SCIENTIFIC EVIDENCE IN INDIA:PROBLEMS AND PROSPECTIVES

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Introduction

Science has long been regarded as a trustworthy pursuit of knowledge due to its systematic approach, empirical evidence, and consistent results. Its credibility and reputation are built on its ability to provide reliable, valid, accurate, and stable information.[1] This has led to the aura of legitimacy and respectability that science holds in various fields, including evidence and justice. The current research study strongly supports the idea of incorporating science and its methods into these areas. By using scientific approaches, we can enhance the accuracy and reliability of evidence presented in legal proceedings. This, in turn, promotes a fairer and more just judicial system. Advancements in science and technology have significantly contributed to the rapid development of various fields. Science is continuously evolving, and its influence is expanding across different domains. Innovations in scientific methods and techniques have revolutionized the way crimes are investigated, leading to more effective and efficient practices.[2]

For instance, in the past, it was extremely challenging for investigators to identify and trace minute particles present at crime scenes. However, thanks to the progress made in scientific methods, crime investigators can now employ cutting-edge techniques to identify even the smallest pieces of evidence. This includes using advanced forensic technologies, DNA analysis, fingerprinting methods, and sophisticated imaging techniques, among others. These scientific advancements have greatly improved the process of gathering evidence and solving crimes. The use of science in crime investigation not only increases the chances of finding the truth but also minimizes the likelihood of errors or biases in the process.[3]

Moreover, science's impact goes beyond the field of crime investigation. It plays a crucial role in various areas, from making groundbreaking discoveries in fundamental research to enabling the development of new inventions that benefit society as a whole.

Meaning of Evidence:

In this section, the researcher explores the conceptual aspects of the term "Evidence." The term "Evidence" is derived from the Latin words "evidens" or "evidere," which mean "to show clearly" or "to make plainly certain." In the legal context, evidence is used to either support or contradict a disputed fact. According to William Blackstone, "Evidence" refers to anything that demonstrates,

[1] Nozer D. Singapurwalla et al, "Is Reliability a New Science?" p.1 A Paper presented at the 10th International Conference on Mathematical Methods and Reliability, p.1 (Grenoble Institute of Technology, Universite Grenoble Alpes, Grenoble, France,
[2] Nidhi Bishnoi, "*Forensic science has a significant role in the criminal justice system*" volume 18 issue 6, Journal of advances and scholarly Researches in Allied Education 369-376(2021).
[3] *ibid*

makes clear, or ascertains the reality or truth of facts or points in issue, whether on one side or the other.[4] Simply put, evidence is any information that clarifies, demonstrates, reveals, or proves the truth of the facts or points under consideration in court. Pitt Taylor defines "Evidence" in relation to law as encompassing all legal means, excluding mere arguments, that tend to prove or disprove any matter of fact submitted for judicial investigation. He further classifies evidence into two types: Competent Evidence and Satisfactory Evidence.

In the case of "Ramnarayan vs. State of Maharashtra"[5], it was noted that the word "evidence" is used in common parlance in three different senses:

1) As equivalent to proof,

2) As equivalent to material, and

3) As equivalent to the material on which the court bases its conclusion about the existence or non-existence of a disputed fact.

To clarify the meaning of evidence, Adrian Keane and Paul McKeown state that evidence is the information by which facts tend to be proven, and the law of evidence consists of the rules and discretion governing how facts may be proven in courts of law and tribunals.[6]

“The Indian Evidence Act, 1872, it merely ‘defines’ the term ‘Evidence’ in not very comprehensive words: Section 3 states that “Evidence means and includes-

1. All statements (oral or documentary) which the court permits or requires to be made before it by witnesses, ‘in relation to the matters of fact under inquiry’; such statements are called Oral Evidence;

2. All documents including the electronic records produced for the inspection of the court; such documents are called Documentary Evidence.”[7]

Reliability of Evidence

The utmost importance of evidence lies in its reliability before a court of law, where it can be admitted only with the judge's full conviction based on prudence, reasoning, and the arguments of the concerned parties. In legal proceedings, especially in criminal investigations, one party often disputes the facts presented by the other. Ideally, the court should consider all relevant evidence that logically proves or disproves the disputed facts to ascertain the truth of the matter.

However, practical constraints exist in the real world that limit the court's ability to consider all evidence. These constraints include time and cost considerations and the need for a conclusive resolution of litigation. Additionally, in the English and Indian Adversarial system of trial, the court is bound to rely solely on the evidence presented by the parties and cannot undertake an independent search for relevant evidence.

[4] Ratanlal Ranchhoddas and Dhirajlal Keshavlal Thakore, *The Law of Evidence* 1 (Lexix Nexix ButterworthsWadhwa, Gurgaon, 2013).
[5] Ramnarayan vs. State of Maharashtra, AIR (1964) 5 SCR 1064.
[6] Adrian Keane & Paul McKeown, *The Modern Law of Evidence* 2 (Oxford University Press,London, 2016).
[7] The Indian Evidence Act, 1872 (Act 1 of 1872)

Furthermore, the law of evidence itself imposes various rules that may exclude relevant evidence for several reasons. For instance, evidence may lack sufficient relevance or have minimal probative value. It could give rise to subsidiary issues that distract from the main matter, or it may be deemed unreliable. Additionally, certain evidence might be prejudicial to one party, outweighing its probative value for the party introducing it. In some cases, disclosure of certain evidence may be detrimental to national interests.

Despite aspiring to ascertain the truth, the court must ultimately reach a decision and settle the dispute, even if the evidence presented is inadequate or inconclusive. In practicality, the court's decision-making process involves balancing the available evidence and considering the relevant legal rules and constraints to arrive at a resolution, even if a comprehensive search for truth may not be possible within the confines of the legal process.

Kinds of Evidence in relation to Scientific Aid:

The researcher has addressed the topic of "Kinds of Evidence" in the context of scientific aid. This includes evidence directly obtained through the use of scientific methods or techniques, as well as evidence indirectly obtained through scientific means.

Direct and Circumstantial Evidence

Evidence can fall into two categories: direct evidence and circumstantial evidence. These types of evidence can be used to secure a conviction, either independently or in combination. Direct evidence directly proves the existence of a fact, while circumstantial evidence requires the judge to draw inferences from the evidence to establish the existence of a fact.[8]

Testimonial and Real Evidence:

Testimonial evidence is provided by witnesses who testify under oath or affirmation in a court proceeding. This type of evidence is based on what the witness personally experienced, observed, or knows about the case. It includes statements made by witnesses during their testimony and can also include information provided in affidavits and depositions. Testimonial evidence is crucial in helping the court understand the events and circumstances surrounding the case. In some situations, expert witnesses may be called upon to provide specialized knowledge or verify scientific evidence related to the case.[9]

For example, if a witness testifies that they saw the defendant commit the crime, their statement would be considered testimonial evidence. Similarly, if a forensic expert provides testimony about the DNA analysis of evidence found at the crime scene, it would also be considered testimonial evidence.

Real evidence, also known as physical evidence, refers to tangible objects or material items that are directly related to the incident in question. These physical objects play a direct role in the events under consideration. Real evidence can be presented in court for inspection and examination by the judge and jury. Unlike testimonial evidence, real evidence is not based on witness statements but on the actual objects themselves. For instance, if a murder weapon is recovered by

[8] Dr. Avtar Singh, Principles of The Law of Evidence303 (Central Law Publications, Allahabad, 2011).
[9] *Ibid*

law enforcement and presented in court as evidence, it would be considered real evidence. Similarly, if bloodstains or clothing with gunshot residue are collected from the crime scene and introduced in court, they would also be considered real evidence.[10]

Personal evidence is evidence derived from the actions, behavior, or conduct of human agents involved in the case. It can include various aspects related to the behavior of parties, witnesses, or even the judge during the court proceedings. Personal evidence is often used to assess the credibility of witnesses, parties, or other individuals involved in the case. For example, if a witness displays contempt of court by being disrespectful or uncooperative during their testimony, it would be considered personal evidence. Similarly, the behavior and demeanor of parties involved in the case during the trial can also be considered personal evidence.

In summary, testimonial evidence is based on witness statements, real evidence refers to tangible objects directly related to the case, and personal evidence involves the behavior and conduct of individuals involved in the legal process. Each type of evidence serves a unique role in helping the court arrive at a fair and just decision.

Oral Evidence and Scientific Aid

Section 60 of the Indian Evidence Act, 1872 deals with the recording of oral evidence. Oral evidence refers to statements made by witnesses in the presence of the court concerning the truth of the facts. It is evidence based on what the witness has personally seen or heard. For oral evidence to be admissible, it should be direct and positive, meaning it directly supports the main fact in question. Nowadays, Law Enforcement agencies use surveillance tools like CCTV cameras and mobile devices to monitor events. These scientific devices can corroborate an eyewitness account by providing additional evidence.[11]

Documentary Evidence and Scientific Aid

According to Section 3 of The Indian Evidence Act, documentary evidence refers to all documents and electronic records that are presented in court for inspection. This includes written records, contracts, letters, emails, photographs, videos, and any other form of recorded information. Documentary evidence is crucial in legal proceedings as it provides tangible and written records that can help establish facts and events related to the case. In certain legal cases, especially those involving customs or attitudes of the parties, documentary evidence becomes particularly important. This is because written records can provide clear and objective evidence of the parties' actions, intentions, or understanding of the relevant customs. Such records can shed light on the historical practices, agreements, or behavior of the parties involved in the case.

For instance, if there is a dispute over the terms of a contract, the written contract itself serves as documentary evidence and can play a decisive role in determining the actual terms agreed upon by the parties. It is essential to ensure the authenticity of documentary evidence before admitting it in court. Investigators and the court have a responsibility to ascertain whether the documents presented are genuine and not forged or tampered with. This is crucial to maintain the integrity of the legal process and ensure that only reliable evidence is considered during the trial. Various scientific methods can be employed to verify the authenticity of documents, such as forensic

[10] Dr. Avtar Singh, Principles of The Law of Evidence303 (Central Law Publications, Allahabad, 2011).
[11] Batuk Lal, The Law of Evidence 333 (Central Law Agency, Allahabad, 2012).

analysis, handwriting analysis, and digital forensics for electronic records. By subjecting the documents to these scientific methods, the court can determine the credibility and admissibility of the evidence.

Physical and Biological Evidence

Scientific evidence can be categorized into two main types: Physical Evidence and Biological Evidence. Physical Evidence comprises non-living or inorganic items, including fingerprints, shoe and tire impressions, tool marks, fibers, paint, glass, drugs, firearms, bullets, shell casings, documents, explosives, and petroleum byproducts or distilled fire accelerants. On the other hand, Biological Evidence is typically composed of organic materials such as blood, saliva, urine, semen, hair, as well as botanical materials like wood, plants, pollens, chitin, moth cocoons, and similar substances.

Scientific Evidence:

Forensic science is a multidisciplinary field that involves the application of various scientific disciplines, including chemistry, biology, medicine, metallurgy, and engineering, to investigate crimes and gather relevant evidence. This scientific evidence plays a critical role in legal proceedings, helping establish the presence of a crime and identifying those responsible. Defining evidence in the context of forensic science is relatively straightforward—it refers to any information or material that can be used to prove or disprove the occurrence of a crime. However, when it comes to the question of what specifically constitutes forensic evidence, there is no universally accepted response. One common way to define forensic evidence is by describing it as the result of applying the scientific method to analyze physical or biological materials. The goal of this analysis is to produce evidence that is admissible in court and can be used to support or refute claims made during a trial. By subjecting the evidence to scientific scrutiny, forensic experts seek to ensure its reliability and accuracy.

However, delving deeper into the characteristics of what makes a procedure "scientific" can lead to somewhat unsatisfying answers. Simply describing a scientific process as being done "very carefully" or with great attention to detail may not fully capture the complexity and rigor of true scientific methods. In reality, scientific methods involve a systematic approach to investigation, including formulating hypotheses, conducting controlled experiments or observations, collecting and analyzing data, and drawing objective conclusions based on evidence. These methods aim to minimize bias, uphold objectivity, and arrive at reliable and valid findings. Meticulousness and carefulness are indeed important attributes in forensic science, as handling evidence with utmost care is crucial to preserve its integrity. However, they alone do not encompass the comprehensive methodology employed in scientific investigations.

Forensic science utilizes a range of scientific disciplines to investigate crimes and gather evidence. Scientific evidence is the result of applying the scientific method to analyze physical or biological materials for court purposes. While attention to detail is vital, the essence of scientific methods lies in their systematic and objective approach to producing reliable and valid evidence.

In the seventeenth century, Francis Bacon introduced scientific procedures that continue to be regarded as the cornerstone of scientific inquiry. He emphasized the importance of testing hypotheses to identify the most plausible ones. Bacon's concept of science involves a process of affirmations and exclusions, where experimentation and trial and error ultimately lead to

conclusions. This framework has since been the fundamental guiding principle in scientific investigations. Bacon viewed science as an inductive process, where the focus shifts from specific observations to more general principles or theories.

Reliability of Science:

Due to its reliability, validity, accuracy, and consistency, the term 'science' has earned a long-standing reputation for credibility and trustworthiness. Scientists demonstrate reliability by obtaining consistent results when repeating experiments with different batches or communities. Validity ensures that experimental findings accurately reflect the theory being investigated; while accuracy pertains to how precisely a measuring tool determines the measured variable's value. To evaluate stability, tests and retests are often conducted, comparing the outcomes of two tests taken by the same individual. A strong correlation between these outcomes indicates good test reliability.[12] The primary aim of science is to develop and enhance general descriptions or models of the physical universe through a structured process:

(a) posing a question,

(b) formulating a hypothesis, and

(c) testing and either temporarily accepting or rejecting it until further evidence necessitates modification or rejection.

This raises a thought-provoking question about whether scientific and technological methods should be employed in law enforcement and criminal investigations to gather evidence from imperceptible materials, as these materials cannot be detected by the human eye."

Significance of Role of Science in Evidence and Justice:

Science, with its precision and accuracy in calculations and observations, plays a crucial role in providing reliable and credible evidence in legal proceedings. According to the Indian Evidence Act, evidence from any source, including the scientific community, is considered relevant and essential for the court to make informed decisions in criminal or other legal matters. This recognition underscores the significance of scientific evidence in establishing the truth and aiding justice.[13]

The excerpt then discusses the prevailing belief among the scientific community and Police Criminal Investigation Departments that criminals often leave behind traces of evidence at the scene of the crime. The quotation from Paul Leland Kirk poignantly captures this idea, describing how every action of a criminal, even unintentional, can become silent evidence against them. The list of various types of physical evidence left by criminals, such as fingerprints, footprints, hair, fiber, broken glass, tool marks, scratches, blood, and semen, illustrates the diverse forms of evidence that can be instrumental in identifying and convicting criminals. The passage highlights the unique attributes of physical evidence. Unlike human witnesses, physical evidence does not forget or become confused by the excitement of the moment. It remains a factual representation of

[12] Baskin E.M.," The General Law of Reliability and classification of the Reliability laws" *SSRN* (March 2018).
[13] Nidhi Bishnoi, "Forensic science has a significant role in the criminal justice system" volume 18 issue 6, *Journal of advances and scholarly Researches in Allied Education* 369-376(2021).

what transpired, unaffected by human biases or fallibilities. The emphasis on the reliability of physical evidence lies in its inherent characteristics. Physical evidence cannot be inherently wrong, lie, or completely disappear. Its value as evidence comes from its objective nature and its ability to provide a clear record of events.[14]

However, the excerpt also acknowledges that the interpretation of physical evidence can be subject to human error. This is where the expertise of forensic scientists and investigators becomes crucial. Properly finding, examining, and understanding the physical evidence is essential to avoid misinterpretation and ensure its accurate presentation in court.

Coalition of Science and law:

Science and law are two distinct but equally important fields, and they often intersect, particularly when it comes to the use of scientific evidence in criminal investigations and legal proceedings. Throughout history, the relationship between science and law has evolved, but during the early Middle Ages, there was little integration between the two disciplines. It was in the fourteenth century that the legal system faced challenges in dealing with scientific evidence due to the fundamental differences in their approaches and methodologies. The legal system relies on an adversarial process to seek the truth and aims to arrive at a just and politically acceptable resolution of conflicts. It provides guidelines and establishes rules to govern public and private interactions, defining how society should function and behave. On the other hand, science follows an empirical investigation to discover truth based on verifiable facts and evidence. Science is descriptive; aiming to portray the world as it is, whereas the legal system tends to be prescriptive, seeking to define how society should operate and how individuals should conduct themselves. In simpler terms, forensic science is the application of scientific principles to legal matters. This combination of science and law offers innovative methods and tools for discovering the truth in criminal investigations and legal cases. Forensic science plays a vital role in providing accurate, precise, timely, and comprehensive information to decision-makers within the criminal justice system.[15]

The term "forensic" originates from the Latin word "forensis," which referred to a public gathering place or forum where Roman senators and other dignitaries held deliberations and court procedures. Thus, "forensic science" implies the application of scientific knowledge in a legal setting, much like the exchange of ideas and arguments that occurred in the Roman forum. Overall, science and law may have different purposes and methodologies, but they complement each other in the pursuit of truth and justice. Forensic science acts as a bridge between these two domains, offering valuable insights and methods for finding and presenting evidence in legal contexts, thereby contributing to fair and effective legal outcomes.

Problems which we are facing regarding Scientific Evidences

The research study primarily revolves around the application of scientific principles and techniques in the context of evidence and justice. As science progresses rapidly in various fields, it has also made significant advancements in crime investigation. New discoveries and inventions have brought about innovative scientific methods and technologies that aid investigators and judges in their pursuit of justice.

[14] Hal S. Stern, Maria Cuellar and Kaye, “Reliability and validity of forensic science evidence” *signiicancemagazine.com* (April 2019).
[15] Goble, George W. "Law as a Science," *Indian Law Journal*: Vol. 9: Issue. 5, Article 2 (1934).

For instance, in the past, it was a daunting task for crime investigators to trace and identify minute particles present at a crime scene. However, thanks to advancements in science, especially in the field of forensic science, investigators can now employ advanced methods to analyze and track even the smallest pieces of evidence, such as fingerprints, DNA, or trace materials.

Despite these remarkable scientific achievements, there are challenges related to the handling and interpretation of scientific evidence by Investigation Agencies, particularly the police, and the judicial system. These challenges may involve issues like the proper collection, preservation, and analysis of evidence, the accurate interpretation of scientific results, the presentation of evidence in court, and the understanding of complex scientific findings by judges and juries.

Addressing these issues is of paramount importance to ensure the credibility and integrity of the Criminal Justice Delivery System. It requires collaboration between scientists, forensic experts, law enforcement agencies, and the judiciary to establish standard procedures and guidelines for the use of scientific evidence in investigations and court proceedings. Additionally, promoting education and training on scientific principles and methods for investigators and legal professionals can enhance the fair and effective utilization of scientific evidence in the pursuit of justice. By doing so, the criminal justice system can leverage the power of science to ensure more accurate and reliable outcomes in legal cases.[16]

The process of gathering evidence through scientific techniques, which serves as a form of scientific assistance to the court, begins at the crime scene. If any evidence is overlooked or mishandled during the initial investigation, subsequent rigorous examination and analysis in the laboratory won't be able to correct the issue. Unfortunately, revisiting the crime scene to obtain missed evidence is usually not feasible. This flaw in crime investigation can lead to the collapse of the prosecution's case. In this research, the author endeavors to analyze the reasons behind such disorganized practices on the part of crime investigators.

Another significant concern relates to the admissibility of scientific evidence in legal proceedings before the court. Currently, there exists a considerable amount of confusion regarding the approach courts take, as they often seem hesitant to admit evidence obtained through scientific methods and techniques. Surprisingly, despite the well-established principle that scientific results are based on factual evidence and extensive experimentation, courts sometimes undervalue or resist their admission. This raises a thought-provoking question: Why are courts reluctant to accept or assign adequate value to scientific evidence? This reluctance is not limited to India; even in the United States, Britain, and other advanced Western countries, a similar trend is observed. The researcher believes that this situation demands a reassessment of the credibility and recognition given to scientific evidence in the legal system.

Conclusion and Suggestions:

Following are the suggestions to fill up the loopholes mentioned above so thatScientific Aid become more prominent in the field of Evidence and Justice;

[16] Kaye N. Ballantyne, “Assessing the reliability and validity of forensic science – an industry perspective” 52(3) Australian Journal of forensic sciences 1-7 (January 2020).

Necessity for conducting strict and rigorous research in the development of scientific methods: The recommendation emphasizes the importance of scientific research in the context of the legal systems. Scientists are urged to conduct thorough and meticulous studies related to how science can be applied in legal proceedings. This involves employing reliable and demonstrative methods to establish the facts. When scientific evidence is obtained using robust and unquestionable methodologies, it holds significant weight in the eyes of the court.

By conducting rigorous research and presenting evidence supported by accurate scientific methods, scientists can contribute to the credibility and acceptance of scientific evidence in the legal system. Judges and legal professionals are more likely to consider and value scientific findings that have been rigorously tested and proven. When evidence is presented in this manner, it becomes harder for the court to disregard or ignore it, as it carries a higher level of trustworthiness and accuracy.

In essence, the recommendation encourages scientists to play an active role in bridging the gap between science and the legal system by conducting reliable research, using demonstrative methods, and presenting evidence that can withstand scrutiny in the court of law. This collaboration can enhance the integrity and effectiveness of the justice system, ensuring that scientific evidence is given due consideration in legal proceedings.

Necessity of Full-Fledged Law on Forensic Evidence It is now imperative to introduce comprehensive legislation on forensic evidence similar to Australia's Criminal Law (Forensic Evidence) Act, 2005. While Ireland also has such a law, India currently lacks such a provision.

Need of High Tech Crime Units: Propose a dedicated police unit for "Digital and Cybercrimes," with officers trained in Digital Media Investigative Skills. Include Network Investigators to trace data transmission locations on websites. This unit would focus on tackling cybercrime effectively, including hacking, online fraud, and cyberbullying. Specialized training would equip officers to handle complex digital evidence and conduct digital forensics. Network Investigators would track cybercriminal activities and identify the source of attacks. A separate wing is essential to combat the evolving and sophisticated nature of digital crimes. Enhancing law enforcement capabilities will protect individuals and organizations from cyber threats.

Establishing a Comprehensive Law on DNA Procedure: The most needed suggestion is for the Indian Parliament to convert the D.N.A. Technology (Use and Application) Regulation Bill, 2019, into a comprehensive law by reintroducing it in the legislative session. This bill should be upgraded to a full-fledged legislation to address DNA technology's use and application effectively. By doing so, the Parliament can ensure the proper regulation of DNA-related matters, such as identification, forensic investigations, and crime-solving. This transformation will strengthen the legal framework and facilitate the appropriate utilization of DNA technology in various domains, including law enforcement and justice systems. Taking this action is essential to enhance India's capabilities in utilizing DNA technology for societal benefit and crime prevention.