CHAPTER-V

Nature, Scope and Use of Scientific Evidence
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NATURE, SCOPE AND USE OF SCIENTIFIC EVIDENCE

I. Introduction

Justice delivery system heavily depends on the testimony of eyewitness to the crime. But the dependence on eyewitness do not prove to be effective as they are generally found to turn hostile, many a times due to threat to life or lure of money etc., the other method to which the crime investigators resorted to 'third degree treatment' for interrogation of the suspects to bring out the truth, which due to cultural change and values accepted universally, are considered inhuman as many innocent people also suffered. In the mean time, lot of scientific research and development has taken place and it was visualized that the modern scientific techniques could provide quick resolutions to a majority of problems of human beings. One of such problem is the problem of increase of criminality. The dimensions of crime are expanding with the development of science and technology. The traditional crimes like theft, murder etc. are being committed with latest inventions and techniques. New fields of criminality have also developed like cyber crime, space crimes etc. So the traditional methods for investigating and combating such crimes have become insufficient.¹

The importance of science in criminal investigation is no longer a matter for discussion, it is a recognized practice now. There is no branch of science that does not play a part in actual practical inquiry.² Scientific criminology is the leading weapon in the fight against crime and a preliminary mean of preventing it. It is ally of the law abiding and right hand of the police system. The experts are the most important auxiliaries of an investing officer. They are nearly the main factors in deciding a case. It is an important thing

for a investigating officer to know, just whom he ought to apply to i.e. what kind of expert he ought to select; moreover, he must know that the expert is capable of telling in particular case, where his knowledge begins and what are the natural limits to it and finally he must seize the proper moment for putting his question.  

The gulf between the expert and the non-expert has been much narrowed with the advance of scientific education on one hand and availability on the other of authoritative treatise on almost every subject concerned with the expert evidence. Taylor has observed that the application of every branch of medical knowledge is important for the purpose of law. But medical jurisprudence is not a single science, as a practical application of many other sciences also has enlarged the field of expert evidence. According to him anatomy, physiology, pathology, pharmacology, medicine, surgery, midwifery, gynecology and the sciences ancillary thereto viz. chemistry, physics, botany etc. are required in some cases to enable a Court of Law to arrive at a proper conclusion on a conquest question affecting life or property.

The requirement of law thus has increased with the advance in the range of science. The law cannot perch its requirement of science any higher than the advances made in the science so far could meet. In other words, the forensic necessity for expert evidence at any given point of time in any branch of science can only be co-extensive with the advance so made in the science and absorbed into the bulk of knowledge.

II. Need and Importance of Scientific Evidence

The use of science on a large scale in the dissemination of justice is comparatively new phenomenon in our country. There is urgent and wide

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3 Supra note 2, p.26.
spread need for the application of forensic science in the criminal justice delivery system. The present day scenario of crime investigation and prosecution of criminals, in India is a sad sight. A large percentage of the trials, in heinous crimes ultimately end in acquittals. The official figure in 2010 for acquittal was 86 percent. It is estimated that the prosecution agency spends lacs of rupees on each trial. Thus, not only a dangerous criminal goes scot free but the huge amount of public money is also wasted. These frequent acquittals also embolden the criminals and escalate crime and multiply criminals. The need for the application of science in the dissemination of justice is pressing. If we do not adopt scientific methods then the alternatives to scientific methods are eye witnesses, confessions, approvers and stock witnesses. The eye witnesses are the oral admissible evidence. But the eye witness account have inherent weaknesses. Observation power, memory, descriptive skill, emotional inputs and subconscious rationalization of the eye witness affect the evidence tremendously. Besides the emotional involvement, bias and influence of others and of the media make the eye witnesses highly unreliable, yet we continue to depend upon the evidence almost religiously.

True confessions are rare. They are often obtained through third degree methods which are illegal, unethical and inhuman. Besides in the changing social scenario, they often recoil. They are also retracted. The approver is an approved class of witness. He confesses or accepts his role in the commission of crime for personal pardon. He saves his skin, implicates his friends and perhaps relatives also. He often retracts his statements especially if he finds his going good on the other side. His services are a slur on the justice system.

The society is undergoing drastic social change at a very rapid pace. There is a growing shift from a rural to an urban society. These changes have made the old techniques of criminal investigation absolute. The use of 'third

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5 B.R. Sharma, Forensic Science in Criminal Investigation and Trial, p.7.
6 Id., at p.11.
degree' techniques used in those days (British period) even today does not find favour with the new generation of the administrators, the judges and public at large. In view of changing society, the means of escaping from the society may be many. Firstly, the quick means of transport and the high density of population in cites have facilitated the escape from the punishment after the commission of the crime. The criminal can hide himself in a corner of the city or move away to thousands miles in a few hours after committing crime at a particular places. He thus, often escapes apprehension, and prosecution.⁷

Secondly, individuals especially in cities are becoming self centered. We even do not know the next door neighbours. Thus, even if the neighbours are killed, the murder comes to light sometimes only when bodies putrefy and emit foul smell. In the mean while the culprits leave the scene and the evidence is also destroyed, obscured becomes indirect or diminished. Thirdly, the technical knowledge of an average man has increased tremendously in the recent years. The criminals are using science. The crime techniques are getting refined. The investigating officer, therefore needs scientific methods to combat the modern scientific criminal.⁸

Fourthly, the field of activities of the criminal is widening at a terrific rate. Formerly the criminals were usually local. Now we find that national or international criminal is a common phenomenon. Smuggling, drug trafficking, financial fraud and forgeries offer fertile and ever expanding fields. The recent attack on the world trade centre in New York and on the Pentagon in Washington, destroying property worth billions of dollars and killing thousands of people in one go, is really more than an eye opener to the world about the capabilities of the terrorists. Cyber crimes have gone beyond the earth, in the space, through the perpetrators are earthly beings, but they have ultra high sophistication.

⁷ Supra note 5, p.8.
The traditional methods of detecting crime is becoming insufficient. On the other hand the use of scientific means in the collection of evidences during investigation and proving them in the court, is becoming more prevalent and useful. The use of scientific means in investigation is gaining popularity and is generally termed as scientific investigation. The scientific investigation can be meant in two senses, first employing scientific means during the course of investigation. Secondly, investigation as a whole to be conducted in a scientific manner, which evidence is to be collected firstly and what is to be done in investigation as a whole, so far as the manner and procedure is concerned, it has been laid down by the law itself. However, the scientific investigation in this chapter would mean using of scientific methods for collection of evidence. Since, evidence is collected with a view to establish a fact before the court. Where it is known as expert evidence. The relationship between investigation and expert evidence would be governed by the theory of proof.

III. Meaning of Scientific Evidence

According to the New Encyclopedia Britanica, any system of knowledge that is concerned with the physical world and its phenomenon and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truth or the operations of fundamental laws. Science is knowledge of world of nature. Science is to be considered as knowledge of natural regularities that is subjected to some degree of skeptical rigour and explained by rational causes. According to the Oxford Dictionary, the term ‘Scientific’ means involving science or technical. The term ‘Evidence’ is defined by Andrew Chao as “the information with which the matter requiring proof in a trial are

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proved”. Under Criminal Procedure Code the term ‘evidence’ has been used in a wider sense to include the evidences taken during trial but also the material looked into during the course of inquiry.

Under the Indian Evidence Act, 1872, the term evidence has been used in the sense of statements made by the witnesses, documents and the electronic record produced and proved according to the set procedure before the Court. Therefore, the term Evidence has been used by the researcher in wider sense which include the material collected during the course of investigation and may be used for the purpose of framing charges of acquisition as well as a fact proved before the Court which becomes evidence in the course of trial.

Since the scientific techniques are used in collection of evidence during the course of investigation and for the framing of acquisition charges during the course of trial. Therefore, the term ‘evidence’ in technical sense is defined under the Indian Evidence Act. Hence, the term scientific evidence means the legally permissible scientific means employed for investigation and trial. The term scientific evidence has been used for those scientific methods of collection of evidence which can be used during the course of inquiry and trial as distinguished from those methods, which are merely aid to investigation, but can not be used against accused person by virtue of prohibition incorporated under section 162 of Criminal Procedure Code, Sections 24, 25 and 26 of Indian Evidence Act and Article 20(3) of the Indian Constitution.

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14 Section 3 of Indian Evidence Act, “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 evidence;

(2) All documents including electronic records produced for the inspection of the court.
Thus, scientific evidence means, such evidence which is produced before court with the help of scientific techniques. Such evidences have become essential in those cases where the offence involves such method for crime or for its detection that the use of special scientific methods becomes necessary.

IV. Nature

Generally the opinion of the witness as to the fact of case are not admissible as evidence. It is a rule that only facts should be stated and not the inferences or opinion. But there is one exception to this general rule. When the judges are not capable of forming opinion about the fact/presumption, due to its technical nature, then the opinion of experts in that particular field is taken and is admissible. But the expert evidence is considered as secondary evidence and merely week type of evidence, specially in those cases where the expert does not have sufficient knowledge on that subject. Expert evidence is of corroborative nature. It means that this evidence will have probative value if there are other physical evidences or eyewitnesses supporting the same view. It supports the other evidences and generally court does not convict a person solely on the basis of expert evidence.

The probative value of expert evidence may vary according to field of expert evidence. In case of scientific evidence, it depends on the fact that, whether a particular branch of science is developed and infallible or not. Scientific evidence in criminal matters is produced to establish a fact or to prove a fact for proving a crime. Broadly crime can be classified into two categories. Firstly, the crime against human body and secondly, crime against property. When the crime against human body is committed, may it be murder, grievous hurt, rape, etc., then for the detection and proving of the crime, primarily the fields of forensic medicine are applicable i.e. Toxicology,

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Ballistic, DNA Test, Blood Test, Urine Test, Semen Test, Fingerprint Matching Tests etc. are used. Generally, the help of medical experts, chemical analysers and forensic scientists is taken for this purpose.

When crime against the property is committed, the help of experts in fingerprints, footprints, tool marks, tyemarks, documents, computers, typewriting etc. is taken. Some of the expert evidences are useful and applicable in both type of crimes e.g.: NARCO test, Fingerprint Matching, Ballistic etc. Method of collection of the scientific evidences also differs according to the nature and place of crime. A scene of occurrence is the site where the incidence or crime has occurred. It is the meeting place of the persons involved. The parties exchange traces with one another and with the scene, leaves and adds the marks of tools, wearing apparels, means of transport, hand and feet. Thus, the scene of occurrence provides a wealth of information about the crime.\(^\text{16}\) If the crime is committed in open place, e.g. road, forests etc., then the evidences can be collected in the form of tyre marks, foot marks, evidences available on the body of victim or any other physical evidence etc. However, if the offence is committed in an enclosed area, i.e. in building, vehicle etc., then the evidences are generally available in the form of fingerprints, foot-prints, hair, blood stains, evidences available on the body of victim, documents, electronic evidences, tool marks, or other physical evidence etc.

The scene of occurrence changes rapidly and cannot be preserved for ever. Some of the evidences gets lost soon after the occurrence of crime, the other evidences disappears, gets contaminated or altered with further passage of time. Therefore, the scene needs immediate processing. The expert can analyse and produce the evidence before the court with more certainty only when the proper and uncontaminated sample is given to him and he adopts the proper procedure for analysis.

\(^{16}\) Supra note 5, p.132.
V. Uses of Scientific Evidence

Forensic science embraces all branches of science and applies to the purpose of law. Originally the techniques were borrowed from various scientific disciplines like chemistry, medicines, surgery, biology, photography, physics and mathematics. But in the past few years it has developed not only its own techniques but also its own branches, like fingerprints, ballistics, serology, voice analysis etc.17

A. Medical Evidence

The triumph of medical science is seen everywhere in the way of justice, whether it is civil or criminal. According to great social and political thinker Bartrand Russel "Science has changed the face of administration of justice. It has spanned the skies of evidence, measured the truthfulness of witness and wrested from the criminals many hidden realities. A step in of medical science in the periphery of criminal administration extended the frontiers of our knowledge in various ways and directions. As regards the criminal administration the scope and ambit of medical science is not only limited to human body, medicines and other psychological phenomenon but also extended to chemical innovations, investigations, technical analysis, new technologies etc."18

Forensic or legal medicine is the branch of medicine which deals with the application of medical knowledge to the purpose of law. It is that science which teaches the application of every branch of medical knowledge to the purpose of law, hence, its limits are, on one hand, the requirement of the law and on the other, the whole range of medicine. It is however not the province

17 Supra note 5, p.6.
18 Gaur S N,LOIN, Medical Jurisprudence for India,(1986),p.90
The evidence of medical expert either oral or documentary is often on the course of death, the nature of injuries and their causation, age, assault, rape, paternity and mental condition etc.\textsuperscript{20}

Forensic medicine is quite different from 'healing art'. The medical expert has to go to look at the facts more with the eyes of a lawyer than the eyes of a doctor. The medical jurist has to decide whether the injuries are post-mortem, or ante mortem, whether they are accidental, homicidal or suicidal or whether they are dangerous to life. The forensic medicine is largely connected with the criminal jurisprudence and it is one of the chief aid for the detection of the crime and assessment of criminal liability.\textsuperscript{21} Generally medical evidence can be used in the following fields:

1. **Identification of Persons**

   The primary problem of criminology is the identification of individual. By the identification of a person is meant the establishment of his individuality. Identification may be complete or partial. Complete identification implies the absolute fixation of the personality of and the determination of the exact place in the community occupied by the individual. Identification is incomplete when certain facts about the person have been ascertained, other facts necessary for the establishment of his personality are still unknown.

   The establishment of the identity of a person in whom they are interested, is the business of the police, but it happens, not frequently, even though help of medical men is required even in this connection. He may be able to supply the police with certain facts about an individual, a body which will enable them to complete the identification. The data supplied by the body which assist in the establishment of the identity are race, sex, age, religion, social standing, general development, congenital peculiarities like personal

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\textsuperscript{19} Delhi Administration v. Paliram, AIR 1979 SC 14 (1979) : 2 SCC 159.
\textsuperscript{21} Oscar, T., Schultz, "The Role of Medical Science in the Administration of Criminal Justice."
appearance, complexion, eyes, hair, finger prints, malformations, Birthmarks, moles etc. Acquired peculiarities like scars, tattoo marks, stains, acquired malformations, articles such as clothing, jewelry, documents etc. may give informations as to identity.\textsuperscript{22}

In case of the death, medical help is more often required. In such cases medical man may be able to assist the police (Investigating Officer) by noting any acquired or congenital peculiarities present on the body. The race of living person or of one recently dead is a matter that the police are usually more competent to decide than medical men. The determination of sex usually presents no difficulty. However, cases in which the body is mutilated or only part of it or of the skeleton is available for examination, and in rare instances of doubtful sex due to malformation, it becomes a much more difficult question. Any question with regard to the sex of dead body usually arises when only mutilated fragments of a body or bones only are available for examination. There are specific characteristics of Muscular development, general hairiness, size of bones, shape of skull etc. which may indicate the sex of the dead body.\textsuperscript{23}

Age has an important bearing on identification. In this connection absolute accuracy is seldom if ever required, except in the case of the newborn child or of a young person. In other cases, it is usually sufficient to determine the age approximately and in most of the cases this is all that is possible. In the absence of reliable documentary evidence, questions regarding age are always referred to a medical man.\textsuperscript{24} The determination of age may be required for the identification of an individual living or dead. In criminal cases, it is necessary in connection with the offence of rape, abduction and infanticide, also to determine whether a child has reached the age at which the law holds it responsible for its acts and if so, what manner of punishment or restraint should be imposed on it. For ascertaining the age of

\textsuperscript{23} Supra note 20, p.97.
adult person, the following data can be helpful: general appearance, teeth, weight and height, ossification and degenerative changes. Experts after conducting certain tests and with their medical knowledge may be able to ascertain the approximate age of the person.\textsuperscript{25}

The most commonly applied and most useful method of identification is that of recognition of the person in question by a witness or witnesses who are acquainted with him. Fingerprints, footprints of a person may also supply necessary information about a person provided, the test is conducted by efficient person by adopting proper procedure. Apart from it, malformation of body, moles, birth marks may also provide necessary information about the person.

2. Examination of Live Person

Whenever a person has committed an offence relating to human beings e.g. rape etc. or the accused has also suffered the injuries and in most of the cases the victim of crime are required to be examined by the medical examiner. The medical officer is furnished with a report on the prescribed form. Before proceeding with the examination of a person who is accused of a crime, the medical examiner should obtain his consent. The examiner generally notes:

\begin{itemize}
\item[(i)] the time and place of examination.
\item[(ii)] the name, sex, age and occupation of the person examined.
\item[(iii)] the names of persons who identified the individual.
\end{itemize}

The examination may extend to the clothing or other articles to noting any evidence of a struggle they may present and to determining whether the weapon produced is such as to have caused injuries.\textsuperscript{26}

\textsuperscript{25} Digambar Gope & Ors. v. State of West Bengal, 1997, Cr.L.J. 2072.
\textsuperscript{26} Supra note 15, p.132.
Medical examination of the accused will be conducted, to trace out the injuries on the person of the accused, their approximate cause and nature. Where the accused is facing allegations of sexual offence, then complete medical examination will be conducted of the accused.

3. Examination of Dead Persons

In India, except in a few large centers, where this work is done by experienced police surgeons, the carrying out of post-mortem examination in medico-legal cases is one of the many duties of civil surgeons and other medical officers in Government services. The object of a medico-legal post-mortem examination is to ascertain the cause of death and if the cause prove to be other than a natural one, to collect such information bearing on the manner of death as may be useful to the police and judicial authorities in determining the responsibility of death. The body of a murdered person must as a rule be identified and examined in order to warrant a connection in law or even a trial.

The body of a dead person is examined properly as to ascertain age, sex, appearance as to identify person, if any injury is caused to the body then the wound will be examined as to ascertain that how and in what manner they have been caused. Whether the injuries were fatal and consequently caused death or not.

If the symptoms of poisoning are there then the tests are to be conducted in order to ascertain that the poison was of which category and whether it was administered in such a quantity as to cause death of the person. Various tests are conducted by medico-legal experts discovering the changes in the body, effects of wounds, time of death, cause of death etc.


This is the function, which can be performed only by the medical experts and none else. It is a very important and useful aid to the administration of justice.


Yet another field of forensic necessity for expert evidence is the identification of the instrument of crime. From the identification of the instrument of crime, the inference as to the guilt of its possessor is not generally fraught with much difficulty, since there is usually other confirmatory evidence, though possession of the instrument of crime by itself does not exclude the possibility of another having used it to commit the offence. Nevertheless, it is an important link in the chain of circumstantial evidence, and evidence as to the identification of the instrument of crime is the provinces of the concerned expert.\(^29\)

In the vast majority of cases the medical examination of the wound reveals a clue to the nature of the weapon used, and in the case of gunshot wounds, to the specific weapon. Sometimes expert evidence as to the nature of the weapon used helps to expose the falsity of the alleged eye witness, while it is always an index of the intention of the offender.\(^30\)

5. Causes of Death

It is in cases of homicide, that forensic necessity for expert evidence is most keenly felt and in these cases that expert evidence attains its full stature. Because it is an essential ingredient of homicide that it should be established that the deceased died of foul play before it could be said that the accused was responsible for it.\(^31\) In all cases of alleged death by foul play, an autopsy by a medical expert is absolutely necessary, in order to ascertain the actual cause of death, for there may be cases in which the apparent cause of


\(^{31}\) Supra note 27, p.37.
death, inspite of the most careful consideration may be deceptive. Further, tropical conditions cause rapid decomposition; and wild animals and insects play their part in causing all traces of violence to disappear. If the body is not discovered within a short space of time after death, proof of the cause of death may often become almost impossible. In such cases, of course, the evidence of the medical legal expert is invaluable, for his post-mortem examination may reveal the actual cause of death and establish that the case was one of the homicide where foul play was no more than suspected.  

It is the duty of the medical officer, after complying the autopsy, to give his opinion as to cause of death, based on the appearances observed by him. But in those cases, where he is unable to find any unnatural cause of death or in unable to reach any conclusion, it is advisable and very often necessary to preserve the viscera for chemical analysis. Death may be caused by certain modes:

(i)  **In Cases of Death by Physical Violence**

Cause of death may be considered particularly with reference to the medico-legal problems that may arise in cases of death alleged to be due to physical violence. Firstly it is necessary to know that in all cases of death natural or accidental, whatever may be the medico-legal cause, these are from a purely medical point of view, three primary modes of death viz. syncope, death beginning at the heart and occurring by the stoppage of its action; asphyxia, death beginning at the lungs and occurring from the stoppage of their respiratory function; and coma, death beginning at the brain and occurring from insensibility due to cessation of the action of the brain.

A medico-legal inquiry is not interested in the manner or mode of death, but in the cause or causes of the particular manner or mode of death.

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32 Supra note 27, p.42.
33 Supra note 20, p.46.
The medico-legal causes of death by syncope, when it results from the physical violence are stated to be sudden and excessive hemorrhage from wounds of the large blood vessels or of the internal organs, sharp inhibiting the action of the heart from sudden fight, blows on the head or on the epigastrium or from extensive injuries to the spine or other parts of the body.\textsuperscript{34}

The medico-legal cause of death by asphyxia, when it results from physical violence are stated to be mechanical obstruction to the air passage by blocking their lumen from within as in suffocation and drowning or by their compression from without as in strangulation and hanging or stoppage of movements of the chest resulting from mechanical pressure on the chest or abdomen or collapse of the lungs from penetrating wounds of the thorax. The medico legal causes of death by coma, when it results from physical violence are stated to be compression of the brain, resulting from injuries of the brain or its membranes, such as in conclusion, effusion of blood on or in, the brain subsequent on fracture of skull.\textsuperscript{35}

Whatever the medico-legal cause of death, it is for the medical jurist to pronounce his opinion and for the court to arrive at a conclusion within such legitimate expert assistance. The causes of violent death by asphyxia and which are of special medico-legal interest are drowning, hanging, strangulation and suffocation. Hanging is a form of death in which the body is wholly or partially suspended by the neck so that the constructing force applied to the neck is the weight of the body acting upon the ligature used as its point of support. The medico-legal question of great interest is whether death was due to hanging or the body was hanged after death, which is to be decided by the medical jurists.\textsuperscript{36} Strangulation is a violent form of death which results from constructing the neck by means of a ligature without

\textsuperscript{34} Supra note 2, p.46.
\textsuperscript{35} Supra note 23, p.49.
suspending the body. It is called throttling when construction is produced by the pressure of the fingers upon the throat.\textsuperscript{37}

In strangulation, though asphyxia may be the main cause of death, sometimes there may be other causes as well. The medico-legal question which arise are whether death was due to strangulation or the ligature was placed around the death. It is settled that no inference should be drown simply from a ligature mark. The medical man is able to say that death was due to strangulation by a close observation of the effects of violence in the underlying tissues in addition to external signs and appearances of death from asphyxia.\textsuperscript{38}

Finally when a person is found dead as a result of physical violence, the question often arises as to how long the victim would have survived or more particularly what he could have done after being subjected to violence. It is the medical expert only who is able to give answer of these questions.

(ii) Death by Poisoning

In cases of death alleged to be due to means other than physical violence, by poisoning is of great medico-legal importance. In poisoning, death ultimately takes place by any of the modes of death, syncope, asphyxia or coma, as the case may be, according to the nature and action of the poison. Poisoning is one of the most baffling cause of death. The most legitimate, valuable and wonderful application of scientific evidence is on charge of poisoning. The most important proof of poisoning is the detection of poison in the excrete during life and in the content of stomach and other organs and tissues of body after death. In any poisoning case the chemical evidence is vital, without it the prosecution cannot support its charges.\textsuperscript{39}

\textsuperscript{38} Supra note 2, p.51.
\textsuperscript{39} Supra note 2, p.54.
(iii) **Accidental Death**

In vast majority of cases, death by violence, the deceased is found to have been hacked into pieces, butchered, staked indiscriminately or battered to death and with multiple injuries on various parts of the body so much so that mere sight of corpus would satisfy a mere layman that death was homicidal. But the cases do occur in which it is difficult to establish whether death was homicidal or accidental. In such cases the Medico-legal experts may be able to establish by his post-mortem examination whether the case was accidental, suicidal, or homicidal.\(^{40}\) The description of the injuries by the medical man with the details of their number, nature and position and the force necessary to cause them may well rule out in many a cases the probability if not the possibility of both suicide and accident. On the other hand, the medical man may often be relied upon to undo a connected case of homicide, whether actual cause of death was either suicide or accident.\(^{41}\)

It is sometimes considered that it is not accurate to say that problem of suicide and accident from part of the legitimate evidence of the medical jurist, is safer as the utmost that he can be ordinarily expected to say after autopsy is whether death may have resulted from the deceased's own act or from accident and other evidences must be available in such particular case to ascertain the truth of this medical possibility. But the general professional experience of the medical jurist is the main stay and guiding factors in such matters, even though he may be obliged to take into consideration all the circumstances connected with the finding of the body and the history of the case.\(^{42}\) It does not therefore appear to be correct to say that the answer to the issue whether death was accidental, suicidal or homicidal, is not within the legal competence of the medical jurist.


\(^{41}\) Supra note 27, p.55.

\(^{42}\) Ibid.
6. Infanticide

Infanticide is the unlawful destruction of a newly born child.\textsuperscript{43} It is nothing but similar to murder in law. In cases of infanticide the prosecution has to prove that the child was born alive and that it died from criminal violence, inflicted after its birth. In the latter, the signs of their having lived are frequently indefinite. Hence, in order to provide protection against the possibility of wrong convictions, the law presumes that every new born child found dead was born dead, until the contrary is proved. Hence, on these occasions there is a most difficult duty cast upon a medical witness. In the greater number of cases where the delivery is in secrecy and no one is present to give evidence respecting the birth of the child.\textsuperscript{44} Under these circumstances the medical evidence is very important. The great forensic necessity for the evidence of the medical jurist in cases of infanticide is thus obvious.

By the examination of the women the medical men can come to a definite conclusion on the questions as to whether she was recently delivered a child or not. By the postmortem examination of the body of a child he can come to a conclusion as to whether the child was born dead or alive and if born alive, as to the cause of death. In this type of cases, expert evidence constitutes the major part of the proof. The application of medical science in such type of cases can prove very helpful in establishing the guilt or innocence of the accused.

7. Time of Death

It is of highest importance from a medico-legal point of view that the time of death should be determined with a fair amount of certainty. Determination of the time of death is one of the vital questions on which the

\textsuperscript{43} Supra note 27, p.56.

\textsuperscript{44} Supra note 7, p.785.
medical jurist is frequently called upon to give his opinion. The result of it is vitally connected with the guilt or innocence of the accused in many a case of murder, since it helps to decide the existence or non-existence of an opportunity for him to commit the offence at the relevant time as well as to judge the truth of the story of the eye witness, if any.

It is essential that the time of the Post-mortem examination should be recorded, as it is necessary to ascertain the time of the death in terms of date and probable hour of occurrence. It is further necessary to know from the medical witness that how long the deceased survived after he was victimized, since death need not always ensue immediately after the criminal act.

Even where portions of the body alone have been discovered, the medical witness is able to give an opinion as far as possible as to the date of death. In giving his opinion, the medical man has to take many factors into consideration, while the points that help to determine the question in each individual case vary so much so that generally on approximate time of death only can be given.

8. Sexual Matters

The subjects of sexual capacity and sexual crimes may conveniently be considered under the following heads:

(i) Impotence
(ii) Virginity
(iii) Pregnancy and Legitimacy
(iv) Birth and Delivery re-inheritance
(v) Rape
(vi) Abortion

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45 Supra note 27, p.57.
46 Indradeo Rani v. State of Bihar 1992, Cr.LJ. 4005 (Pat.).
(vii) Unnatural Sexual Crimes

Sexual crimes as includes the offence of rape as well as unnatural offence, whichever it may be, medical evidence is always necessary. The necessity of medical evidence in cases of rape is generally enhanced because of the frequency of false charges. Medical evidence is often the only reliable evidence on the factum of rape. The evidence in proof of the factum is derived from:

(i) the marks of violence on the person of prosecutrix;
(ii) marks of violence about genitals of prosecutrix;
(iii) the presence of stains of the spermatic fluid or of blood on the cloth of prosecutrix;
(iv) the presence of seminal matters in the Virgna.

The first and foremost circumstance that would be looked for in a case of rape, where rape is denied and consent is pleaded, is the evidence of resistance which one would naturally expect from a women unwilling to yield to an act of sexual intercourse forced upon her, and where there was absolutely no evidence of any struggle having taken place, it could not be said that the accused had sexual intercourse with the women without her consent. The only independent evidence in proof of resistance that can satisfy a court is obviously medical evidence of the characteristics signs and marks on the women alleged to have been raped. Therefore, it is the essence of the crime of rape that carnal knowledge to the women's person should be by the adverse will of the women to the act being overcome by force on the part of the ravisher. Forensic necessity for the proof of such force by expert evidence is the inevitable concomitant of the essence of the offence.

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48 Ram Kala v. Emp., AIR 1946, All. 191.
9. Intoxication

Intoxication is prohibited under service laws during the office hours and also at the public places. Intoxication is punishable under various State enactments. Courts have invariably insisted on medical evidence on the question as to whether an individual was intoxicated or not at or about the time when he was challenged. The ordinary witness may not be in a position to appreciate the condition of intoxication as it is understood under the law. He may not be able to appreciate the proper significance of certain symptoms. The police or other prohibition officer affecting the arrest of an individual on the ground that he was found intoxicated is no more than an ordinary witness. He is therefore not entitled to give opinion evidence on the question of intoxication.

Alcohol is a cerebral poison and is treated under medical jurisprudence under the head of inebriant poisons. It is stated in text books that there is close relationship between the concentration of alcohol and degree of alcoholic intoxication. It is therefore observed that it is necessary to analyse the urine for estimation of alcohol concentration in cases where persons have been accused of being drunk. Scientific research has established that as to how much of percentage of alcohol in the blood produces intoxication or drunkenness punishable at law.\(^5^1\)

It is obvious, therefore that medical evidence is absolutely necessary in cases of drunkenness which is punishable as such. Sometimes medical evidence may disapprove certain allegations of eye witnesses. It is possible from an examination of the accused within a reasonable time by a medical man to confirm or disprove the allegations of having consumed liquor at the time stated.\(^5^2\) Intoxication is the effect of the consumption of an intoxicant. It may vary in degree and forms from person to person.\(^5^3\)

\(^{51}\) Supra note 49, p.243.
\(^{52}\) Begam Khurshid Pesikaka v. State of Bombay, AIR 1954 SC 123.
\(^{53}\) Supra note 27, p.65.
State of intoxication has to be judged in those cases where a person has committed an offence under the State of intoxication. Section 85 and 86 of the Indian Penal Code deals with the act done by a person under intoxication. So the test for intoxication becomes important to conduct the tests of accused by a medical practitioner.

10. Insanity

The question of whether a person is sane or insane arises at many times when a doctor has to examine the person and certify. The most important types of cases are those where criminal responsibility is declaimed on the ground of insanity.\textsuperscript{54} Section 84 of Indian Penal Code deals with insanity as one of the general exceptions. The section defines the nature of insanity which provides a defence. Unsoundness of mind to be a legal defence must be of a particular kind of degree. It must be such as to render the accused incapable of knowing, at the time of doing the act, the nature of the act which he was doing or of knowing that what he was doing was whether wrong or contrary to law. It means that the insanity must be legal insanity to serve as a defense under section 84 of Indian Penal Code.\textsuperscript{55}

Courts have to use medical evidence at the finding of insanity in terms of the requirements of section 84 of Indian Penal Code. A doctor asked to examine and give his opinion as to the sanity of the accused person has to approach the question from the purely medical point of view. (Unsoundness of mind from purely medical where it does not satisfy the legal requirements and standard to serve as defense may however have a bearing on the question of sentence. Therefore, however great responsibility and sympathy of medical jurist towards the habitual and depraved criminal, may be his primary function is neither to make law nor to revise it conformably to his

\textsuperscript{54} Deoraj v. Emperor, ILR 1946, Nag. 946.\textsuperscript{55} Supra note 7, p.59.
notions of insanity, but to bring the whole of his knowledge and ability to assist the court in dispensing justice according to the law as it stands.\textsuperscript{56}

But, whatever the definition of legal insanity may be, the question in any view of the matter is primarily and substantially a medical one.\textsuperscript{57} Ultimately, it may be more a question of psychiatry than of medical jurisprudence, but in its broader aspects, medical jurisprudence may be said to embrace it. In any case in which the question of insanity is raised as a defense, the medical evidence is absolutely necessary on the general question of insanity. However, advisory it may be character of the question of legal insanity. Even the general question of insanity is a large field which demands specialized knowledge. A great deal may depend in such cases on the opinion of medical expert.

B. Toxicology and Drug Identification

Toxicology is the science of poisons. Poisons are frequently involved in homicidal, accidental or suicidal deaths. They are sometimes used to destroy animals and plants. The detection of poisons and their identification is an important aspect of the forensic science.\textsuperscript{58} It is generally the business of the forensic toxicologists to investigate all cases of poisoning, partly because someone has to do the analysis in order to determine the cause of death and partly because he himself welcomes the experience gained, any death from an uncommon poison, however sad an event is grist to his mill.\textsuperscript{59}

A poison is a substance, which on being absorbed into the body injures health or destroys life.\textsuperscript{60} However, it will not be enough to define its manner because certain substances harmless in small doses are capable of causing death when absorbed into the system in large doses although not usually

\textsuperscript{56} Supra note 7, p.59.
\textsuperscript{57} Field CD, Expert Evidence (Medical & Non-Medical), (2007), p.106.
\textsuperscript{58} B.R. Sharma, Forensic Science in Criminal Investigation and Trial, p.745.
\textsuperscript{60} Nabar B.S., Forensic Science in Crime Investigation, (2008), p.254.
considered poisons e.g. common salt or sulphate of Potash in sufficiently large quantities or toxins of disease, though capable of, causing death are not considered as poisons. For legal purpose in India, however, the exact definition of ‘Poison’ is not essential because the law usually paraphrases in explanatory form its reference to ‘poison’.

Basically the action of most of the poison is to prevent the supply of the oxygen to the body tissues. Failure of the availability of oxygen stops the normal functioning of the body and the victim dies. But the mode of this stoppage varies. The action of a poison may be local or remote. Most of the poisons affect the victim immediately. If the person survives, the poison is eliminated through body excretions. However, some poisons get accumulated in the body and when a certain level is reached and the person dies. Arsenic is one such poison. It is for this reason that this poison has been favourite with criminals through the ages and still one of the commonest homicidal poison in India.

Poisons have been classified differently by different persons engaged in the detection and identification of poisons, in poisoning cases. Once poisons were classified as animals, vegetables or mineral. A more sophisticated method was based on their mode of action - corrosive, irritant, narcotic and rafforth. Poisons may be inorganic or organic and biological.

Chemical examination of the food, vomit, urine etc. reveals the presence of suspected poisons. Every poison has its own chemical composition and symptoms and it can be identified or detected with the help of medical practitioners and the chemical examiners. Generally chemical examiner will receive from Pathologists or doctors a sample of blood, urine, possibly vomit, if the victim is live and stomach washings if the victim is dead. An analysis of the blood reveals the concentration actually circulating at the

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61 Supra note 7, p.255.
63 Loin’s Medical Jurisprudence for India, p.522.
time of death. The best modern practice is first to make using the smallest possible amount of material for each, a small number of preliminary screening tests chosen either to detect the commonest poisons or if they are negative, to exclude at once as many poisons as possible. According to equipment, they will range from simple colour tests done on a micro scale to gas chromatographic analysis. In the light of what these tests tells him, the toxicologists will then go on to his main analysis. Finally, to anticipate, his report will say what poisons he found and how much he may from his results be able to suggest the mode of ingestion – orally, by inhalation, by injection etc.\(^{64}\)

C. Ballistics

The use of firearms in a criminal offence is of frequent occurrence. In fact they figure prominently in most of the heinous crimes like murders, decaties, robberies, assassinations and mob violence and also in police encounters and firings.\(^{65}\) The firearm evidence, therefore is important in criminal investigations and trials. A firearm is a device to hurt a projectile. The force is supplied by the creation and expansion of gases usually from the burning of power charge.\(^{66}\) According to Indian Arms Act, a fire arms means arm of any description, designed or adopted to discharge a projectile or projectile of any kind by the action of any explosive or other forms of energy. The firearms which are commonly used are shotguns, Revolvers, Pistals, Rifels, Machine guns, Muzzle loaders and improvised firearms.\(^{67}\)

Ballistics is the part of forensic science which deals with the study of motion of projectiles and projectile is known as a body projected by force mostly from fire-arms, especially through air. The science of projectile thus involves the study of fire-arms.\(^{68}\) The identification of projectiles, firearms

\(^{64}\) Supra note 59, p.104.
\(^{65}\) Supra note 5, p.155.
\(^{66}\) Ibid., p.175.
\(^{67}\) Kirk Paul L., Crime Investigation, (1953), p.381.
\(^{68}\) Supra note 5, p.155.
and related materials falls under the category of Ballistics. The general fact of ballistic is that no missiles discharged from the same or different firearms bears the same trace marks.\(^6^9\) This general truth was until recently unknown and disputable, but now the judiciary recognize it.\(^7^0\) This has now become an integral part of the crime investigations as the reconstruction can lead to many evidences which can be used in a given case. This makes it possible to trace a bullet or carriage to the particular weapon which is in question. If an evidence bullet has some class characteristics and matching individual characteristics to test bullets fired from 'a suspect firearm', the firearm examiner can conclude that the bullet was fired from the suspect firearm. A successful demonstration of these facts by the use of comparison, microscope along with photography is the most valuable and full prove evidence.\(^7^1\)

A ballistic expert with the help of chemical analyst can discover several facts in relation to the part played by the particular firearms in the commission of an offence, the nature of the ammunition used etc. The services of the ballistic expert is therefore necessary and valuable in cases where firearms recovered either at the scene of the crime or from the accused.\(^7^2\)

When inspecting the bullet, the ballistic expert establishes its form design, size, colour, number of traces left by the bore lands when inspecting pellets, their number, form, maximal and minimal dimensions are also established by the ballistic expert.\(^7^3\) In addition to the above investigations and methods, the ballistic expert also has to decide some other questions.

\(^7^0\) Mohinder Singh v. State, AIR 1953 SC 415 : 1953 Cr.L.J. 1761. In this case SC held that "In a case where the death is due to injuries or wounds by a lethal weapon. It has been always been considered to be the duty of the Prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with which that where the prosecution has a definite or positive case.
\(^7^1\) Supra note 67, p.399.
\(^7^3\) Supra note 59, p.201
1. Whether a given object is a firearm, this question could arise in examining a home made weapon manufactured by simplified form to copy a known model. The question is resolved by studying the mechanism and individual parts of that device to see whether it can actually ignite gun powder, eject a projectile and develop striking power.

2. Whether a shot can be fired from a given types of weapon; this question is important in establishing its possible use as an instrument of crime.\footnote{Gennady Guvanov, Criminalistics, (1984), p.145.}

The ballistic evidence is of considerable importance. In the opinion of the many authors, the science of ballistics is highly developed and in many a case, the lack of ballistic evidence is form of tracing of firearms and its identification can be detrimental to the case.

D. Fingerprints Identification

The identification of finger prints has become most important branch of the criminal investigation. The basis of science of finger prints is that palmer surface of hands and soles of the feet including toes are transversed by innumerable rings forming many variety of patterns.\footnote{Supra note 5, p.47.} The order of arrangement of rings and ridge characteristics in their relative position on fingers, palms and sole of a person is forever different from the rest of the world. In civil laws also to prove the identity of a person, finger prints play an important role.\footnote{Supra note 22, p.1038.}

In order to ascertain whether a finger impression is that of the person of whom it is said to be, the finger impression, which are either admitted or proved to the satisfaction of the Court to be of that person may be compared
with the former impression. If the finger prints are clear enough, the court must verify the evidence of the expert by examining them by magnifying glass and apply its own mind to the similarities and dissimilarities afforded by the finger prints before coming to the conclusion.

Finger Prints have been called the burglar's visiting card and being used on the reasonable assumption that the nature never duplicates herself, stand as the first direct weapon in the investigator's armoury. The primary use of the criminology is to establish, (a) the identity of a person either by comparison with existing record or as a check on an arrest that has been made as a result of the collateral inquiries, (b) the identity of the instrument of the crime.

A finger print is unique and individual mark of a person. If the specimen fingerprints are taken properly and compared by experts without any negligence. The finger print experts can draw unambiguous conclusions without committing any mistake. Therefore, it is almost necessary for the court to have the testimony of expert or other person competent to give an opinion in a case where the identity of the accused can be established by means of finger prints. But it does not mean that the opinion of finger prints is binding upon the court. The Court has to exercise its own mind and should also consider the other evidences on record. In case court is fully satisfied with the opinion of finger print expert, there is no reason to prohibit the court to convict the accused solely upon the evidence of expert witness without any corroboration. But it is always unsafe to rely merely on a critical inspection of a thumb impression.

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81 Emperor v. Abdul Hameed, ILR 32, Cal. 759.

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E. Foot Prints Identification

The Science of Identification of footprints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification.\(^{\text{82}}\) A person who has made a study of the prints made by the human foot is better qualified to notice prints of similarity. He is able to lay these prints before the court and from his evidence the court can draw its own conclusion.\(^{\text{83}}\) Foot prints are categorized with track marks. Track marks are varied in nature, naked footmarks, footwear marks, Paw marks, hoof marks, tyre marks, drag line of a load, impression of a stick etc.\(^{\text{84}}\) The track evidence however can be relied upon as a circumstance would print to the identity of the culprit. Though by itself would not be enough to carry conviction in the mind of the Court. The science of identification of foot prints is not a fully developed science and therefore if in a given case evidence relating to the same is found satisfactory it may be used only to reinforce the conclusions as to identity of the culprit already arrived at on the basis of other evidence.\(^{\text{85}}\)

F. DNA Testing

DNA Finger printing is an authentative technique that is capable of distinguishing every human individual from the other individual, with the exception of identical twins or clones.\(^{\text{86}}\) Hence, DNA profiling is routinely used to link individuals to biological evidence fount at crime scenes which has generated considerable excitement in the criminal justice community.\(^{\text{87}}\) DNA or deoxyribonucleic acid is a chemical messenger of genetic information found in all living cells. It may be found either in nucleus or mitochondria of human cell and is unique. No two individuals, except identical twins share


\(^{\text{83}}\) Mylaswami Croundan, In re, AIR 1937, Mad., 951.

\(^{\text{84}}\) Supra note 36, p.176.


the same DNA pattern. It is combination of half of mother’s DNA and half of father’s DNA. It is identical throughout the persons body, whether found in his blood, salvia, skin cells, bones, semen and even in hair roots. It does not change over a period of time, hence even the old samples can be compared with the latest ones. It is often referred as a blue print of life. Chemically DNA is simple molecule and is made up of four kinds of compounds.\(^8\) However, it is because of its simplicity that approximately 3000000000 of these building blocks are required to generate the variety required for the approximately 35000-40000 genes that make up the human genome.\(^9\) Such is the complexity of human genome that only a part of the genome can be utilized for the purpose of DNA Finger Printing.

Deoxyribonucleic Acid (DNA) stores the chemically encoded genetic information present in all living organisms. It is carried in the nucleus of every major type of cell except for mature red blood cells. Each DNA molecule is structured as a ‘double helix’ a long threadlike molecule consisting of two threads that intervene the coil.\(^9\) Technologically there has been developed mainly three types of DNA testing which are widely used for both science and legal identification purpose. Each testing protocol differs slightly from each other and has its own positive and negative points. Therefore, the circumstances such as the age, size and handling of sample determines what type of testing is used.\(^9\) In DNA profiling process firstly, the DNA is isolated from cells or tissues of the body in which the amount of DNA is found at the root of one hair is sufficient. After chemically extracting the intact DNA from the sample restriction enzymes are used to cut DNA at specific places. The DNA pieces are then sorted out according to size by the techniques called electrophoresis in an aragosegal. The DNA fragments are blotted from the gel into a nylon membrane. This process is known as ‘Southern Blotting’. On addition of radio active or coloured probe to the nylon sheet, a pattern called the DNA finger print is

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produced. The final DNA fingerprint is built by using several probes (5-15 or more) simultaneously.\textsuperscript{92} It has become one of the most widely used techniques in crime laboratories around the world. The most common PCR-based technique is the 'Short Tendem Report (STR) Technology.

In criminal cases evidence sample is collected by the crime investigating authorities from the body of the victim for traces DNA coming from the suspect. The evidence sample is matched with a reference sample taken from the suspect and the victim. The purpose of DNA test is to determine the existence of an association or a match between existence of an association or a match between the evidence sample and reference sample. Section 9 of the Indian Evidence Act, 1872 declares any fact relevant which goes towards establishing identification of a person. However, there is no specific provision for admissibility of DNA evidence under Indian Evidence Act 1872, but it can be included within the term 'Science' in Section 45 of the Act. In India, in several cases, the judgement has been given either based on the results of DNA testing alone or along with other corroborative evidence.

It is accepted fact among forensic scientists that forensic DNA tests results are meaningless unless it is conveyed to the court in a statistical form.\textsuperscript{93} There are mainly two reasons for this, firstly, like traditional finger printing the value of DNA evidence is not certain. It depends on the probabilistic calculations. Secondly, because of involvement of population genetics, the probability of a match report can be given only in numerical terms.\textsuperscript{94} The general concern regarding this is that judges may admit technical evidence at its face value

\textsuperscript{92} Abhijeet Sharma, "DNA Fingerprinting – A Legal Perspective, 2004, Cr.LJ., p.143.
\textsuperscript{93} According to Walls, “Among forensic scientists there is a growing recognition that in many cases the results obtained yield their maximum information only if statistical methods and calculations of probability are used”, See Walls,“Ten years of Forensic Science, 1964-73, [1974], Crime L.R. 505.
\textsuperscript{94} However, in some laboratories they are using a different method to convey the evidentiary value of DNA test results. For example, in England, Forensic Science Service (FSS) Laboratory of Birmingham uses a set of descriptive terms to explain the strength of matching probabilities. They use certain English terms in an ascending order to convey the strength of evidence: inconclusive, weak support, moderate support, moderately strong support, strong support, very strong support and conclusive.
without any evaluation either because of their ignorance in the subject or due to a special status given to the technical witness or their subject.  

DNA finger printing has been hailed as the greatest advance in forensic science. The weight of DNA profiling match will be presented by means of a match probability and likelihood ratios. As the process itself is relatively new, the method by which results are presented to the courts is also new. So there is a tremendous amount of sensitivity involved in the process, as a result unquestionable need for expert testimony.

G. Handwriting

Identification of handwriting is a science and occupies an important place in the administration of justice, where the rights and liabilities of person depend upon the genuineness or otherwise of questioned documents in courts of law. Documents examined under the microscope, by revealing innocence or guilt have changed the lives of many people. In civil cases ranging from 10 dollars cheques to contested wills testaments, the disposition of millions of dollars has depended upon the identification of a handwriting or upon evidence of the date of an ‘instrument’.  

A detailed study of handwriting enables the exposure of the fraud and forgeries etc. Handwriting in its broad sense is the making of any mark upon any surface by direct human agency, as a means of communicating information to a fellowman. This may include engrossing and drawing and even painting. However, in its popular acceptance, the term handwriting is limited to that form of freely written characters which is usually adopted by a person in sending message to another person. In its restricted sense,

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96 Ibid.
therefore, handwriting may be considered as a written speech of the individual.  

In general, there is a distinct prevailing character in every person, manner of writing, which is easily discoverable by observation and when, once known may be afterwards applied as a mental standard by which to test any other species of his writing, whose genuineness is disputed. In each person’s handwriting there is some distinctive characteristic which, as being the reflex of his nervous organization, is necessarily independent of his own will and unconsciously forces the writer to stamp the writing of his own. The most striking feature in the handwriting of a person is the uniformity of his signature. Many persons habitually sign their names in a peculiar hand, very different from the handwriting, they adopt and preserve a particular form of signature, while the general hand is constantly charging. Thus, different criteria may prevail in the identification of handwriting and signature of the same person.

Many type of crimes are committed by imitating the handwriting of different persons. There are many persons who can forge the signatures of the others with great skill. The forgery in such cases is so perfect that it becomes difficult to identify which is the forged one. For ascertaining whether a signature is forged one for far judging the genuinity of a signature, the suspect document is sent to the handwriting experts for their opinion. The individuality of the writing and signature of every other person is the result of several factors constituting the basis of formation of handwriting. The formation of handwriting is brought about by several factors like, influence in the school room, family influences, race and nationality, sex, influence of mind and physical causes etc. There are four main movements in the formation of figures and letters: finger, wrist, forearm and whole arm

99 Supra note 22, p.2431.
100 Ibid.
102 Supra note 62, p.375.
movement. It is exceedingly difficult for a person habitually writing by one movement to successfully imitate writing executed by another movement. In addition, original and highly eccentric persons develop equally original and eccentric handwriting. A person has a distinct characteristics of his own handwriting. His manner of writing, stroking, spacing, curling, loops, pen rest, pen pressure, etc. must be according to his own style and habit and it shall be unique and different from others.

A handwriting experts attention is focused on this area. The handwriting characteristics of a particular person must be different from all other. Experts may give their opinion upon the genuineness of a disputed handwriting after having compared it with specimens admitted or proved to the satisfaction of the judge to be genuine. By utilizing the services of a document expert, who is able to develop facts and present evidence based on modern scientific methods of examination, countless tragedies can be avoided. A qualified and experienced document expert can render a great variety of services that are probably entirely new and unknown to most practicing attorneys. The experts technological knowledge and its proper application can provide the court with evidence that can change the outcome of the case. Any comparison of a disputed signature will be only useful when it is done with an admitted signatures otherwise it will be a case of blind leading the blind. There is a need for care and caution in utilizing the testimony of handwriting experts. It is not the apparent qualifications of a handwriting expert, which ought to determine the value of the evidence given by him, but the soundness of the reasons advanced by him in support of the opinion expressed by him. The assistance of handwriting expert can provide a great help in detection of crime. However it needs to be corroborated by other evidences. The reasons for opinion must be carefully probed and examined before deciding a case.

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103 Supra note 22, p.1015.
104 Bindessuree v. Dona, (1968), 8 WR. 83.
105 Vembu Ammal v. Esakkia Pillai, AIR 1949, Mad. 419.
106 Supra note 46, p.2445.
H. Typewriting

The increasing use of the typewriters for the production of fraudulent writings of many kinds has certainly created an urgent necessity, for means that will lead to the correct identification of these documents, the determination of their dates and the discovery of their authors. Without careful investigation it is of course usually impossible to say in advance what can be determined from the examination of any particular piece of typewriter. In the matters involving the procedure for obtaining exemplars is somewhat different from that of handwriting. The opinion of typewriting expert is an opinion of a person specially skilled in that branch of science with reference to which the court has to form an opinion on the point involved. The examination of typewriting document is based on a scientific study of certain significant features of the typewriter peculiar to a particular typewriter and its individuality which can be studied by an expert having professional skill in the subject.

The identity of the machine on which two letters have been typewritten, would not by itself show that the writer of the two is one and the same person. But such a conclusion may be drawn from additional evidence i.e. internal evidence afforded by the document, or external circumstances or the continuity of the correspondence passing between the sender and the addressee.

Different habits of touch, spacing, speed arrangement, punctuations or incorrect use of any letter, figures or other characters may also show that the document was or not written fully by one operator. These facts often have a very important bearing on the genuineness of a document under investigation. The identification of a typewritten document in many cases is

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exactly parallel to the identification of an individual who exactly answers a
general description as to features, complexion, size etc. and in addition
matches a detailed list of scars, birth marks, deformities and individual
peculiarities. ¹¹¹

The relevance of expert opinion on a questioned typewritten
documents has been accepted under section 45 of Indian Evidence Act. ¹¹²
However, this evidence is not conclusive in nature. It only assist the court, to
establish the authorship of document and is only corroborative in nature.

I. Electronic Records

The rapid growth of information and communication technologies over
the past decades has created revolution in both business transactions and
individual practice. ¹¹³ The world wide explosion of electronic commerce and
development in the computer telecommunication sectors are changing the
delivery and availability of information and services. The growth of electronic
media has also created new fields of criminality. Increase in the use of
computers in every field of life has increased the opportunity of misuse of
computers also. The data stored in the computers is called electronic record.
Electronic Record ¹¹⁴ means data, record or data generated, image or sound
stored, received or sent in an electronic form or micro film or computer
generated microfiche. Electronic records are included with documents for the
purpose of proving or disapproving any fact in issue. Electronic records like
other documentary evidence may be primary or secondary evidence and are
admissible. There is no express threshold requirement for computer
generated evidence to be given before an Indian Court of law. But before any
electronic record is admitted as evidence, the court must satisfy it with two
tests. Firstly, there must be no reasonable ground for believing that the
statement is inaccurate because of improper misuse of the computer.

¹¹⁴ See Section 3 of Information Technology Act, 2000.
Secondly, the computer must have been operating properly at all material times or at least the part that was not operating properly must not have affected the production of the document or the accuracy of the content.

Apart from these fields of science (medical and non-medical) which are specifically admissible in the court as evidence, there are some other fields also which are either in developing stage or not accepted by the scientists as established science. Such as lie detection tests and tracker dogs etc. These fields though not acceptable in court as conclusive evidence. But they are recognized as a useful investigative aid in crime detection.

J. Lie Detection Tests

In the era, when the religious faith and morality is deteriorating day by day, the people can give false statements even after taking oath. So in order to ascertain the authenticity of the statement lie detection tests have proved very helpful. With these scientific tests, it can be concluded with a degree of certainty that the statement which is given by the person is true or false. Such techniques though not admissible as a evidence in the Court of law but can be used as a investigative aid.

1. Polygraph Examination

In the modern times scientists have designed a instruments that are capable of recording various physiological changes which may serve as the basis for detection of truth or deception. The instrument designed for this purpose is known as polygraph, which is commonly known as lie detector.\textsuperscript{115} The first scientific use of this instrument for crime investigation dates back to 1895. When Lombroso conducted experiments on actual criminal suspects and demonstrated that there is a change in the suspects blood pressure and pulse rate during lying. The modern Polygraph (lie detector) is in fact a

\textsuperscript{115} Supra note 95, p.345.
product of such early experiments.\textsuperscript{116} This instrument is presently considered to be the most practical and scientific instrument available for the detection of truth or deception.

Going through the difficulties of Criminal Justice functionaries, it is observed that the problem is not whether or not polygraph results are admissible in the court but it is how to admit the polygraph results. Polygraph test is a technological \textit{Abrakadabra} to them,\textsuperscript{117} which can be solved by understanding the technique and working of this test.

Since the development of Polygraph, it has been widely applied in criminal investigation by the police especially in developed countries. In the recent years, this technique has been used by Indian Investigating agencies also. But Polygraph test has acquired a little recognition as evidence in the court. The results of Polygraph examination are not accepted as evidence in both civil as well criminal court,\textsuperscript{118} because the scientific community feels that the test is far from infallibility. Despite this fact, Polygraph is extensively used in criminal interrogation, as it may provide direction to the investigation.

\section*{2. Brain Finger Printing}

One step ahead in the field of the detection of criminals is the Brain Finger Printing. The brain finger printing is the method of matching the fingerprints of information in the brain with that of the actual crime scene. It is analyzing the ability of the brain to identify particular information given to it, with scientific accuracy, for the purpose of arriving at a concrete conclusion as to the presence of particular information in brain. When any information is given to an individual, which corresponds to the started up information in his brain. It emanates an electronic signal in acknowledgement. Absorbing this

\begin{footnotesize}
\begin{itemize}
\item[\textsuperscript{116}] Supra note 5, p.22.
\item[\textsuperscript{117}] Lie Detector Test : A Global Perspective, (2006), Cr.LJ., p.183 (Aug.)
\end{itemize}
\end{footnotesize}
electronic brain impulse with the aid of a device called 'Electroencephalograph (EEG) and marshalling them in an algorithmic index, for presence or absence of a particular information in his brain is the technique of brain mapping.\textsuperscript{119}

This new technique can act as an important investigative tool in criminal cases in confirming the guilt or innocence of suspect of crime. The application of brain finger printing in the realm criminal investigation is not to pin-point the culprit with Precision but to authoritatively confirm that the suspect has got in his brain the silent features of the crime. The brain finger printing is more accurate and advantageous than other modes of lie detection in the sense that the true information in the brain is absorbed before any manipulation can be done to it by the conscious mind.

Although brain finger printing has not acquired clear admissibility in the courts but in a recent decision of Supreme Court in \textit{Dattu Shamrao Volke v. State of Maharashtra},\textsuperscript{120} it was observed that even though the investigating agencies have conducted brain finger printing evidence, the court declined to comment on its admissibility blaming prosecution that, it did not rely brain printing evidence. The courts are reluctant to admit brain finger printing as relevant evidence. Because this process has not acquired universal acceptance. But in view of the latest trend in the terrorism and technological advances in the commission of crime, this technique may prove very useful.

3. Narco Analysis Test

The term Narco-Analysis is derived from the Greek word narkc (meaning 'anesthesia or tarpar') and is used to describe a diagnostic and psychotherapeutic technique that uses psychotropic drugs particularly barbiturates, to include a stupor in which mental element with strong


\textsuperscript{120} 2005 \textit{Cr.LJ.}, 2555: AIR 2005 SC 2331.
associated effects came to surface, where they can be exploited by the therapist. Harseley coined the term Narco-Analysis in 1936 for the use of narcotics to include a trance like state wherein a person is subjected to various queries. Narco analysis reached the main stream in 1992. When Robert House, a Texas obstetrician used the drug on two prisoners. After that there is no looking back in the progress and use of this field. Narco Analysis Test for the criminal interrogation is valuable technique which would profoundly effect both the innocent and guilty and thereby hasten the cause of justice.

Narco-Analysis test is conducted by mixing three gram of sodium pentothal or sodium anytal dissolved in 3000 ml. of distilled water. Narco test refers to the practice of administering barbiturates or contain other chemical substances. Most often pentothal sodium, to lower a subject inhabitations in the hope that the subject will more freely share information and feelings. A person is able to lie by using his imagination. In the narco analysis test, the subjects inhabitations are lowered by interfering with his nervous system at the molecular level. In this state it becomes difficult, though not impossible for him to lie. In such sleep like state efforts are made to obtain probative truth about the crime. The effects of bio-molecules on the bio-activity of the individual is evident as the drug depresses the central nervous system, lowers blood pressure and slows the heart rate putting the subject into a hyponastic trance resulting in lack of inhabitation. The subject is then interrogated by the Investigating Agency in presence of the doctors. The statements made during this stage are recorded both in Video Cassettes and Audio Cassettes. The report prepared by the expert which is used in the process of collecting evidence. Under the influence of drugs, the subject talks freely and is purportedly deprived of his self-control. In this state, it becomes difficult for him to lie and his answers would be restricted to facts he is already aware of his answers are spontaneous as a semi-conscious person. He is unable to manipulate his answers. The questions are designed carefully.

121 ABCD of Narco Analysis, Civil Services Chronicle, June 2010, p45.
and are repeatedly asked in order to reduce ambiguities during interrogations. After the Narco Analysis examination is over, the subject is made to relax for 2-3 hours.

Under the Criminal Procedure Code from Sections 156 to 159 and other provisions relating to collection of evidence by the Police Officer is permitted by the law. Conducting the aforesaid tests on the accused is to be considered as a process of collection of such evidence by the investigating agency. The Narco Test is a scientific method in furtherance of the investigation. All the three methods of lie detection though used for the purpose of investigating a crime. However, these tests are not admissible in the Court as a piece of evidence.

K. Track Dogs

Dogs and human beings are considered one of the most trusted and faithful companion from the days of Mahabharta. Dogs forms integral part of Police Investigation.\textsuperscript{122} Specially trained Dogs are used to track down criminals due to their superior sense of smell. It has got higher capacity of differentiation of smell to the extent that it can identify the individual human scent and distinguish it from other.\textsuperscript{123} The handler who skillfully handles and trains such dogs, play a vital role in its various anti-crime activities.\textsuperscript{124}

There are two types of works performed by the police Dogs. They are as trackers and sniffers. The use of Dogs in police work though strictly does not fall under Forensic science. Yet it surely comes under the ambit of Modern Criminology. In India, Dogs were formally used by the police for detecting criminals and stolen property.\textsuperscript{125}

\begin{itemize}
\item\textsuperscript{122} Abdul Razab v. State of Maharashtra, AIR 1970 SC 283.
\item\textsuperscript{123} Dev H.I., Laws of Police Investigation & Scientific Aids, (2005), p.245.
\item\textsuperscript{124} Abdul Razab v. State of Maharashtra, AIR 1970 SC 283.
\item\textsuperscript{125} Gomes Lawrence, Police Dogs in Tracking Evidence – In detection of crime and criminals – Its evidential Value, 2003, Cr.LJ, p.213.
\end{itemize}
Track dog evidence is not admissible as an evidence in the court of law but can be relied upon as a circumstances which alongwith other circumstances would point to the identity of culprit, though by itself it would not be enough to carry conviction in the minds of the court.  

VI. Scope

In today's criminal justice scenario, the traditional sources of proof, eye witnesses, approvers, confessions have gone away. The trials just take too long to keep the witnesses from turning hostile and criminals are turning cleverer and more scientific. It is important that the prosecution agencies rely on something more authentic, more concrete and more productive in terms of convictions without the police having to resort to the third degree methods, that not only violate fundamental human rights but also fail to produce positive results most of the times. There has to be something that is available, objective and hence, not prove to the whims of the witness. The answer is provided by the science as by nature scientific evidence is more or less exact for more reliable and does not turn hostile threats. Besides it works on clue materials which are available.

Among the large number of scientific techniques and mechanical devices that are now vogue in criminal investigation in the following are generally accepted as scientifically accurate and reliable and judicially acceptable in evidence. They are medical examination of the accused, comparison of fingerprints, DNA, handwriting and photographs, forensic ballistics, deception tests with the help of lie detector or Narco tests etc. Some of these tests are particularly useful in the detection of specific type of crime e.g., medical examination in cases of intoxication, sexual crime, murder and crimes of violence etc. These scientific means provides a link between the origin of scientific means and their legislative use.

\[^{126}\text{Pritam Singh v. State of Punjab, AIR 1956 SC 415.}\]
information derived through scientific police investigation is generally
analysed in a crime laboratory by experts in different disciplines and is
offered in judicial proceedings in the form of expert testimony. Among the
most valuable clues in the scientific investigations of crimes, finger prints and
universal admission by courts as infallible evidence comparison of
fingerprints by the experts helps to identify suspect. Finger prints and foot
prints have led to the detection and successful prosecution of a number of
cases in India particularly in offences like robbery, dacoity, house breaking
e tc. DNA testing of Blood samples, semen, hair, tissues have provided a
more accurate almost perfect and infallible evidence. The accuracy of ballistic
tests is so well established that the reports of forensic ballistic experts is
admissible in evidence and afford good corroborative value.

There are different kind of scientific means, which even though not
relevant before the court. As they may be void due to testimonial compulsion
or they are in developing stage or they are taken under such circumstances
that they are not relevant in evidence. However, they works as a clue to trace
the line of investigation, e.g.: Dog tracking, brain mapping tests etc. A trained
dog with its better smelling abilities than a human being can play a vital role
in various anti crime activities.\footnote{Gomes Lawrence, 'Police Dogs in Tracking Evidence – In Detection of Crimes & Criminals : Its
Evidential Value, 2003, Cr.LJ., 213.} Lie detector or polygraph is a valuable
investigative aid. It can give a new direction to the investigation. But the
detection tests have very little probative value in the courts.\footnote{Supra note 95 at p.344.} Because it is
still in the experimental stage. One step ahead in this direction is Brain finger
printing as invented by Dr. Lowrance Farwel. However, this has to be
balanced with the individual freedoms and the rights which are available to
individuals. As the science cannot be used in inhuman way to violate the
basic rights of human beings enshrined in law.
Today Biometric technologies are becoming the foundation of an extensive array of highly accused identification and personal verification solutions. Biometric based security systems have been suggested as a practical solution for financial services, health care, immigration and law enforcement sectors. These advance fields of science can also be very helpful in detection and prevention of crime. Iris Identification is based upon the fact that no two iris patterns are alike and probability is higher than that of finger prints. This iris is a protected organ which makes the identification possibilities life long. This recognition technologies are now seen in a wide array of identification system in other developed countries. It can be very useful in security authentication and forensic applications, PINs and personal passwords. There are other emerging biometric technologies like vein scan, Facial thermography, and hand geometry recognition etc. These technologies are in experimental stage. Some of the technologies are being used in the developed countries. Their use is authentic but very expensive. At this stage the use of these technologies may not be possible in the developing countries like India. But, that time is not far when these sciences will be accepted as perfect science and used as evidences.

VII. Conclusion

With the development of science and technology new fields of criminality has developed. So in order to detect and punish the wrongdoers,

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131 Vein Scan Biometric Technology can automatically identify a person from the patterns of blood vessels in the back of the hand. The technology uses near-infrared light to detect vein vessel patterns. Vein patterns are distinctive between twins and even between a persons left and right hand. Developed before Birth, they are highly stable throughout one's life only in overall size.
132 Facial Thermography detects heat patterns created by the branching of blood vessels and emitted from the skin. These patterns, called thermo grams, are highly distinctive. Even identical twins have different thermograms. Developed in the mid 1990's, thermography works much like facial recognition except that an infrared camera is used to capture the image.
133 Hand geometry systems use an optical camera to capture two orthogonal two dimensional images of the Palm and sides of the hand, offering a balance of reliability and relative ease of use. They typically collect more than 90 dimensional measurements, including finger width, height and length, distance between joints and Knuckle shapes. These systems rely on geometry and do not read fingerprints or palm prints. Head geometry readers can function in extreme conditions and are not infected by dirty hands.
the aid of scientific means in collection of evidence in investigation and trial has become very important. Scientific evidence means, such evidence which is produced before court with the help of scientific techniques. The main fields of scientific evidence are medical evidence, finger printing, handwriting, typewriting, toxicology and ballistics etc. Now even some new fields have developed as perfect sciences like DNA testing and electronic records, etc. These fields can prove very helpful in crime detection, provided that the investigation is conducted properly. But as the human agencies are involved in conducting the tests, so the chance of error is always there. If proper training is given to the investigating agencies proper instruments are provided to conduct these tests, eliminating any chance of error, then the probative value of the scientific evidence can be increased.

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