Chapter 1
INTRODUCTION AND METHODOLOGY

1.1 CONCEPTUALIZING RESEARCH SUBJECT

“Wherever he steps, whatever he touches, whatever he leaves, even unconsciously, will serve as silent evidence against him. Not only his fingerprints or his footprints, but his hair, the fibres from his clothes, the glass he breaks, the tool marks he leaves, the paint he scratches, the blood or semen that he deposits or collects – all these and more bear mute witness against him. This is evidence that does not forget. It is not confused by the factual evidence. Physical evidence cannot be wrong; it cannot perjure itself; it cannot be wholly absent. Only its interpretation can err. Only human failure to find it, study and understand it can diminish its value.” – Paul L. Kirk, Ph.D.

This research is entirely concerned with the application of science to the detection and prosecution of crime\(^1\). The advent of forensic science technologies have made dramatic scientific breakthroughs in the decision making process of criminal cases but study was required to analyze the exact impact of forensic evidence in determining the rate of conviction and acquittal. It was also required to assess in what type of cases, which kind of forensic evidence could be used. Forensic Evidence is what kind of evidence i.e. is it treated as substantive evidence or corroborative evidence? In what circumstances the court accepted the forensic evidence? If forensic evidence is accepted, does it always lead to conviction or in spite of accepting forensic evidence, acquittal was recorded. In this context, the views of different superior courts regarding forensic evidence have been studied while referring such evidence in the decision making process of criminal cases.

It has been experienced that successful criminal investigation is practically impossible by the traditional method of eye-witness oriented criminal justice system. This method of criminal investigation lowers the quality of criminal justice system. It becomes difficult for the judges to decide a criminal matter or corroborate the fact-in-issue only on the sole basis of evidence of witnesses who might lie or are not dependable (because

\(^1\) H.J. Walls, *Forensic Science: An Introduction to Scientific Crime Detection* 1 (Universal Law Publishing Co. Pvt. Ltd., Delhi, 2\(^{nd}\) edn., 2008)
witnesses fail to appear on the dates fixed by the courts or might not be subject to the process of the court, which delays justice. Moreover, by scrutinizing the examinations-in-chief and cross, the judges fail to reach to a definite conclusion regarding the incident. Nowadays witnesses refuse to come and appear before the court in spite of knowing the truth or witnessing the truth because of fear of becoming preys to criminals or threats which many a time are life taking. Many a time offences are committed in such a condition or situation where it is impossible even to get a single witness. In such cases the decision making process of criminal cases totally depends on circumstantial evidence like DNA evidence, report of the ballistic expert, fingerprints or report of chemical examination.

Due to lack of evidence or lack of proper evidence most of the heinous criminals are acquitted or goes scot free on a basis of even slightest doubt. Moreover the prosecution spends huge amount of money on the trials of criminal cases. Therefore through conventional investigations mostly public money is wasted and criminals get acquittal on the basis of benefit of doubt. Crimes are now committed in a technical way, even technical crimes have emerged which can be investigated only through the use of forensic science. As for example cyber crime, to investigate a cyber crime cyber forensics has to be used. Classification of crimes has also changed from conventional or traditional to technical. The definitions of criminals have also changed since the criminals are now technology savvy. Conventional crimes are also committed in a scientific way through computers in which case no option is left except to use cyber forensic. Intelligent criminals started exploiting science for their criminal acts, whereas investigators are unable to rely on the age-old art of interrogation, development of sources and surveillance to detect crime. Therefore the criminal justice system cannot suffice without the aid of forensic science or new technology. The development of Forensic Science has provided a powerful tool in the hands of the law enforcement agencies and the judiciary.2

A scientific investigation of crime and the justice delivery system, with the aid of forensic science efficiently and effortlessly establishes the criminal charge against an accused with much accuracy. Scientific investigation of crime with the aid of forensic

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science has been accepted all over the world and successful criminal investigation can be done with the help of forensic science.

The pillar of a criminal case entirely lies on criminal investigation. Scientific investigation with the help of forensic science is much more powerful, reliable and fruitful than eye witness oriented criminal justice system. A victim cannot be left at the mercy of the eye witnesses. The different branches of forensic science like DNA, ballistics, fingerprinting, toxicology etc. are much reliable than the examination of ordinary witnesses in the criminal justice system. Some of the questions that are coming in the minds of the researchers are as follows. In everyday life we come across recent developments in forensic science through news papers, television or internet and also training of police personnel on the new forensic techniques but it is still to be revealed whether these developments are of real use in the decision making process of criminal cases?

The value of scientific and technological evidence is three folded. Forensic evidence helps in collecting materials from the remains of the crime scene, fingers the guilty and sets the innocent free. But there is no particular legislation on the admissibility of forensic evidence before court except the Indian Evidence Act which talks about expert evidence, so we usually depend on the decisions and judgments of the higher courts or the Apex Court. Although there is hue and cry regarding the development and acceptability of scientific and technological evidence in the whole world and that its use will certainly help to speedy investigation and criminal justice system, what has to be brought forward is that how many or what ratio of the Indian decisions specially in criminal cases has been given depending or with the aid of forensic science. In other words the question which has to be sorted out is that what is the percentage of conviction and acquittal was recorded in the criminal cases in which forensic evidence were used.

While conducting the study and collecting materials on forensic evidence, I devoted a lot of time and also searched the internet, journals or e-books to find out cases and to assimilate the cases according to the order of judgment. Therefore I intend to precede my work in such way that the future researchers do not have to waste time to search the cases and arrange it. My work will be to chronologically arrange the cases to each forensic topic.
A crime scene often is rich in information that reveals the nature of the criminal activity and the identities of those persons involved. Perpetrators and victims may leave behind blood, saliva, skin cells, hair, fingerprints, footprints, tire prints, clothing fibers, digital and photographic images, audio data, handwriting, and the residual effects and debris of arson, gunshots, and unlawful entry. Useful evidence cannot be gathered without the aid of scientific analysis. Without the use of science, it is not possible to convict criminals, ranging from common theft to a homicidal rampage, unless there was an eyewitness present at the crime scene when the crime occurred. Murderers would continue killing, thieves would continue stealing, and drug traffickers would continue dealing. Fortunately, in today's world, science is used in solving crimes. The element of anonymity and lack of territorial borders in cyberspace makes internet an attractive medium for criminals to commit crimes. Not only the conventional crimes such as thefts, extortion, defamation or forgery are committed through computers but also new forms of crime have emerged such as hacking, trojan, phishing attacks etc. Therefore, forensic science and its use have become indispensable for purpose of investigations.

1.2 BRIEF INSIGHT INTO THE HISTORY AND DEVELOPMENT OF FORENSIC SCIENCE

DEFINITION: The word ‘Forensic’ is derived from the latin *forum* for “public” (Oxford English Dictionary, 2005). In ancient Rome, the Senate met in the Forum, a public place where the political and the policy issues of the day were discussed and debated; Technically, “forensic” means as applied to public or legal concerns. Together, “forensic science” is an apt term for the profession of scientist whose work answers questions for the courts through reports and testimony. ‘Forensic Science’ would, therefore, mean the science which is used in the courts of justice. The National

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Institute of Justice (NIJ, 1908) defines forensic science as “application of scientific knowledge to the legal system.” More broadly it can be defined as that scientific discipline which is directed to the recognition, identification, individualization and evaluation of physical evidence by the application of the principles and methods of natural sciences for the purpose of administration of criminal justice. In other words it is the application of a broad spectrum of sciences and technologies to investigate situations after the fact and to establish what occurred based on collected evidence. A synonym of forensic science is also termed as “Criminalistics”. The word “Criminalistics” was imported into English from a German word “kriminalistic”. It is also known as the science of individualization (Kirk 1963a). The process of individualization is traditionally called identification, as in fingerprint identification, but is more appropriately termed as individualization or source attribution. “Evidence” means and includes—(1) all statements which the Court permits or requires to be made before it by witnesses, in relation to matters of fact under inquiry; such statements are called oral evidence; (2) all documents produced for the inspection of the Court including electronic records; such documents are called documentary evidence. Richard Saferstein writes a more specific definition than what was previously given in his book Criminalistics: An Introduction to Forensic Science, which says that forensic science is the “application of science to those criminal and civil laws that are enforced by the police agencies in a criminal justice system.” The origin of this type of science cannot be accurately pinpointed. According to H. J. Walls’ article “Whither Forensic Science?” it started as a hobby of a few scientists who liked to become mixed up in the proceedings of the police and “enjoyed the kind of problems this association brought them.


9 Supra note 6 at 4

10 Tim Newburn, Tom Williamson, et.al. (eds.), Handbook of Criminal Investigation 303 (Willan Publishing, UK, 2007)

In India, the growing awareness among the police and the judiciary, regarding the role of science played in scientific evaluation of material clues, led to setting up of forensic science laboratories in the State as well as the Centre. After a considerable thought given by the forensic science forums to build comprehensive forensic science facilities under one roof, most of the new laboratories came up with comprehensive facilities by amalgamating scientific sections and chemical examiner’s laboratory into forensic science laboratory. The existing position of the forensic science laboratories and other allied forensic science institutions in the country, offering scientific service in the administration of criminal justice can be studied under two heads. They are (1) Institutions under the Centre (2) Institutions at the State Level

### TABLE 1.1

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<th>i.</th>
<th>INSTITUTIONS UNDER THE CENTRE</th>
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<td>a)</td>
<td>The Central Forensic Science Laboratories under the control of B.P.R.&amp;D&lt;sup&gt;12&lt;/sup&gt; at</td>
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<td>a) Calcutta established in 1957</td>
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<td>b) Hyderabad established in 1968</td>
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<td></td>
<td>c) Chandigarh which was originally established in 1961 as F.S.L. Punjab, later designated as Union Territory Laboratory and re-designed in 1978 as CFSL under B.P.R.&amp;D</td>
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<td>ii.</td>
<td>The Central Forensic Science Laboratory, under C.B.I. New Delhi established in 1968</td>
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<td>iii.</td>
<td>The Government Examiners of Questioned Documents, under administrative control of B.P.R.&amp;D situated at</td>
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<sup>12</sup> The Government of India vide Resolution No.8/136/68-P.I (Pers.I) dated 28.08.1970 formally established the *Bureau of Police Research and Development (BPR&D)* (Ministry of Home Affairs)
iv. The Central Fingerprint Bureau under N.C.R.B.\textsuperscript{13} New Delhi

v. The Serologist and Chemical Examiner to the Government of India, Ministry of Health, at Calcutta established in 1910

vi. The General Manager Mints at

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<th>a) Calcutta</th>
<th>b) Bombay</th>
<th>c) Hyderabad</th>
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vii. The General Manager, India Security Printing Press at

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<th>a) Nasik</th>
<th>b) Bank Note Press, Dewas</th>
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viii. The Controller of Stamps and Stationery

ix. National Institute of Criminology and Forensic Science under M.H.A.\textsuperscript{14} New Delhi established in 1971 which imparts training to police, Judicial and Correctional Service Officers including Scientific personnel from the States and Central Forensic Laboratories

x. Office of the Chief Controller of Explosives established in 1898 in Nagpur. Today there are several circles and sub-circles located in different parts of the country, headed by Deputy Chief Controller, Controller or Deputy Controller at 4 circles and 13 sub circles. The 4 circles are noted as

|---|--------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------|

xi. Central Detective Training Schools at which are training institutes for imparting

\textsuperscript{13} National Crime Records Bureau under the Ministry of Home Affairs available at: \url{http://ncrb.gov.in/} (Last visited on September 20, 2015)

\textsuperscript{14} Ministry of Home Affairs available at: \url{http://mha.nic.in/} (Last visited on September 20, 2015)
specialized detective training to investigating police officers on modern scientific methods of investigation. They are situated at

| a) Calcutta    | b) Chandigarh | xii. Hyderabad |

**TABLE 1.2**

**B) INSTITUTIONS AT THE STATE LEVEL**

The State Forensic Science Laboratories exist in 19 States as mentioned below

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<td>i)</td>
<td>At Calcutta, West Bengal established in 1952</td>
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<td>ii)</td>
<td>At Bombay, Maharashtra established in 1958</td>
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<td>iii)</td>
<td>At Jaipur, Rajasthan established in 1959</td>
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<td>iv)</td>
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<td>vi)</td>
<td>At Bhubaneswar, Orissa established in 1962</td>
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<td>vii)</td>
<td>At Patna, Bihar established in 1963</td>
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<td>viii)</td>
<td>At Srinagar, Jammu &amp; Kashmir in 1964</td>
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.ix) | At Sagar, Madhya Pradesh established in 1964 |
|x) | At Gauhati, Assam established in 1967 |
.xi) | At Bangalore, Karnataka established in 1967 |
.xii) | At Lucknow, Uttar Pradesh established in 1969 |
.xiii) | At Madhuban, Haryana established in 1973 |
.xiv) | At Ahmedabad, Gujrat established in 1974 |
.xv) | At Hyderabad, Andhra Pradesh established in 1976 |
.xvi) | At Chandigarh, Punjab established in 1981 |
.xvii) | At Shillong, Meghalaya established in 1986 |
.xviii) | Simla, Himachal Pradesh established in 1987 |
.xix) | At Delhi, established in 1993 |

States like Maharashtra, Tamil Nadu, Andhra Pradesh, Gujrat, Uttar Pradesh, Orissa, Jammu & Kashmir have further extended their forensic science facilities by establishing laboratories at regional and District Level. Some of the States like Goa, Arunachal Pradesh, Mizoram, Nagaland and Sikkim and Tripura do not have their own
organized laboratories. Similarly, Union Territories like, Pondicherry, Chandigarh, Andaman & Nicobar Islands, Daman & Diu and Lakshadweep do not have their own laboratories. They avail the facilities of the neighbouring States or the nearest Central Forensic Science Laboratory.

1.2.1 Divisions And Facilities Provided By The Laboratories

Both the State and Central laboratories may have all or most of the divisions:

1) Ballistics 2) Biology 3) Chemistry 4) Documents 5) Lie-Detector 6) Physics 7) Serology 8) Toxicology

The work and functions of some of the divisions are discussed are discussed hereunder to co-relate with the forensic topics dealt in this thesis:

1) **Ballistic Division**: This division deals with:

i) Examination of all types of firearms and ammunitions to connect bullets and spent cartridge cases with a particular firearm to the exclusion of all others.

ii) Determine the serviceability of firearms and ammunitions

iii) Determine, time range and angle of firing.

iv) Nature of gunshot injury and a host of other problems associated with offences involving firearms and ammunitions.

In most of the laboratories, cases related to the identification of explosives, their handling and examination of residue materials, after the explosion, are also handled. In some laboratories there are separate division to undertake examination of explosive cases.

2) **Chemistry Division**: The following items of evidence are dealt with in the Chemistry Division:

i) Examination of Petroleum Products like petrol, diesel and kerosene.

ii) Examination of sub-standard construction material like bricks, cement, concrete etc. besides adulteration in these materials.

iii) Determination of alcohol in blood and urine in cases of suspected drunkenness and analysis of fermented wash, illicit liquor, varnish etc. in prohibition and excise cases
iv) Examination of inflammable material in suspected cases of arson, dowry deaths etc.

v) Analysis of pesticides for their identification.

vi) Analysis of narcotics, dangerous drugs such as opium, ganja, bhang, LSD, heroin, pethidine, methadone etc.

vii) Analysis of dyes, paint, ink and other chemicals with a view to ascertain their identity, quality and composition.

viii) Examination of metal alloys and metal fragments for identification and comparison.

3) Serology Division: The serology division undertakes the following examination:

i) Examination of articles stained with blood, semen, sweat, saliva to determine their nature, origin, grouping, DNA profiling etc.

ii) Determination of paternity through blood groups.

iii) Individualization of blood and bloodstains based on enzymatic studies using latest techniques.

iv) Determine origin and grouping of fragments of muscle, skin, bones etc. on objects like bullets, fingernails, etc.

4) Toxicology Division: The division deals with:

i) The examination of viscera, stomach wash, vomit etc. to determine poisons of vegetable origin, inorganic salts and metals, synthetic drugs, pesticides, alcohol and other general poisons.

ii) Examination of powders, pills, capsules, syringes, vials etc.

iii) Determination of alcohol in blood and urine in drunken driving cases\(^{15}\).

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\(^{15}\) Central Forensic Science Laboratory (CBI), available at: [http://cbi.nic.in/aboutus/manuals/Chapter_27.pdf](http://cbi.nic.in/aboutus/manuals/Chapter_27.pdf) (Last visited on May 11, 2015)
1.2.2 Facilities Offered By Other Expert Institutions

Now let us study the specialized functions provided by some of the particular institution of the centre except the Central Forensic Science Laboratories and the State Fingerprint Bureau.

1) The Serologist and Chemical Examiner to the Government of India

This institution, which was first established for serological examination is concerned with the identification, analysis, origin and grouping of blood and blood stained articles referred to it by police agencies throughout the country. The articles are sent to it through the State Forensic Science Laboratory or the Chemical Examiner Laboratory. This institution is capable of giving advice in a variety of cases involving actual bloodshed like murder, hurt, suicide cases, cases of disputed paternity by identifying blood group or other criminal cases in which other body fluids may be involved. Since, recently, most of the Central and State Laboratories have developed serological expertise within their set up. Such of these laboratories have discontinued sending articles for serological examination to this institute at Calcutta. Besides, serological examination, it also serves as a production and supply centre for serums, for blood analysis.

2) i) Central Fingerprint Bureau, Calcutta

This bureau was set up in 1957, under the control of Intelligence Bureau. It was later brought under the control of Central Bureau of Investigation. It is now under the control of N.C.R.B. It is a national bureau maintaining fingerprints of convicts from all States and Union Territories of India. It has the largest collection of fingerprint records in our country. When a criminal from one State operates in another State, his previous conviction records can be obtained from the Central Fingerprint Bureau to secure enhanced punishment. The bureau also maintains the records of international criminals. The fingerprint records are now computerized to facilitate faster retrieval.

ii) The State Fingerprint Bureau

Every State has a fingerprint bureau on the lines of the CFPB. These bureaus have the following functions:

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16 Central Fingerprint Bureau available at: http://164.100.44.112:8888/English.aspx (Last visited on May 11, 2015)
i. Maintain a record of fingerprint slips primarily of criminals convicted for certain offences specified in the Indian Penal Code.

ii. Assist in searching the crime scenes for chance prints for suspect identification. Some States have established these bureaus in regions and districts also, most of which are for single digit records. A few States have started using computers for speedy processing of fingerprint records.

1.3 TYPES OF FORENSIC EVIDENCE

Although, ‘Forensic Science’ clinches all branches of physical and natural sciences, chief among them being chemistry, biology, physics, broadly there are two areas of forensic science. They are Identification and Individualization. In Identification the parent field is mostly chemistry, though principles are drawn from physics or biology. The goal of these specialties typically is to identify a substance and to quantitate it. So the method is also called quantitation. For example, what chemical is certain powder, and how much of it is present? Does a cadaver contain poison, what kind, and how much? These fields based on conventional science, are considered highly reliable and are rarely challenged in court unless a new technique is presented or evidence of negligence or fraud exists. The individualization on the other hand seeks to associate an item of evidence found at a crime scene with its unique source, to the exclusion of all others and it is not derived from conventional sciences. Rather the methods and principles employed by the individualization includes, comparison of such things as bite marks, bullets, fingerprints, footwear, hair, handwriting and so on. DNA typing is the exception. It is the first individualization science derived from traditional science.

The term "forensic science" encompasses a broad range of forensic disciplines, each with its own set of technologies and practices. Some of the forensic science disciplines are Chemical examination, Fingerprints and footprints, mobile phone data, DNA test (Forensic Identification), Identification by photograph, identification by voice, Ballistics, Toxicology. Except these there are also various other classification of

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17 Supra 2 at 7-16


19 Supreme Court Digest, 2011, 2010 and 2009
Forensic Science. They are, Forensic Entomology, Forensic Odontology, Forensic Pathology etc. Since, in the present study only four topics are dealt with such as DNA, ballistics, fingerprints and toxicology, only those four topics are discussed at length.

1.3.1 DIFFERENT TYPES OF FORENSIC EVIDENCE DEALT UNDER THIS THESIS

a) Forensic Identification by DNA Profiling Technique (DNA tests)\(^{20}\)

DNA is the abbreviation of Deoxyribo Nucleic Acid. It is the basic genetic material in all the living cells of the body. It is contained in white blood corpuscles and not in red blood corpuscles. It carries the genetic code. Hence the DNA structure determines human character, behavior and body characteristics. Each individual, consequently, is unique and is different from all others. In monozygotic twins, DNA structure is the same because they come forth by the division of a single fertilized egg. Monozygotic twins are generally identical.\(^{21}\) In 1984, Sir Alec Jeffrey discovered the method of identifying individuals from DNA and in 1985 UK police first used forensic DNA profiling.\(^{22}\)

b) Ballistics:

Ballistics is the use and study of firearms. The science of ballistics has been developed to facilitate the examination of firearms, ammunition and other related matter. As a term of art, ballistics technically refers to the study of a bullet’s path from the firearm, through the air, and into a target. In criminal investigations, however, ballistics is a shorthand term for firearms identification: the art of matching recovered bullets and their casings to the firearm from which they were fired. Firearms identification is often


\(^{21}\) B.R. Sharma, Forensic Science in Criminal Investigation & Trial 1123 (Universal Law Publishing Co. Delhi, 4th edn., 2003)

\(^{22}\) History of Forensic Science, available at: http://forensicsciencecentral.co.uk/history.shtml (Last visited on May 16, 2015)
treated as a subspecialty of tool mark identification. A tool mark expert attempts to match tools like screwdrivers and crowbars to the marks they make when used on objects. Ballistics experts are more than tool mark specialists. They are generally experts in many aspects of firearms and testify about topics ranging from whether a specific object is, legally, a firearm, to intricate reconstructions of crime scene evidence. Forensic Ballistic was first invented by Calvin Goddard, a pioneer in this study.

c) Fingerprints:

“Fingerprints are God’s own seals, given to us that we may recognize his greatest creation-MAN.” The best and certain method in identification was fingerprints which were discovered during the fag end of the nineteenth century till the advent of a similar method DNA Fingerprinting. Pattern and impression evidence is one of the most common forms of evidence that can be detected and collected from a crime scene. Impression evidence is created when two objects come in contact with enough force to cause an “impression”. Typically it is either two dimensional such as fingerprint or three-dimensional such as marks on a bullet caused by the barrel of a firearm. The fingerprints as evidence are important because of the following features of the fingerprints. They are unique, they are permanent, they are universal, they are inimitable, they are classifiable, and they are frequently available in crime situations as evidence. Latent fingerprints are crucial pieces of evidence used in criminal investigations that can link a suspect to a crime. They are extracted from crime scene by experts by using chemical or physical methods. The fingerprint images could then be photographed, marked up for distinguishing features by latent fingerprint examiners, and used to search an automated fingerprint identification system (AFIS). An AFIS is a computer system (not available in India) that stores fingerprint images in an organized, searchable data structure that is widely used by criminal justice agencies to maintain


databases of the fingerprints of individuals who are arrested or incarcerated\textsuperscript{25}. There is a controversy regarding the inventor of fingerprint. It is accepted by many that Henry Faulds is the true inventor of Fingerprint. Although evidence were found that the use of fingerprint existed from the pre-historic times, the English first began using fingerprints in July, 1858, when Sir William Herschel, the Chief Magistrate of the Hoogly District, first used fingerprints on native contracts\textsuperscript{26}.

d) Forensic Toxicology:
Forensic toxicology is the use of toxicology and other disciplines such as analytical chemistry, pharmacology and clinical chemistry to aid medical or legal investigation of death, poisoning, and drug use. The primary concern for forensic toxicology is not the legal outcome of the toxicological investigation, but rather the technology and techniques for obtaining and interpreting the results. A toxicological analysis can be done to various kinds of samples. The first comprehensive work on forensic toxicology was published in 1813 by Mathieu Orifila. He was a respected Spanish chemist and the physician who is often given the distinction of "father of toxicology." His work emphasized the need for adequate proof of identification and the need for quality assurance. It also recognized the application of forensic toxicology in pharmaceutical, clinical, industrial and environmental fields.

1.4 EXISTING INDIAN LAWS
Section 45 of the Indian Evidence Act, 1872, deals with ‘opinion of expert, when relevant’. But the opinion of expert is admissible by evidence only after scrutinization under Article 21 and Article 20(3) of the Constitution of India and section 161(2) of Code of Criminal Procedure, 1973. Section 293 of Code of Criminal Procedure, 1973, specifies under what circumstances certain reports of Government scientific experts may be used in any evidence. Sections 53 and 53A of Code of Criminal Procedure,


\textsuperscript{26} U.S. Marshals Service for Students available at: \url{https://www.usmarshals.gov/usmsforkids/fingerprint_history.htm} (Last visited on June, 30, 2016)
1973, is also very much useful for DNA profiling of the accused. The law relating to ‘fingerprints’ is specifically covered by different sections of the Identification of Prisoners Act, 1920, Section 73 of the Indian Evidence Act, 1872 and section 293 of the Code of Criminal Procedure, 1973 along with the general laws applicable to other forensic techniques. The laws relating to toxicology is specifically dealt under certain sections along with the general laws. Section 284 of the Indian Penal Code, levies the punishment for ‘negligent conduct with respect to poisonous substance’. Sale of Poisons Act, 1919, prohibits except under a licence, the import of any specified poison and may by rule regulate the grant of licences. Narcotic Drugs and Psychotropic Substances Act, are also a certain category of poison and dealt by the provisions of The Narcotic Drugs and Psychotropic Substances Act, 1985.

1.5 THESIS CHAPTERIZATION:

This thesis is divided into seven chapters, the first chapter provides a layout, giving an introduction of the topic of the thesis, history and development of forensic science, types of forensic evidence, existing Indian Laws, purpose of this study, hypothesis, research question, review of existing literature and research methodology. The second chapter contains Law of forensic evidence in India and Abroad: A comparative study. The third chapter deals with the study of DNA evidence in particular and its applications in criminal cases by the Indian Judiciary. The fourth chapter contains the analysis of criminal cases in India using forensic ballistics. Fifth chapter highlighted the criminal cases in using fingerprint evidence in India. The sixth chapter portrays how forensic toxicology and chemical analysis affects judicial decision making in India in criminal cases. The seventh and the last chapter deals with conclusion and findings along with recommendations with future research suggestions.

1.6 PURPOSE OF THE STUDY

Apparently, courts are independent in judicial decision making but in reality independence is dependent on proper investigation. So, without identifying the forensic materials it is barely impossible to prove a case. Sometimes before, forensic
individualization scientists compared pairs of marks, (handwriting, fingerprints, tool marks, hair, tire marks, bite marks) examined whether the marks matched and testified in court that whoever or whatever made one made the other. In India, the method of comparing handwriting is still evident and prevails in Section 73 of the Indian Evidence Act, 1872. The testimony of the experts was rarely questioned as cross-examination failed to outweight the certainty of the forensic analyst. Studies have revealed that there is a standardized shift in the Forensic Identification Science. The merging of the legal and scientific forces is dragging the traditional forensic identification sciences towards a fundamental change. The presumption that existed in the core of this field about its distinctiveness is weakened by proof of errors in adeptness testing and in actual cases. Changes in the law pertaining to the admissibility of expert evidence in court along with the advent of new techniques are forcing the old techniques towards a new standard. Some examples are cited below proves the errors of the forensic techniques or errors that might occur.

a. In State v. Krone,27 Krone was convicted of murder and sentenced to death, on the basis of evidence of a forensic odontologist who suggested that the bite mark found on the victim’s flesh matched with the alignment matched with Krone’s dentition but after a decade Krone was exonerated by DNA analysis.

b. Errors can also occur in the field of ballistics. Two bullets were viewed through a comparison microscope. The bullets were fired from two consecutive manufactured Smith & Wesson 38 Special Revolver Barrels. A probability in the nomenclature can occur, whether it was fired through the same or different barrels as numerous matching and non-matching situations are engraved onto bullets. To reliably identify the barrel through which the questioned bullet was fired, an examiner must distinguish among class, sub-class and every single and possible characteristic. These two bullets illustrate sub-class characteristic agreement of striated markings on a groove impression that could be mistaken for individual characteristics. Without investigating the potential of subclass carryover, the examiner could mistake

these as having been fired from the same gun.\textsuperscript{28} This example can be compared with identical twins. In case of identical twins it is very difficult to get the dissimilarity so every possible combination or test has to be tried to bring out the difference.

c. In March 2004, a latent\textsuperscript{29} fingerprint was recovered after the train bombings in Madrid, Spain, which was compared with a database fingerprint belonging to Brandon Mayfield of Port-land. On the basis of these prints FBI fingerprint examiners identified Mayfield as the bomber which was later proved to be erroneous.\textsuperscript{30}

Based on the case analysis and data provided by the “Innocence Project”, Cardozo School of Law (New York), the factors associated and responsible for wrongful conviction in New York has been brought forward. It revealed 71\% of the wrongful convictions take place due to Erroneous Eyewitness Identifications, Forensic Science Testing Errors are responsible to the extent of 63\%, Police Misconduct is responsible for 44\% errors, Prosecutorial Misconduct leads to 28\% errors, False/Misleading Testimony by Forensic Scientist leads to 27\% error, Dishonest Informants leads to 19\% errors, Incompetent Defence Representation leads to 19\% errors, False testimony by lay witnesses results in 17\% errors and False Confessions again makes 17\% errors. Among all the reasons only Forensic Science related reasons amount to 90\% wrongful convictions (Forensic Science Testing Errors are responsible to the extent of 63\% + False/Misleading Testimony by Forensic Scientist leads to 27\%).

\textsuperscript{28} Bruce Moran, firearms examiner with the Sacramento County (CA) District Attorney, Laboratory of Forensic Services available at: http://www.corpus-delicti.com/fs_bookstore/cr/cr_authors.html (Last visited on June 19, 2015)

\textsuperscript{29} A Latent Fingerprint is an impression left by a finger (or, more precisely, by friction ridge skin) on a surface. Latent prints are commonly recovered from crime scenes.

\textsuperscript{30} Problem Idents, available at: onin.com/fp/problemidents.html#madrid (Last visited on June 19, 2015)
The traditional forensic individualization sciences rest on a central assumption that two indistinguishable marks must have been produced by a single object. Traditional forensic scientists seek to link crime scene evidence to a single person or object to the exclusion of all others in the world. They do so by inclining on the “assumption of discernible uniqueness”. Basing on this assumption, markings produced by different people or objects is observably different. Thus, when a pair of markings is not observably different, criminalist concludes that the marks were made by the same person or object. The “assumption of discernible uniqueness” offers important practical benefits to the traditional forensic sciences although it lacks theoretical or empirical foundations. It enables forensic scientist to draw bold, definitive conclusions that can make or break cases. It excuses the forensic scientist from developing measures of object attributes, collecting population data on the frequencies of variation in those attributes, testing attribute independence or calculating and explaining the probability that different objects share a common set of observable attributes. Far more scientific work would be needed and criminalist would need to offer more tempered opinions in court. Forensic science experts most of the times are tempted, in their careers, to report positive results when their inquiries come up inconclusive, or indeed to report a negative result as positive. The traditional Forensic science experts have pre-conceived notions.\textsuperscript{31} To cure such problems scientists have invented new forensic techniques which are much more dependable and trustworthy. In the past decade thousands of people who were convicted for serious crime and even sentenced to death have been exonerated by DNA analyses of crime scene evidence that had not been tested at the time of their trial. Another problem in the field of Forensic Science is that in ordinary science academically sound students receive four or more years of doctoral training where and spend more time to learn where much of the socialization into the culture of science takes place. This culture emphasizes mechanical rigidity, openness and cautious interpretation of data. In Forensic Science, the forensic experts are mostly layman, who do not receive any formal or specialized training in the field of forensic science. It was found 96% or less of the positions are held by persons with bachelor’s degree, 3% master’s degree and 1% Ph.D. When individuals who are not sharp in the culture of

\textsuperscript{31} Id note 31 at 893, 894
science work in an adversarial, crime fighting culture, there is a substantial risk that a
different set of standard will prevail. A former forensic scientist noted, this pressure
packed environment can lead to data fudging and fabrication. Another problem which
is not only faced by countries like Boston, Los Angeles, Detroit, New York but by the
whole world is that forensic experts are careless, bias, incompetent, they have private
understandings with the prosecutors. These factors have raised doubts about the
accuracy and trustworthiness of the findings of many laboratories. It is believed by
many academicians in the world that there is a strong requirement of research culture in
forensic science because research culture affects the understanding of evidence,
changes the forensic analyst’s relationship with the empirical data and changes the
method as to the way how evidence is reported. It is also felt by the academicians that
forensic science evidence must be placed on a more accurate scientific base. It implies
that a noteworthy culture shift is required. The focus of forensic science should be more
on science than on law. Among all other issues and problems of research the most
significant is that the empirical data do not support the traditional forensic sciences
adequately to justify the frequent strong claims of analyst. The academicians also agree
with the NAS\textsuperscript{32} Report which concluded that in major areas of forensic science, there
is lack of existence of well-defined system for determining error rates and proficiency
testing reveals poor performance of some examiners. No large population studies have
been conducted in most forensic science fields to establish the specialty of marks or
features. Despite the unavailability of statistical foundation, probabilistic claims are
being made by the examiners basing only on their experience. In February, 2009, a
long- awaited report was published by the prestigious National Academy of Sciences
(NAS) on forensic sciences. The report focused on “research”. The report also pointed
that research need to be balanced against other needs. It also said that forensic science
laboratories are too busy to undertake, or even participate in research. But NAS also
pointed out “more research, imprecisely defined, is not enough. What forensic science
needs is the creation and institutionalization of a research culture.” A research culture
means a culture in which the following questions are primary: What do we know? How

\textsuperscript{32} National Academy of Science available at : http://www.nasi.org.in/ (Last visited on June 19, 2015)
do we know that? How sure are we about that? It means a culture in which these questions are asked with reference to data, to published studies, and to publically accessible materials, rather than primarily by reference to experience or craft knowledge or simply assumed to be true because they have long been assumed to be true. It is firmly believed that a research culture should be more centralized and more well-established within forensic science which does not imply that henceforth all forensic practitioners should research. On the contrary, forensic practitioners will continue to practice forensic science with a research culture in place. A research culture should be created on the basis of experimental support. The practices in the laboratory, conclusions in reports and testimony in the courtroom should depend on experimental support for claims. At present there is a lack of research culture in forensic science. If forensic analysts are asked in court about the basis of their claims, they usually refer to experience and training rather than providing any systematic data. Although experience is a legitimate basis for certain kinds of knowledge, but it is severely dangerous for experience alone to be the basis for sweeping claims like individualization. It is also obvious that the legal system is also the major client for forensic science, the requirements court impose will naturally, and perhaps inevitably, influence what quantum and what kinds of research are deemed necessary by the community itself. The moot question here is that though judicial decision making in India is a part and parcel of the Criminal Justice System but is justice really seen to be done? One of the main reasons for the lack of any effective changes brought out in recent years is the lack of proper investigation which includes failure to collect physical evidence from the crime scene or improper crime scene investigation.

Therefore, the purpose of the study is to, look into the development of forensic science and its realistic use in the criminal justice administration and its acceptability by the courts in India. To analyze the decided cases for the last ten to twenty years of the superior courts in India which based its decisions with the aid of forensic science? To understand the attitude of the superior courts in India regarding the admissibility of

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33 Individualization is the assertion that an item can be identified to a unique, specific source- that a print can be identified to a particular finger, to the exclusion of every other finger in the universe; or that a handwriting specimen can be identified as belonging to one and only one particular author out of the entire human population. Because no individual examiner can ever examine every possible specimen in the universe, experience alone cannot justify a claim of individualization, assuming that the potential population of the source is substantial.
forensic evidence in the decision making process. To make a comparative study of the Indian court decisions with the foreign court decisions regarding the admissibility of forensic evidence in courts. To examine and identify lacunas in the Criminal Laws as well as support mechanism of using forensic evidence and to suggest any law reforms to use forensic science/evidence in more effective way.

1.7 LITERATURE REVIEW

Michael J. Saks\(^\text{34}\) and Jonathan J. Koehler\(^\text{35}\) has put forward that the converging legal and scientific forces are pushing the traditional method of proving cases towards fundamental change. The assumption of infallibility that resided in the core of this method is weakened by evidence of errors in proficiency testing and in actual cases. Changes in the law pertaining to the admissibility of expert evidence in court, together with the emergence of DNA typing as a model for a scientifically defensible approach to question of shared identity, are driving the older method toward a new scientific paradigm\(^\text{36}\).

“The Need for a Research Culture in the Forensic Sciences” is an article which reflects an effort made by diverse group of participants which includes law professors, academics from several discipline and practicing forensic scientist to find and explore common grounds in the debates regarding methods, techniques and reliability of forensic sciences in general. Issues like “To what extent do the forensic sciences need to change in order to place themselves on an appropriately secure foundation in the 21\(^{st}\) century”? has been discussed. It was firmly agreed by the group that the traditional forensic sciences in general that the pattern identification disciplines, such as fingerprint, firearm, tool mark and handwriting identification evidence in particular, presently do not possess an absolutely developed well established scientific foundation. This can only be accomplished through the development of a research culture that permeates the entire field of forensic science. In this article, the authors

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\(^{35}\) McCombs School of Business, University of Texas, Austin, USA

described the underdeveloped research culture in the non-DNA forensic sciences, offered suggestions for how it might be improved and explained why it matters.\textsuperscript{37} Adarsh M. Dhabarde, in the article “Forensic evidences in Criminal Trial: Need of the Hour, attempted to highlight the need of recognizing forensic tests in criminal trials in the light of changing modus operandi of criminals and spectacular growth of science in this regard in the last few decades. It has been highlighted that trials in India are conducted with the help of two major criminal procedure laws, The Indian Evidence Act, 1872 and the Criminal Procedure Code, 1973 where expert testimony of Medical Practitioners and other experts have been provided. Careful study of the judicial decisions of Supreme Court of India reveals that courts have rarely relied upon such evidences because they do not explain the facts beyond reasonable doubts or because performance of such tests cannot be mandated in the light of Right to Life and Liberty under Article 21 of the Constitution.\textsuperscript{38}

In the case of \textit{Smt. Selvi v. State of Karnataka}\textsuperscript{39}, it has been held by the Supreme Court that compulsory administration of the Forensic Techniques like Polygraphy, Narco-Analysis and Brain-Mapping is unconstitutional if performed without the consent of the accused as it violates Article 20(3) of the Constitution of India, which prohibits self-incrimination and the right to life and personal liberty guaranteed by Article 21 of the Constitution of India. In this respect a comparative study of Supreme Court judgments regarding Article 20(3) and Article 21 is discussed with reasons.\textsuperscript{40}

Recent developments in scientific techniques and their use in criminal investigation have also raised an important question that whether the involuntary administration of the three techniques (i.e. Narco-Analysis, Polygraph, and Brain Electrical Activation Profile) in criminal cases are valid under the contemporary Indian Law and whether it


\textsuperscript{38} Supra note 13

\textsuperscript{39} 2010 (7) SCC 263

violates HUMAN RIGHTS as well as fundamental rights which are available to all citizens? 41

“Preventive Forensics” is another new term which is a part and parcel of forensic evidence. The article “Preventive Forensics: Emerging Trends And Issues” the meaning of “Preventive Forensics” has been explained and its present and future application is portrayed in different sectors. Reasons for adopting “Preventive Forensics” in corporate sectors and what are the solutions have been discussed. Vicarious liabilities and steps for limiting such liabilities are focused. Prevention of crimes by the use of Preventive forensic is the other part which has been brought forward.42

Forensic ballistics has evolved considerably since the field came to prominence in the 1920s. Early experts discovered that firearms leave distinctive marks on bullets and cartridge cases, and since that discovery the science of ballistics research has essentially dealt with comparison. For many years, experts used a comparison microscope to measure the similarities between two or more bullets or cartridge cases, but since the 1980’s, ballistic scientists have relied on computer software that allows them to manipulate and compare images. With software like Pyramidal Technologies’ ALIAS43 system, the work of forensic ballistics experts stands to get much easier.44

“Photomicrograph” is a part of ballistic evidence. Photomicrograph is the visual representation of the matching of the striation marks of the crime bullet and the test bullet. There will be a lacunae in the expert’s report if the if the photomicrograph is not produced by him in the court before the judge. Only the oral version of a ballistics expert on the witness box like, “I have compared the striation marks of these two types of bullets and there is a complete matching” is not sufficient to prove a prosecution case in absence of the photo-micrograph. Therefore to prove the inspection of a firearm


by the ballistic expert “Photomicrograph” is essential evidence without which the prosecution case cannot be proved.\(^\text{45}\)

The article has examined the science of DNA identification and its use during criminal investigations and in criminal proceedings, including criminal trials, appeals and post conviction proceedings. It highlighted the main benefits and costs of the increasing role of DNA identification in the criminal justice system with special emphasis to India. DNA profiling is a technique by which an individual can be identified at molecular level. The use of DNA evidence in criminal investigation has grown in recent years. No doubt, DNA has great importance in criminal investigation cases such as murder, rape, disputed paternity, man-made disaster etc. still there is no specific provisions under the Indian Evidence Act, 1872 and Code of Criminal Procedure, 1973 to manage forensic science issues.\(^\text{46}\)

As any crime show buff can tell you, DNA evidence identifies a victim's remains, fingers the guilty, and sets the innocent free. But in reality, the processing of forensic DNA evidence takes much longer than a 60-minute primetime slot.\(^\text{47}\)

The plausible solution to overcome the conflict between eye-witness and medical evidence is to enhance the value of medical evidence. The scientific methods in the detection of the crime are daily improving and are becoming accurate, sensitive and specific. They should be utilized. Thus lawyers and judges have to become proficient in weighing competing expert evidence and to have a harmonious construction with the testimony of eye-witness.\(^\text{48}\)

A critical study on the causes of failure of criminal cases reveals different issues which are enumerated with the plausible solutions. The causes for failure of the Criminal cases under the Arms Act, 1959, with special reference to Forensic Perspectives are Defective Investigation, Absence of Ballistics/Arms Expert’s Report etc. Therefore the

\(^{45}\) Dr. Durga Pada Das, “Role of Photomicrograph in Forensic Ballistics” 3 CriLJ 177 (2009)


\(^{47}\) DNA fingerprinting enters 21\(^{st}\) century, available at: www.sciencedaily.com/releases/2012/04/120427163418.htm (Last visited on April 27, 2012)

Investigating Officer (IO) of such type of cases should be much more vigilant. The work of labeling on the seized fire arm should be well known to him. The IO should also send the offending fire arm to a competent ballistic expert or to an experienced arms expert to justify that the seized fire arm was in working condition and must conform to take the expert report after the examination of the offending arms.\textsuperscript{49}

Evidentiary Value of Video Conferencing is an upcoming issue and can be studied under the head of Cyber Forensics. There is a need to infuse sensitivity in the minds of the court and the lawyers about the hardship and inconvenience which the witness suffers when the case is adjourned. The advent of technology has greatly benefitted other countries across the world in imparting justice to their citizens, it is time we utilize the same to improve our abysmal statistics toward clearing cases and attempt to reduce litigation time. The legislature should enact a law setting guidelines for video conferencing and keep in pace with the times. We should learn from Singapore which has amended its Evidence Act which is similar to ours to include a new section governing video conferencing.\textsuperscript{50}

Law is a social requirement. Legislations are made with the changing requirements of society. A focus has been made on the necessity of Forensic Evidence and its acceptance by the society at large. Criminal justice system starts from investigation to the delivery of the judgment or decree. Investigation starts from grass root level. Therefore unless the investigating personnel like police or expert is strong it is not possible to form an effective criminal justice system. To make a strong and effective criminal justice system both police and experts should be provided with scientific tools and mechanisms along with economic solvency to go beyond bounds for processing the investigation. The Governments also needs to be active to implement policies in this respect. Some of the daily reports from newspaper are portrayed here to bring to the notice how the whole process of criminal justice system runs from the bottom level because justice system is like a chain where a break of one ring of the chain will collapse the whole system.

\textsuperscript{49} Dr. Durga Pada Das, “A study on the Causes of Failure of Criminal Cases under the Arms Act, 1959, with special reference to Forensic Perspectives” 2 CriLJ 149 (2008)

\textsuperscript{50} Gautamaditya Sridhara, “Evidentiary Value of Video Conferencing” 2 CriLJ 166 (2008)
a. DNA test helps to identify 6 submarine sailors reported in Mumbai on 30.08.2013 by Sumitra Deb Roy and T Ramavaraman

b. The Centre for DNA Fingerprinting and Diagnostics (CDFD) will provide DNA Fingerprinting services to the CID, AP Forensic Science Laboratory (APFSL) and other law enforcing and crime investigation agencies free of cost. It has been reported in Hyderabad on July 14, 2012.

c. The Forensic Science Laboratory at Mumbai, Kalina, will prioritize the DNA profiling of the sailor’s bodies retrieved reported on August 19, 2013 by Sumitra Deb Roy in Mumbai

d. DNA Fingerprinting helps to unravel mystery deaths reported by Ch Sushil Rao on September 18, 2001, at Secunderabad.

e. The Benaras Hindu University (BHU) is going to introduce the facility of DNA Fingerprinting at the Department of Forensic Medicine, Institute of Medical Sciences reported in Varanasi on November 1, 2011

f. Senior judicial officers, scientists, forensic experts and crime scene investigators from police departments of USA, United Arab Emirates, Nepal, central investigating agencies, and from 20 states will be in city on Saturday to attend the third international conference on the 'Science of DNA Fingerprinting. It has been reported at Lucknow on November 12, 2011.

g. Statements of Nupur Talwar recorded at a sessions court in Ghaziabad continued on the forensic examination of Hemraj's blood being found on a pillow case. Reported at Gaziabad, Noida, on May 13, 2013.

h. Centre for DNA Fingerprinting and Diagnostics at Hyderabad yet to receive DNA samples of Uttarkhand victims reported at Hyderabad on July 27, 2013.

i. DNA Test indicate that scion Abhishek Kasliwal of Sreeram Mills raped woman reported at Mumbai on May 30, 2006

j. Rohit Shekhar (33), who is seeking to declare 88-year-old N D Tiwari as his biological father, was granted relief by the Delhi high court on Tuesday which allowed his plea to gain access to the veteran Congress leader's DNA test report that had mentioned him as his son. It has been reported in New Delhi on April 10, 2013.
k. Some of India's leading forensic researchers working in Kolkata's Central Forensic Science Laboratory will now train men from the CBI headquarters, and police forces of Maharashtra, Gujarat, Jammu & Kashmir, Madhya Pradesh and Tamil reported in Kolkata by Subhro Niyogi on September 17, 2003.51

1.8 RESEARCH QUESTIONS:
1. Though judicial decision making in India is a part and parcel of the Criminal Justice System but is justice really seen to be done?
2. Is forensic evidence in India really aiding Judicial Decision making?
3. Does the judicial decision making convey justice in reality or deprive justice?
4. On what grounds forensic evidence is accepted and rejected?

1.9 HYPOTHESIS:

Scientific investigation of crime with the aid of forensic science has more probative value than direct evidences in deciding criminal cases.

1.10 RESEARCH METHODOLOGY:

1.10.1 Theoretical Approach

This research adopted an interpretive as well as positivistic research paradigm relying on observation, analysis of existing texts. This empirical research took a critical approach to the existing law in India and its progenitor, United Kingdom along with the United States of America and all available literatures pertaining to Forensic Evidence and its relation with judicial decision making. The key theoretical principle in this thesis was to study the approach of decision making process of criminal cases in developed countries and their similarities and differences with India.

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51 Articles on DNA Forensics, available at: articles.timesofindia.indiatimes.com/keyword/dna-fingerprinting (Last visited on August 30, 2013)
1.10.2 Study Design
The method of the research is primarily analytical and the methodology which has been adopted is doctrinal. As the title of the research suggest the study could only have been possible by the analytical study of select cases and observation given by the Hon’ble Supreme Court and the High Court in a chronological order and to assess and explore the privileges and shortcomings in the criminal justice system depending on forensic evidence by stimulating insights incorporated. Decisive cases which brought about changes in the law for accepting or rejecting forensic evidence in the court were also studied. Therefore the study has been based on principles of law arising from judicial decisions and more appropriately can be termed as ‘Case Study Method’. Although case law is distinguished from statute law yet together with statute law sometimes can be considered as primary source of law, especially when judgments are given by Supreme Court, interpreting the statutes. It is a key feature of the common law system and researching case law is an important part of the legal research process. Case law is a law based on the reported decisions of judges in cases that come before them. The judges in their decisions lays the relevant facts of the case and the legal reasoning that applied while deciding the case. Under, common law there is a hierarchy of authority in judgments. Those made by superior courts form precedents and inferior courts must follow the precedents, so the reported decisions of judges in cases form an important part of the law.52

1.10.3 Setting
The research study was undertaken by employing a combination of historical, empirical, comparative and critical method. For this extensive use of legal libraries specially KIIT Law School Library and NLU Delhi, library deserves a special mention. The style of thesis is based on ILI (Indian Law Institute), citation format.

1.10.4 Duration

Review of literature in the form of articles, blogs posted in the internet, books and literature pertaining to forensic evidence, both by Indian and foreign authors, books relating to the Indian Constitution highlighting the correlation between Article 20(3) and 21 with the admissibility of Forensic evidence, study of historical materials pertaining to growth and development of forensic science, relevant cases of Supreme Court and High Court were done. The cases studied under various chapters of this thesis are taken from the year 1995 to 2015, which resulted in duration of 20 to 21 years. The process of study commenced from 7th July, 2012 and the thesis was completed by 25th September, 2015.

1.10.5 Data Collection Procedure
The study is based on both primary and secondary sources such as statutes, reported judgments in journals, books and articles on Forensic Science, including e-journals etc. The role of forensic evidence in criminal cases in India has been analyzed by the study of the superior court’s decisions available in Supreme Court Cases, Criminal Law Journal, SCC Online, Manupatra, etc. where evidence like DNA, Fingerprints, Ballistics and Toxicology has been used.

Primary Sources of Data:

The following are the criminal minor legislations:

a. The Arms Act, 1959
b. The Dowry Prohibition Act, 1961
c. The Explosives Act, 1884
d. The Explosive Substance Act, 1908
e. The Narcotic Drugs and Psychotopic Substances Act, 1985
f. The Poisons Act, 1919
g. The Protection of Women from Domestic Violation Act, 2005
h. The Medical Termination of Pregnancy Act, 1971
i. The Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act, 2005
Secondary Source of Data

Books, journals, reports, articles, unpublished thesis works, newspaper reports, judgments, websites etc.

1.10.6 Data Analysis Procedure

The data analysis was made by comparing and analyzing the data in a systematic manner for getting a focussed output. Finally, in the light of the hypothesis and research questions, the data thus collected and processed was analyzed. The interpretation and attempts to explain the general factors as has been observed during the course of the research shall hopefully guide others for further research.