschel had been gathering fingerprints from convicts on official documents and agreements. As cases involving theft, homicide, and burglary increasingly relied on fingerprint evidence, it became clear that India needed dedicated forensic institutions. Madras saw the opening of India's first significant forensic laboratory in 1949, with an emphasis on examining physical evidence tied to crimes. This paved the way for State Forensic Science Laboratories to spring up nationwide, each handling diverse specialties like questioned-document analysis, toxicology, firearms examination, and fingerprint identification.⁶ By 1957, the national government had set up the Central Forensic Science Laboratory (CFSL) in New Delhi to oversee forensic work across the country, with fingerprint analysis forming a core part of its mission. The CFSL later grew to include regional branches in Chandigarh, Hyderabad, and Kolkata, each contributing its own specialized forensic capabilities.

In subsequent decades, technology reshaped how fingerprint identification was carried out. The rise of Automated Fingerprint Identification Systems (AFIS) toward the end of the 20th century and into the 21st revolutionized matching processes, allowing databases to be searched swiftly and accurately without relying solely on manual comparison.⁷

Fingerprint analysis continues to be among the most trusted tools for identifying suspects in Indian criminal cases today. Forensic labs across the country keep incorporating newer

³ W. J. Herschel, *The Origin of Finger-Printing* (Oxford Univ. Press 1916).

⁴ Simon A. Cole, *Suspect Identities: A History of Fingerprinting and Criminal Identification* (Harvard Univ. Press 2001).

⁵ Edward R. Henry, *Classification and Uses of Fingerprints* (7th ed. H.M. Stationery Off. 1934).

⁶ G.T.C. Lambourne, *A Brief History of Fingerprints*, 17 *J. Forensic Sci. Soc'y* 95 (1977).

⁷ R.K. Tewari & K.V. Ravikumar, *History and Development of Forensic Science in India*, 46 *J. Postgraduate Med.* 303 (2000).

technologies to sharpen precision, and the shift toward digital fingerprint systems has made this evidence indispensable⁸ — both for investigative work and for courtroom proceedings. From Sir Edward Henry's foundational efforts to today's high-tech methods, the evolution of fingerprint science and its supporting laboratories stands as a testament to India's lasting influence on forensic practice worldwide.⁹

3. PRINCIPLES OF FINGERPRINT ANALYSIS:

Fingerprints are an essential identification tool because each person's fingerprints are unique and do not change over time. This concept is based in the principle of **persistence** or **permanence**¹⁰, where newly developed skin cells follow the existing friction ridge and furrow pattern. These patterns of ridges, created during fetal development, are classified into three main types: **loops, whorls, and arches**. Notably, no person has ever been found to have identical fingerprints across multiple fingers, and even identical twins with the same DNA possess completely different fingerprints. This demonstrates the unmatched uniqueness of fingerprints as a biometric identifier. Fingerprint examination also involves comparison of an unknown fingerprint, often obtained from a crime scene, with that stored in a database or directly with those of a suspect. In order to identify specific points that match between an unknown print and a known one, experts focus on analyzing minutiae, or the ridge features within the fingerprint.

Fingerprints are further categorized based on their visibility and the medium in which they are found. **Latent prints** cannot be observed without enhancement methods like chemical treatments or powdering. **Patent prints** are generally left when fingers are covered with substances like blood, ink, or dirt that are visible to the naked eye. **Plastic prints** are three-dimensional impressions left on soft surfaces such as clay or wax. These classifications and techniques make fingerprint examination a strong and dependable tool for criminal identification.

CLASSIFICATION OF FINGERPRINTS AND TYPES OF PATTERNS:

The original fingerprint classification system, known as the Ten-Digit classification system, was developed by Henry. It considered all of the fingers and converted the ridge patterns on

⁸ John Berry & David A. Stoney, History and Development of Fingerprinting, in Advances in Fingerprint Technology (Henry C. Lee & R.E. Gaensslen eds., 2d ed. 2001).

⁹ G.T.C. Lambourne, A Brief History of Fingerprints, 17 J. Forensic Sci. Soc'y 95 (1977).

¹⁰ Henry Faulds, The Permanence of Finger-Print Patterns, 98 Nature 388 (1917).

them into letters and numbers that could be easily arranged in a fraction. This classification was introduced to maintain the record of each and every criminal with their fingerprints. Years later the fingerprint analysts classify there are three types of fingerprints that can be found:

1. Latent Fingerprint
2. Patent Fingerprint
3. Plastic Fingerprint

- **Latent fingerprints:** They are invisible to the naked eye and are composed of sweat and oil released on the skin's surface. To visualize these prints, forensic experts use techniques such as applying powders or using chemical reagents.

- Conversely, **patent fingerprints**, when fingers come into contact with materials like blood, oil, ink, or dirt, they leave behind visible prints known as patent fingerprints. No additional processing is required to clearly view these prints.

- Three-dimensional impressions left on flexible or soft surfaces, including tar, soap, wax, or fresh paint, are known as **plastic fingerprints**. They can be observed with the unaided eye and do not need to be processed further for analysis, just as patent fingerprints.

Everyone's fingerprints are unique ridge patterns that are categorized into four main types. These patterns are further divided based on specific characteristics.

1. **Arch:** The simplest and least common pattern, arches consist of ridges that enter from one side of the fingerprint and exit on the opposite side without forming recurves. Arches account for approximately 5% of fingerprints worldwide and are classified into plain arch and tented arch.
2. **Loop:** This is the most common fingerprint pattern, characterized by ridges entering from one side of the fingerprint and curving around a core to form a loop pattern and then exiting back on the same side of the area. Loops are further classified into radial loop (The ridges flow toward the thumb) and ulnar loop (The ridges flow toward the little finger).
3. **Whorl:** Whorl patterns in fingerprints are defined by two or more ridges forming circular or spiral shapes. They are categorized into **plain whorl**, **central pocket whorl**, **double loop whorl**, and **accidental whorl**. Each of these types is further classified into subtypes based on unique ridge structures and characteristics.
4. **Composite:** The composite pattern consists of two or more different patterns, as separate and a combination of both patterns. It is further sub classified as central pocket loop, twinned loop, lateral pocket loop and accidental loop.

It is important to note that the variation in fingerprint patterns between individuals is influenced

by genetics, environmental factors, and personal habits. Consequently, fingerprints serve as a highly dependable method for personal identification, playing a crucial role in forensic investigations.

4. FINGERPRINT COLLECTION AND ANALYSIS TECHNIQUES:

Obtaining fingerprints from a crime scene and using the methods for analysis that follow are essential elements of forensic investigations. Before any evidence is collected, it is essential to secure the crime scene to prevent contamination or tampering with potential evidence. Latent fingerprints are meticulously examined at the crime scene and can be enhanced using a variety of methods, including powdering, magnetic powdering for sensitive surfaces, and the application of chemicals like ninhydrin to surfaces, which react with the fingerprint residues to reveal them.

For documentation purposes, a fingerprint is photographed as soon as it is visible. High-resolution photographs are taken from different angles to capture the details of the print before it is lifted or altered. After the fingerprint is developed, it needs to be carefully lifted from the surface using lift tape or gel tape. Lastly, Documentation is crucial for maintaining the chain of custody and ensuring that the fingerprint evidence is admissible in court. Fingerprint Analysis Techniques includes, Comparison of known samples, once when fingerprints are collected, they need to be compared with known fingerprints from suspects or databases. A variety of methods, including automated fingerprint identification systems (AFIS) and manual comparison, are used to accomplish this comparison. The ACE-V method, which stands for Analysis, Comparison, Evaluation, and Verification, is the main technique used by fingerprint experts. It describes the crucial processes in the fingerprint analysis procedure. Enhanced Modern Imaging Techniques¹¹ have emerged such as **three-dimensional scanning** and **digital enhancement**, allow forensic experts to enhance and analyse prints with extreme precision.

5. ROLE OF FINGERPRINT ANALYSIS IN CRIME SCENE INVESTIGATION:

Criminal investigations depend greatly on fingerprint examination, especially when suspects leave their prints at crime scenes. It plays a crucial role in the criminal justice system, connecting suspects to victims and crime scenes while clearing innocent individuals.

¹¹ Edward Rich, Fingerprint Techniques (1997).

Fingerprints can be used as important evidence in criminal investigations with the support of technology and skilled fingerprint specialists. Investigators commonly collect fingerprints from a range of surfaces in cases involving homicide, burglary, and other offences.

These prints can lead to suspect identification through database matches. Fingerprint examination also helps in linking multiple crimes by identifying the same individual across different scenes, allowing law enforcement to trace serial offenders and discover crime patterns. In many jurisdictions, latent prints recovered from cold cases are regularly re-examined with new fingerprint databases or advanced technology, sometimes resolving decades-old crimes. By examining the angle and position of fingerprints on objects, investigators can determine how and when those objects were handled. This can reveal suspicious behaviour and help establish the sequence of events leading up to a criminal act. Fingerprinting also acts as a deterrent for potential criminals. The fact that they can be identified by their fingerprints serves as a strong warning for those who might otherwise consider committing crimes. This preventive approach promotes safety and security for all citizens by helping to maintain law and order in society. Fingerprinting helps convict the guilty and identify innocent persons. Notable irregularities and inconsistencies in fingerprints can be found by carefully examining them, potentially clearing those who have been wrongly accused. Developments in fingerprint examination technology have led to several instances of people being acquitted of wrongful convictions; this highlights the crucial role fingerprinting plays in ensuring that justice is served.

6. FINGERPRINT ANALYSIS AS A CRUCIAL TOOL FOR PRISONERS IDENTIFICATION:

The Identification of Prisoners Act of 1920 and the Indian Evidence Act of 1872 govern the use of fingerprints as evidence in criminal investigations in India.

- The Identification of Prisoners Act, 1920¹² sets out the procedure for collecting and preserving fingerprints of individuals who are arrested or imprisoned. India uses several of systems to identify prisoners, including the National Automated Fingerprint Identification System (NAFIS) and Aadhaar verification.
- In addition to that, section 53 of Criminal Procedure Code, 1973 shall provide that it is the duty of the police official/ prison official to collect the data which include Finger impressions, Palm-Print impressions, Footprint impressions, Photograph samples and their examination of

¹² Identification of Prisoners Act, No. 33 of 1920 (India).

the accused person or the prisoners.

- Indian law enforcement agencies can obtain and share biometric fingerprint data through the **National Automated Fingerprint Identification System (NAFIS)** operated by the National Crime Records Bureau (NCRB).
- The NCRB's Central Finger Print Bureau is a nationwide database of all fingerprints in the country. It contains over a million ten-digit fingerprints of criminals who have been arrested and convicted, and it provides search capabilities on the Fingerprint Analysis and Criminal Tracing System (FACTS). It includes fingerprint information from every state and union territory. These records may be stored for a maximum of 75 years.
- **Legal amendment like Identification of Prisoners Act, 1920**, for authorizing investigating officers across the country to collect advanced biometrics from Arrested/Convicted persons¹³. The Bureau has also initiated student internship programs for mutual benefit. It looks forward to encouraging partnership with universities, researchers, NGOs and public.
- On the direction of Hon'ble Supreme Court of India, a portal was created at national level for displaying the details of Proclaimed Offenders to assist in inter-state coordination, efficient Law Enforcement and in seeking Citizen support. The portal provides a photo of the proclaimed offenders along with their name, date of court order, State, District, PS, age, gender, and related facts.
- Law enforcement agencies can use NAFIS to search for a person of interest and connect their name to any active warrants. A method that compares an inmate's biometric data, such as fingerprints, with the data stored in the Aadhaar database.
- Every criminal or convicted prisoner will have a unique 10-digit National Fingerprint Number (NFN) that they can use to register in the NAFIS system. Even across different law enforcement organizations and countries, fingerprints are traceable and organized to this number, which remains constant throughout the person's life and acts as a reference point.

7. LEGAL AND ETHICAL CONSIDERATIONS IN FINGERPRINT ANALYSIS:

The Indian Penal Code (IPC) of 1860, being a detailed criminal code, does not directly deal with forensic evidence like fingerprint examination since these techniques were not common at the time. Nevertheless, a few laws, procedures, and judicial decisions that support the Indian

¹³ Saumitra Basu, Forensic Science and Scientific Measures for Criminal Identification in British India, 54 Indian J. Hist. Sci. 177 (2019)

Penal Code (IPC) regulate the legal framework for fingerprint examination in India.

Indian Evidence Act, 1872: The act governs the admissibility of evidence, including fingerprint evidence. Under the act, section 45 provides admissibility in opinions of experts, including fingerprint experts, can be used in courts. If a fingerprint expert has been qualified as an expert and their testimony is considered relevant, then their testimony is admissible.

Identification of Prisoners Act, 1920¹⁴: This Act provides the legal framework for the taking of fingerprints in India. It allows law enforcement authorities to collect the fingerprints of individuals:

Section 3: Authorizes fingerprints to be taken from convicts awaiting trial, those convicted of specific offences, and those arrested for them. A magistrate may order someone to provide their fingerprints for examination under **Section 4**.

- **Code of Criminal Procedure, 1973¹⁵:** Section 293 of the Act explains that the report submitted by the Director of Forensics Bureau can be taken and accepted as evidence. This section allows us to save time and avoid unnecessary examination.

- **Bharatiya Sakshya Adhiniyam, 2023:** Section 39 of the Act provides admissibility in opinions of experts, including fingerprint experts, can be used in courts.

- **Bharatiya Nagarik Suraksha Sanhita, 2023:** Section 329 of the act replaces Section 293 of Crpc explains that the report submitted by the Director of Forensics Bureau can be taken and accepted as evidence. This section allows us to save time and avoid unnecessary examinations. Section 349 of this act specifies on order of the First-Class Magistrate the investigating Officer can collect fingerprints of a person who is arrested for investigation.

Looking at the ethical consideration and consequences of Admissibility of Fingerprint Evidence in Courts, though the IPC does not directly deal with fingerprints, crimes such as murder, theft, forgery, and others defined under the IPC can be solved using fingerprint examination. As per Section 45 of the Evidence Act, the opinion of fingerprint experts is essential, and their analysis must be presented through expert testimony. Under Section 73 of the Evidence Act, expert opinions on the comparison of handwriting or fingerprints play a crucial role in assisting the Court. Whenever the Court needs to compare fingerprints or handwriting, it is necessary to seek the assistance of experts, as handling such evidence without expert input could be risky. However, one of the major ethical issues raised is that the process of obtaining fingerprints from the accused is against the principle of Self-incrimination under Article 20(3) of Indian Constitution. It is well-established, however, that when an individual is

¹⁴ Identification of Prisoners Act, No. 33 of 1920 (India).

¹⁵ Code of Criminal Procedure, No. 2 of 1974 (India).

asked to provide a fingerprint impression, it is not considered a personal testimony and therefore does not fall under the protection against self-incrimination. For the purpose of this, Identification of Prisoners Act, 1920 makes it clear that the reason for passing a law of the kind is to prevent refusals made by prisoners in giving their fingerprints.

8. CHALLENGES IN FINGERPRINT ANALYSIS:

Although fingerprinting remains an important technique for managing the criminal justice system, there are certain challenges to it. Fingerprint examination is a subjective field and the interpretation of ridge patterns, and the comparison of fingerprints can be open to personal bias. The expansion of biometric technology and concerns about data security and privacy make it necessary to carefully examine and regulate the use of fingerprint databases. The major challenge of the examination is found to be the preservation of fingerprint evidence. Improper handling or inadequate preservation by investigating agencies can compromise the integrity of fingerprint data. There is a lack of uniformity in the training and certification of fingerprint examiners, leading to inconsistent results and interpretations. The quality of latent fingerprints can vary greatly, making their development and analysis difficult. Low-quality prints can lead to incorrect identifications or failure to make any identification at all. The AFIS systems used for fingerprint comparison are based on mathematical algorithms and can result in false matches or false negatives. Fingerprint evidence, therefore, cannot be completely relied upon, as there is a risk of fingerprint imitation¹⁶, where a person—whether a police official or another individual—could intentionally create false prints to wrongly incriminate an innocent person. In civil cases, fingerprint fraud is also possible. For example, when a pension recipient is required to provide a fingerprint as evidence of life, a family member may exploit this procedure after the person has passed away. The deceased's fingerprints might be fraudulently obtained by the relative, who would then misappropriate the pension money.

9. CASE STUDIES AND REAL-WORLD APPLICATIONS:

1. In *Ammini v. State of Kerala*¹⁷ in the residence of the deceased, the fingerprints were found on glasses. The expert compared and evaluated these fingerprints with those of the accused. However, the Trial Court did not treat this as an important piece of evidence because it was unclear, and there was doubt as to whether the photographs

¹⁶ G.S. Sodhi & J. Kaur, The Forgotten Indian Pioneers of Fingerprint Science: Fallout of Colonialism, 53 Indian J. Hist. Sci. T184 (2018).

¹⁷ *Ammini v. State of Kerala*, (1998) 2 S.C.C. 301 (India).

were of the original prints. The Trial Court's opinion was criticised by the High Court, and the Supreme Court decided to rely on the fingerprint evidence to prove the accused's guilt.

2. ***Pathumma v. Veerasha case***¹⁸, The Kerala High Court held that fingerprints cannot be shared by two persons. No two fingers leave the same mark; each fingerprint is unique to the individual. And if there are no differences, we can presume that the same person made them all.
3. ***Bhaluka Behra v. State case***¹⁹, emphasizes that the importance and weight assigned to an expert's opinion is distinct. A fingerprint, in essence, is a clear and forensically unique signature. Because of this, a fingerprint expert's testimony is given considerable weight in court.
4. ***H.P. Administration v. Om Prakash***, it has been held that the report of the Director, Fingerprint Bureau is accepted as evidence without examining him because the comparison and identification of fingerprints have developed by now into a science and the results derived therefrom have reached a stage of precision. It has further observed that if the report shows that the opinion was based on observation, which led to a conclusion, that opinion can be accepted.
5. In ***Balakrishna Das Agarwal v. Radha Devi***²⁰, the court stated that the forensic scientist is essentially a witness for the court, not for the prosecution or defence, and that an expert is a person who provides an opinion based on experience, knowledge, and training.
6. In ***James v. State of Kerala***²¹, some finger impressions and foot impressions were collected from the scene of crime and the photographs of the same were taken. However, these images were blurred and rather unclear. However, the Kerala High Court stated that the court has the authority to decide whether or not fingerprints constitute a reliable form of evidence, even if they are unclear and indistinct.

The real-world application of fingerprinting examination serves to highlight the impact of fingerprint databases on solving crimes. Through persuasive case studies, this examination explains the instances where fingerprint databases have played an important role in identifying offenders, linking criminal activities, and speeding up investigations, thereby showing their practical effectiveness. It explores cooperative efforts on how the integration of these

¹⁸ Pathumma v. Veerasha, 1988 K.L.T. 798 (Ker.) (India).

¹⁹ Bhaluka Behra v. State, A.I.R. 1957 Ori. 172, 1957 Cri. L.J. 902 (India).

²⁰ Balakrishna Das Agarwal v. Radha Devi, A.I.R. 1989 All 133 (India).

²¹ James v. State of Kerala, 1994 K.L.J. 871 (Ker.) (India).

techniques has led to more strong and conclusive evidence in criminal investigations.

10. TECHNOLOGICAL ADVANCES IN FINGERPRINT

EXAMINATION:

Technological progress in fingerprint examination²² have transformed crime scene investigations, improving accuracy, efficiency, and speed. One major development is the **Automated Fingerprint Identification System (AFIS)**, which uses algorithms to quickly scan and compare fingerprints across large databases, reducing human error. Enhancements in latent print detection, such as fluorescent powders, advanced fuming techniques, and laser-based tools, have improved the visibility and clarity of prints on difficult surfaces. Even from uneven surfaces, digital scanning and imaging—including high-resolution and 3D imaging—ensure precise fingerprint detail capture.

Artificial intelligence (AI) and machine learning further enhance fingerprint matching, enabling the identification of degraded or partial prints with better accuracy. Portable fingerprint scanners now allow real-time, on-site examination, connecting directly to centralized databases for instant identification. Additionally, innovations like **Mass Spectrometry Imaging (MSI)** enable the chemical examination of latent prints, providing insights into substances handled by a suspect. Cloud-based systems facilitate secure, global sharing of fingerprint data, enabling cross-border cooperation in investigations. Advanced forensic software assists with both active investigations and cold case evaluations by improving ridge pattern examination and reconstructing damaged prints. These technological advancements not only simplify investigations but also reduce errors, ensuring that fingerprint examination remains a vital and dependable tool in modern forensic science.

11. CONCLUSION:

In conclusion, fingerprints are an important instrument in the investigation of criminal cases. It has been stated that fingerprint evidence is a reliable piece of evidence. The objective of the Criminal Justice System in India is not only to punish offenders or perpetrators of crime but also to deter future criminal activity. This goal can be achieved not only through the efforts of investigating officers, police, courts, and lawyers, but also by assigning evidentiary value to various techniques. These scientific methods, such as fingerprint examinations, play a vital role

²² A.R. Ikuesan & H.S. Venter, Digital Behavioral-Fingerprint for User Attribution in Digital Forensics: Are We There Yet?, 30 Digit. Investig. 73 (2019).

in solving and preventing crime. Ensuring that ethical considerations, privacy rights, and the possibility errors are addressed is important to maintaining public trust in forensic processes. Future developments in artificial intelligence, machine learning, and image technology advancements should greatly improve fingerprint examination. The progress in forensic science, particularly in fingerprint examination, has significantly improved the accuracy and reliability of crime investigations. From manual identification to automated systems like AFIS (Automated Fingerprint Identification System), fingerprint technology has progressed, accelerating the process of matching prints and increasing the accuracy of criminal profiling for the identification of inmates and other accused persons. These advancements not only help in solving cases more effectively but also strengthen the evidentiary value of fingerprint examination in legal proceedings. Thus, the continuous development of both forensic science and legal standards is necessary to maintain the integrity and effectiveness of fingerprint examinations in crime solving.

REFERENCES:

BOOKS:

- Johari, C. K. (n.d.). Forensic Science - Identification of Fingerprints

JOURNALS:

- International Journal of Legal Medicine
- Forensic Science International

REPORTS:

- National Crime Record Bureau
- National Portal of India
- Digital Government of India

STATUTES:

- The Constitution of India, 1950
- The Code of Criminal Procedure, 1973
- Indian Evidence Act, 1872
- Identification of Prisoners Act, 1920

BIBLIOGRAPHY:

1. R.M. Caplan, "How Fingerprints Came into Use for Personal Identification", (1990) 23 *Journal of the American Academy of Dermatology* 109.
2. E. Keogh, "An Overview of the Science of Fingerprints", (2013) 14 *Anil Aggrawal's Internet Journal of Forensic Medicine & Toxicology* 1.
3. M.S. Al-Ani, "A Novel Thinning Algorithm for Fingerprint Recognition", (2013) 2 *International Journal of Engineering Science* 43.
4. S. Fieldhouse & K. Stow, "The Identification of Missing Persons Using Fingerprints", in *Handbook of Missing Persons* (Springer, 2016) 389.
5. R.K. Tewari & K.V. Ravikumar, "History and Development of Forensic Science in India", (2000) 46 *Journal of Postgraduate Medicine* 303.
6. G.T.C. Lambourne, "A Brief History of Fingerprints", (1977) 17 *Journal of Forensic Science Society* 95.
7. R. Romero Reverón, "Marcello Malpighi (1628–1694), Fundador de la Microanatomía", (2011) 29 *International Journal of Morphology* 399.
8. S.E. Haylock, "Historical Overview of Latent Print Detection", in *International Forensic Symposium on Latent Prints – Proceedings* (1987, Quantico, Va.; republished 1988, NCJ-113506) 3.
9. R. Mukhaiyar, "Analysis of Galton-Henry Classification Method for Fingerprint Database FVC 2002 and 2004", (2017) 13 *GEOMATE Journal* 118.