THE INTERSECTION BETWEEN LAW AND SCIENCE: A STUDY OF EVIDENTIARY AND INVESTIGATIVE FRAMEWORKS

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ABSTRACT

This paper considers comparative methodologies and processes of judicial and scientific evidence, regarding their roles in establishing facts and deriving conclusions. It identifies inherent biases and limitations within the process of judicial inquiries through a critical analysis and finds them diametrically opposite to the objectivity of scientific methods. The principle of 'AUDI ALTERAM PARTEM' is considered in both contexts, pointing out differences in its application. The study also goes on to explore the possibility of integration of scientific methods into the judiciary process for better accuracy and fairness. Focusing on how scientific evidence has been used in the past, as well as presently, by the Indian judicial system in reaching decisions, it suggests ways of enriching the process of judgment by integrating scientific inquiry. This work seeks to close the divide that separates law from science and thus precipitate a more informed and fair judiciary.

Introduction

The basic tenet upon which the law of evidence lies is the parties trying to convince the court of the presence of a certain thing that they claim exists in court. It may also be referred to as meaning the body of rules which regulates and ascertains the admissibility of evidence presented to a court of law in trying to determine rights or liabilities of the parties involved. Both the judicial system and scientific inquiry have protective emphases oriented toward searching for truth and finding fact. In many instances, a **judicial inquiry will rely heavily on the presentation of evidence and its evaluation by judges and jurors who may not possess specialized knowledge in relation to a science.**

On the other hand, **scientific inquiry follows systematic methods that yield empirical data and expert opinions in an effort to help with judicial decisions.**[1] The paper considers the comparative aspects of judicial and scientific inquiries through an exploratory perspective by considering similarities and differences, as well as the various challenges that innovations pose for the integration of scientific evidence into the legal order. The research, therefore, makes a critical analysis of these factors in view to identifying strategies by which effective utilization of scientific methods can improve the operation of the judicial process with increased accuracy and fairness of verdicts as resultant benefits.

Judicial Inquiry

Judicial inquiry is one of the methods utilized to reach a conclusion about **contested facts** and **circumstances**[2]. These contested facts lie at the **heart of a judicial inquiry** premised on "***ex facto jus oritur***". The scope and ambit of the **judicial inquiry** differs from legislation to legislation in terms of **its degree**. Every action that relates to the **regulation of evidence** would fall under the ambit of judicial inquiry.

There is **no one irrefutable manner** to determine the **correctness of the facts** but the law of evidence lays down **primary ground rules** to determine the facts in such inquiries. Inquiries are usually conducted in pursuance of matters revolving around **public importance.** It has a

[1] Thota, Sai Jahnavi, An Overview of the Evidence Law in India and the United Arab Emirates (May 4, 2023). Available at SSRN: https://ssrn.com/abstract=4556340 or http://dx.doi.org/10.2139/ssrn.4556340
[2] John D Ferrar and Anthony M, "*Introduction to the Legal Method"*, Sweet & Maxwell, London, pp 62–73, (1990)

really wide ambit and covers the investigation, admissibility of evidence to even the conduct of the judges.

The judicial inquiry finds its basis in **three primary subjects**[3]:

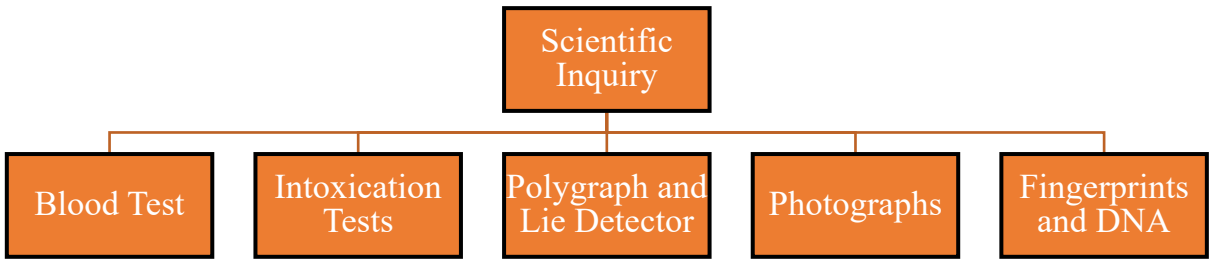
- Analyzing the **relevancy of the facts**
- Analyzing the **proof of facts**
- Verifying the **production of proof of the said relevant facts**

Scientific Inquiry

In select instances, the law allows the **opinions of experts** to be **admissible** in the court of law to aid the court in **arriving at conclusions** relating to matters involving **science, art, foreign law**, and so on[4]. They serve as an **exception** to the general rule of "***res inter alios acta***".

It is to be **respected and accepted** by the court except when it is **unreasonable or arbitrary**[5]. The primary aim of such an inquiry is to provide **empirical deductions that are reasonable** and assist the court in making decisions. The court is **not conclusively**[6] **bound** by such information but is to be treated as **viable and verified evidence**[7].

The following are certain analogies of the manner in which **scientific inquiry is utilized**[8]:



[3] Woodroffe & Amir AliShakil Ahmed Khan, *Law of Evidence*, 21st edition, Vol 1.
[4] The Indian Evidence Act, 1872 § 45, No.1, Acts of Parliament, 1872 (India)
[5] Grid Corporation of Orissa Ltd. v. Eastern Metals & Ferro Alloys, (2011) 11 SCC 334
[6] Godebarish Mishra v Kanti Lal Mishra, (1996) 11 SCC 264
[7] "Dayal Singh v. State of Uttaranchal, AIR 2012 SC 3046"
[8] "Scientific Gadgets in the Law of Evidence, Harvard Law Review, 53(2), 285–296 (1939)"

Moreover, **scientific inquiry and evidence** play a monumental role in enabling profiling that assists not only in punishing criminals but also **enables deterrence**. This often comprises data gathered from different media sources, cellular tower information services, and so on[9].

Contemporary Relevance

With the **advent of technology** and **artificial intelligence**, science has taken over multiple facets of our lives. In recent years, the **ubiquitous use of gadgets** has even **rendered alterations** in the law to accommodate such changes, such as the **permission to admit WhatsApp chat** messages are **admissible evidence** in law[10]. In such a scenario, it is imperative to analyze the different methods that are being **utilized** to **aid** the courts **in delivering justice**[11].

Over the years crimes have become more complex and organized than ever before. Thus, relying on **solely judicial inquiry** in the presence of scientific evidence would be **redundant**. This paper explores the same while establishing how **scientific evidence plays** the role in a judicial investigation that **a logic does to the reasoning**.

Research Questions

1. How do judicial and scientific inquiries compare in their methodologies and processes for establishing facts and deriving conclusions?

2. What are the inherent biases and limitations in judicial inquiries when compared to scientific inquiries?

3. How does the principle of 'audi alteram partem' (hear the other side) differ in its application within judicial and scientific inquiries?

4. In what ways can scientific methods be integrated into judicial proceedings to enhance the accuracy and fairness of verdicts?

5. What are the historical precedents and current practices regarding the use of scientific

[9] "Ms. Jaisy George, Dr. Ashish Deshpande, *Impact of Technology in Investigations: The Judicial Response to Admissibility of Evidence Obtained Technologically,* 8(5): 12023-12041, NVEO- Natural Volatiles & Essential Oils, (2021)"
[10] Bharatiya Sakshya Adhiniyam, 2023 § 63(4)
[11] "Tejas D. Karia, *DIGITAL EVIDENCE: AN INDIAN PERSPECTIVE,* 8(8): 12023-12041, Digital Evidence and Electronic Signature Law Review, Vol 5, (2008)"

evidence in judicial decision-making in India?

Research Objectives

1. To critically evaluate points of similarity and distinction between judicial and scientific inquiries in relation to their methodologies, including the processes taken by each approach.

2. The biases and limitations of judicial inquiries are to be highlighted, along with their contrast to the relative objectivity of scientific inquiries.

3. The principle 'audi alteram partem' is to be analyzed concerning its application within both judicial and scientific contexts, along with the ensuing consequences this has on decision-making.

4. To explore the potential for integrating scientific methods into judicial proceedings, aiming to improve the accuracy and fairness of legal outcomes.

5. To assess the use of scientific evidence within the judicial process in India in the past, take stock of present practices, and suggest recommendations for improvement.

Legal Framework and Judicial Pronouncement(s)

INTRODUCTION

The significance and relevance of scientific evidence present in Indian courts have always been on an upward trajectory, and this has introduced several challenges and complexities faced by the judiciary. This part presents the statutory regime which regulates the admissibility, along with a discourse on the evaluation of scientific evidence in India, and also some of the leading judicial pronouncements which direct this area.

LEGAL FRAMEWORK

Putting into context the admissibility of scientific evidence in Indian courts, the legal framework was basically constructed by the Indian Evidence Act, 1872[12], and now the

[12] Indian Evidence Act, 1892

Bharatiya Sakshya Adhiniyam, 2023 and is substantially augmented by judicial precedents. It suffices that scientific evidence to be used in court shall be reliable and relevant for ensuring a fair administration of justice.

1. Bharatiya Sakshya Adhiniyam, 2023 (Hereafter BSA):

The **Bharatiya Sakshya Adhiniyam, 2023**, serves as the foundational tool with respect to the legal regime revolving around evidence in India. Sections provoking relevance are:

- **Section 39(1):** "*When the Court has to form an opinion upon a point of foreign law or of science or art, or any other field, or as to identity of handwriting or finger impressions, the opinions upon that point of persons specially skilled in such foreign law, science or art, or any other field, or in questions as to identity of handwriting or finger impressions are relevant facts and such persons are called experts*[13]."

- **Section 40:** *Facts, not otherwise relevant, are relevant if they support or are inconsistent with the opinions of experts, when such opinions are relevant.*[14]

This section allows the court to take into account facts which lie in relation to the opinions of experts, as would be suggested facts by experts that would serve to either corroborate or refute expert opinions to provide a full view of the case. Such provisions highlight the need for expert testimony on the side of assistance in carrying out complex scientific issues before the court. Expert witnesses play a vital role in acting as a bridge between technical knowledge and the understanding that the law requires, without which a judge or a juror would be quite deficient in making a wise decision from scientific evidence.

2. The Role of Forensic Science Laboratories (FSL):

The role of Forensic Science Laboratories is quite well defined in the Indian legal system, which provides the much-needed scientific inputs and expertise. The Central Forensic Science Laboratory and state FSLs have a direct bearing on giving scientifically reliable and respectable

[13] Bharatiya Sakshya Adhiniyam, 2023, § 39 (1).
[14] Bharatiya Sakshya Adhiniyam, 2023, § 40.

evidence before courts.[15] These laboratories conduct scientific analyses on many subjects, like DNA profiling, toxicology, ballistics, and analysis of biometric. These things form the crux of solid evidence before the courts and establish crime investigation and trial.[16]

3. Admissibility Standards by the Judiciary:

Indian courts, through various judicial pronouncements, have evolved criteria for admitting scientific evidence. The Supreme Court and High Courts have laid emphasis on reliability, relevance, and adherence to established scientific norms and principles. Following are some of the criteria for which courts look while admitting scientific evidence:

- **Reliability:** How reliable is the applied scientific method? Has it been largely adopted by the relevant scientific community?
- **Relevance:** Whether the evidence is relevant to the case and can help in ascertaining the facts in issue.
- **Expert Qualifications:** The qualifications and expertise of the person presenting the scientific evidence.
- **Methodology:** Whether the technique or methodology adopted to arrive at that evidence is scientific, valid, and correctly applied to the case at hand.[17]

JUDICIAL PRONOUNCEMENTS

1. Ramesh Chandra Agrawal v. Regency Hospital Ltd. (2009)[18]:

The Supreme Court, while reviewing a scientific evidence in the case, expressed the opinion that it should be reliable and based on principles accepted by science. The court held that expert evidence is to be based on facts and reliable data, and the process relied upon is substantially valued and accepted in that particular community, and the scientific community. This ruling

[15] Chattopadhyay, P.K.. (2015). Forensic Science in India. 10.1002/9781118724248.ch15.
[16] Shelton, Donald. (2010). Criminal Adjudication: The Challenges of Forensic Science Evidence in the Early 21st Century. SSRN Electronic Journal. 10.2139/ssrn.1610240.
[17] Pratap, C.E. (2020). Admissibility Standards of Scientific Expert Evidence in Criminal Trials. 10.13140/RG.2.2.15624.57600.
[18] Ramesh Chandra Agrawal v. Regency Hospital Ltd. (2009), AIR 2010 SUPREME COURT 806

brought to light the fact that the strength of any scientific approach is the basis for the establishment of trust in expert findings.

2. Ram Chandra v. State of Haryana (1981): [19]

This was the leading case giving judgment based on forensic evidence in a criminal trial. Here, the Supreme Court explained that the forensic reports must be such that they clearly and precisely relate to facts with proper documentation. Further, the court emphasized following standard operating procedures by the forensic expert to verify their report without compromising the conclusions in question. The case formed a precedent for the way forensic evidence is to be scrutinized strictly by the Indian courts.

3. Mohd. Aman v. State of Rajasthan (1997)[20]

The Apex Court, in this case, furthered the role of DNA evidence in the detection of crime. There it held that the scientific validation of DNA profiling has proved infallible to the hilt and has emerged as pivotal evidence in the pursuit of crime and also establishing identity, with finality unquestioned. This case was the giant leap for accepting DNA evidence in Indian courts if collected, analysed, and presented as per the scientific methodologies recommended by the Court.

4. Santosh Kumar Singh v. State through the C.B.I. (2010): [21]

The DNA evidence was also imperative in the conviction of Santosh Kumar Singh in the Delhi High Court. The court resorted to the admissibility and reliability of DNA profile, being a reliable scientific method in establishing an identity of a person, in ascertaining its evidence in the matter of criminology. The subsequent case reveals how DNA evidence is also used prominently for the conviction of the accused in brutal criminal cases.

5. State of Maharashtra v. Damu Gopinath Shinde[22]

The issue that arose in the Supreme Court in this case was whether the court can rely on narco-analysis/ brain opening in evidence, which includes what statements had been made before the

[19] Ram Chandra v. State of Haryana (1981), 1981 AIR 1036
[20] Mohd. Aman v. State of Rajasthan (1997), AIR 1997 SC 2960
[21] Santosh Kumar Singh v. State through the C.B.I. (2010), CRIMINAL APPEAL NO. 87 OF 2007
[22] State of Maharashtra v. Damu Gopinath Shinde, Appeal (crl.) 992-993 of 1999

admittance of such findings to the court and their evaluation. The instant case had aroused wide controversy and questions of the utility of new scientific techniques in law.

6. Selvi v. State of Karnataka (2010)[23]:

This is a landmark judgment wherein the Hon'ble Supreme Court has enquired into the use of narco-analysis, polygraph tests and the brain-mapping techniques. The court held that these techniques could not be forcibly administered to a person as they would violate the right against self-incrimination under Article 20(3) of the Constitution. The court further said that consent was a condition precedent, and that such evidence must be reliable and scientifically validated. The case established the right to individual protection, but this case and the precedent set within it are with regard to purely scientific investigations.

7. Rajesh Kumar v. State (2011)[24]:

In this case, the Delhi High Court dealt with the admissibility of voice spectrography analysis. Although it was firmly held that a voice sample can be admitted as evidence, provided it is done by an expert and supported by already set down scientific methodology, the approaching court spelled out its potential as a tool for forensic investigation but laid emphasis on scientific rigor in its application.

8. State of Punjab v. Kamaljit Singh (2004) [25]

The above case involved expert ballistic testimony in order to establish the locus, trajectory, direction, and striking point of the bullets in the murder case. The Supreme Court downcast the practice to be followed by such ballistic experts in rigid scientific discipline since the expert report has to be clear and precise. This case identified the critical role played by amongst the forensic ballistics investigation.

9. Krishnan v. State (2003)[26] :

In this case, the Kerala High Court considered the admissibility of fingerprint evidence. It furthers emphasized that fingerprint analysis is a technique whose accuracy is accepted in the

[23] Selvi v. State of Karnataka (2010), AIR 2010 SUPREME COURT 1974
[24] Rajesh Kumar v. State, 2011 AIR SCW 5997
[25] State of Punjab v. Kamaljit Singh, AIR 2004 SUPREME COURT 69
[26] Krishnan v. State, Criminal Appeal No. 2351 of 2011

world of science and therefore cannot be looked aside by court's in criminal cases. The judgment just reiterated the use of fingerprint evidence for identification, which was already prevalent in practice since the early times.[27]

Comparative Analysis

Similarities

As rightly articulated by ***John Stuart Mill*** in his theory on logic:

"the first great lesson learnt from the observation of the world in which we live, is that a fixed order prevails amongst the various facts of which it is composed"

This very adeptly summarizes the **primary premise of inquiry**. Facts remain as the order that prevails over all other components and the subsequent derivations made as it is dependent upon the **deductions made** from the **facts of the case**.

Unknown to the Known

Since both of them are inquiries that serve to **verify the evidence** in a case, they inquire into matters **pertaining to facts**. Both intend to **derive distinct conclusions** from the **factual matrix**[28].

Cause and Effect

In terms of the application of the said inquiries, they derive at a ***cause-and-effect relationship*** even though the techniques used may **differ**[29]. With the given set of facts, the primary objective of both of them would be to **derive a conclusion** in order to realize the role it plays in the trial[30].

The two align on the hypothesis of **correlating nature** and **human conduct** to apply the principles in a **specific manner to be performed**.

[27] Shelton, Donald. (2010). Criminal Adjudication: The Challenges of Forensic Science Evidence in the Early 21st Century. SSRN Electronic Journal. 10.2139/ssrn.1610240.
[28] *Supra* note 16
[29] *Supra* note 16
[30] Bernard Livesey, *Judicial Discretion to Exclude Prejudicial Evidence*, The Cambridge Law Journal, 26(2), 291–309, (1968)

Distinction

The Procedure of Inquiry

***Science*:**

Science is dependent upon carrying out certain steps that are bound to give a **conclusive result**. While it is still **prone to human error**, the **risk in comparison** to that of judicial is **minimal in nature**. The experts rely on **certain formulas and techniques** that provide them with **conclusive and reliable** results.

***Judicial*:**

The **decision-making** is primarily dependent upon the **understanding of the facts** and circumstances by the judge. There is **no particular technique** or method that can be relied on to **derive all the conclusions**. The results come with the **knowledge of the possibility** of **human error**.

Objectives

***Science*:**

The **role of scientific inquiry** in the procedure mainly **remains restricted** to cases when the **court needs assistance** in **deriving evidence** from the facts based upon **empirical data or evidence**. Thus, providing an opinion **without giving a conclusive verdict** is the primary objective of this **form of inquiry**.

***Judicial*:**

Judicial inquiry comprises **examining all facts and circumstances** including inferences provided in an **expert's opinions** and then **determining** the **extent of the rights** and **liabilities** of the parties involved. These results are **conclusive in nature**.

Audi Alteram Partem

Science:

There is **no opportunity to be heard** against the conclusion presented by an expert. The expert

simply provides conclusions and inferences from the facts and relevant material provided to them. Moreover, the expert can only comment or give opinions on the question requiring the requisite skill and experience. It is pertinent to note here that owing to the same there are minimal chances of bias being involved in the report provided.

Judicial:

In cases of judicial inquiry, all parties involved are given an opportunity to allege and state their own case. It is an **established norm** and **tenet of a fair trial** to provide the parties with an opportunity to put forth their case and defend allegations against them.

Dependency

Science:

The sources and techniques are free from the inherent bias of the expert and his opinions would not be influenced by his perceptions. Moreover, since they play the role of an independent neutral third party, they do not have any stake in the outcome of the case.

Judicial:

The end-decision has a **likeliness of being influenced** by the perception of the adjudicating authority. The **witnesses present** are **not** trained to provide information in the court of law accurately **without influence by passion**. They are aware of the outcome and the likely influence of their words on the outcome of the case. Thereby making it infinitely more difficult and less likely to **affirmatively ascertain** the truth in it.

Critical Analysis

"The man of science, in fact, simply uses, with scrupulous exactness, the methods which we all habitually and at every moment use carelessly[31]."

Huxley's works quintessentially summarizes the **complementary application of science** alongside **judicial jurisprudence** and **scientific inquiry**. The author believes that while the

[31] William Twining, Rethinking Evidence: Exploratory Essays, Basil Blackwell, London, 1990, p 55

two inquiries operate in different facets of jurisprudence and serve varying purposes, their interplay complements and eliminates the limitations of each.

Judicial Inquiry Complemented

Inherent Bias

- The **deductions** made in **judicial inquiry** are **conducive to human error** since there are interpretations made by a human on the **basis of their understanding** of certain relevant facts. The **chances of inherent bias** entering the procedure have a **high likeliness.**

- On the contrary to it, scientific inquiry is conducted using techniques. This minimizes the **risk of human fallacy** in deducing the evidence. It is a well-settled opinion of a professional who is **not a party** to the **facts** or the **outcome of the case**. The Apex court similarly stressed the importance of such an inquiry to uphold the fairness of the trial procedure[32].

- It was held that the **scientific evidence** procured would be given **higher recognition** than the **oral disposition** by witnesses in certain cases[33].

Need for Scientific Inquiry

- In situations wherein the court is **not in the position** to analyze the evidence succinctly when the **substantial question of law** involves the **acquisition of some special skill or experience**, the assistance of an expert is required. This rule is formed on merely **necessity** of the situation[34] and becomes applicable wherein the pivotal role played by the **expert cannot be disputed**[35].

- An analogy for such cases is **DNA testing**, which is **accepted and regarded perfect science**[36].

Scientific Inquiry Complemented

Question of Inquiry

- While the court is assisted by professionals in reaching a conclusion, the **court is bound** to

[32] Sharad Birdhichand v State of Maharashtra, (1984) 4 SCC 116
[33] Anwar v State of Haryana, (1997) 9 SCC 766
[34] Gandey Sarvan Kumar v. D. Sriniwas, 2004 (5) Andh LT 827
[35] Ramesh Chandra Agrawal v. Regency Hospital Ltd., AIR 2010 SC 806
[36] Pantangi Balarama Venkata Ganesh v. State of A.P., 2003 Crlj 4508 (AP)

derive **its own conclusions** after the **receipt of the report** of the professional[37]. Moreover, the opinions of experts **cannot be entertained in judicial matters** where the discretion of the court must be used, such as the deliberation upon the **validity of a contract**[38].

- Thus, in instances wherein the **subject matter of the injury** relies upon common education that a reasonable prudent man would be able to ascertain, in such cases scientific evidence or inquiry would **not be permissible**[39].

While it is explicitly clear that while **being both similar and distinct**, both forms of inquiry play a **vital role in delivering justice**, it is pertinent to note here that the goals of the two differ. This enhances the need for **balancing scientific inquiry** and the **legislation regulating scientific evidence**[40].

Conclusion & Recommendations

It would be a safe assumption to deduce that while scientific inquiry is very much in play and action in the court of law especially pertaining to expert opinions, it is not being utilized to its maximum capacity. It becomes relevant here to note that allowing fewer opinions from the experts would **not** in most instances equate with **greater transparency** in the process.

It becomes imperative to draw the **judiciary's attention** toward the merits of this method of inquiry towards an **increased usage** owing to its **ubiquitous application**.

On the basis of the aforementioned deductions, the author would like to suggest the following recommendations to better implement it in India:

I. Verdict:

Inducting **greater employment of science** to establish newer **judicial principles** in occurrences where there is **no prior legislation, statute, or precedent** governing the same. For instance, Data Privacy laws.

[37] "State of Haryana v Bhagirath, (1999) 5 SCC 96"
[38] Hals, 3rd Ed Vol 15 p.588
[39] New Eng Glass Co v. Lovell , 7 Cush 319
[40] "Edmond, G, Judicial Representations of Scientific Evidence. The Modern Law Review, 63(2), 216–251 (2000)"

II. Consistency:

There are certain procedural uncertainties such as the use of scientific inquiry has not been labelled as "**neutral**" in all instances. Thus, the manner of employment in judgments is **not** entirely consistent. This hampers the active facilitation and involvement of scientific inquiry in the future.

III. Scope:

While they are multiple precedents that touch upon the concept of judicial inquiry, none of them explicitly establish the framework, scope and ambit of judicial inquiry.

All of these suggestions must be paid heed to **enable the judiciary** to better **utilize the resources** and also keep the **expert as the neutral party** without enabling them to have a **certain stake** in the **outcome of the case**. This would aid in **rationalizing the decisions** and **maintaining decorum**.

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