



Investigation Techniques & Modern Technology

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Abstract: *The scientific knowledge and skills are the result of sophisticated methods where the liability of courts and investigation process has been increased during the last couple of decades. The use of technology and different other similar modern methods are helpful in the detection of offenders, and it is the revolutionary evaluation of investigation techniques. Since the offenders are also using different techniques for their criminal activities, so the use of technology is becoming more necessary for tracking the criminals. Both police and courts are using modern techniques of investigation with the use of modern technology for the detection of violent crimes and criminal activities. This paper examines the impact of modern technology on the investigation process and working mechanism of police and courts. Further, it elucidates the importance of modern technology and its impact upon the investigation process along with the outcome of criminal investigations.*

Key Words: Modern Technology, Scientific Knowledge, Courts, DNA Profiling, Criminality

Introduction

It could be believed that offence was there from days prehistoric. Similarly, the detection and investigation of offence is as well pretty aged. With the progression of scientific knowledge and technological skills, the offenders have taken up novel techniques and practices for committing offences; however, scientific knowledge also facilitated the investigating hands in their endeavors to detect the offenders or actual perpetrators. Juridical Scientific knowledge is one of the sophisticated methods employed in identifying offences and offenders. It is extremely exigent, charismatic, vibrant, and thrilling knowledge (Ratan & Hasan Zaidi, 2008). The temperament of law is energetic and not stagnant, so the law also varies with the public transform. The law is the binding string of the civilization, and the courts have the liability of construing the law for the larger benefit (Bentham & Stuart Mills, 1900). The appliance of scientific knowledge and technological expertise to the discovery and investigation of offence and dispensation of justice is not novel to us (Nanda & Tiwari, 2001). Notwithstanding this, lots of people are not conscious of the verity that scientific understanding performs a considerable role in the detection of offences and offenders. The region of its actions is fairly extensive and broad-ranging. In its appliance to the legal dispensation, it is branded as "Forensic Science". Formerly, it was forensic medicine, which initially entered the territory of science; the same as medical man's assessment is being sought after all over the epochs to discover the reason of casualty of a man equally in occurrences of normal or of abnormal demise.

From the very beginning, the offence has been a component of the culture of human beings, and the requirements of law and a variety of legislations was felt whilst the society started to evolve in an organized form. There are diverse types of laws and regulations which resist on the face of offences in the community. The

offence is an equally societal and economic fact, due to which the whole civilization finds anguished (Technologies of forensic science, 2011). The character of the crime has also been varying and expanding with the swell and progression of the society. Currently, the defenders of the law got a lending hand from various scientific methods and technological innovations for combating crime. Much progression has booked in the area of criminological scientific learning, and it has been hailed in the criminal enquiry.

The area of forensic science is transforming rapidly due to innovative tools and techniques. The use of technology involves different types of methods and techniques for the investigation process that are based on the use of sophisticated technology, including high-performance liquid chromatography, DNA tests, mass spectrometry and 3-D computer imaging. It has been helpful for the reconstruction of the crime scene and to determine different elements that are part of it. The current criminological science can distinguish hint components and biological resources attributable to the point of just a few hundred particles (Innovative techniques of forensic science, 2012).

Assumed the understanding of the mechanisms, criminological inventors need to be adhered to severe dealings and morals to be sure that their results stand applicable, are reliable and can endure scrutiny in the courts of law and society. The latest forensics can assist in bringing into the limelight the covert crimes, get condemned the offender and justify the cleared if it is employed with care. At present-day, versatile science plays a significant part in identifying the victims of wrongdoing, catastrophe, misfortune, and fight, which gives a guarantee, finale, and emotional prop up for bereaved survivors.

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The attribute of our criminal justice system is the thoughtful gaze for veracity. Our modus operandi of the autopsy, guidelines of criminal technique and appellate practice are primarily intended to ensure that guilty are penalized while the guiltless are sheltered. Nevertheless, whilst ours is a system to be treasured, it is not a perfect system, and ones responsible for the dispensation of justice have liability for asking for its persistent progression.

Technological expertise and law, two special vocations, have an escalating number of products to be intermingled for guaranteeing a just modus operandi and to monitor that justice is made. In recent times the lawful scheme must have keep pace through novel technological confirmation happening numerous occasions, which has caused intense, challenging circumstances for the law. At an elemental stage, countless these hard circumstances happen from primary discrepancies between the medical and penitentiary practice. The predicaments stand obvious. On solitary pointer, medical impervious proffer striking menace amazingly accurate fact-tracing and a decline within the vagueness that often matches with criminal choice-creation. At the same time, scientific tactics commonly have dangers of haziness which the penitentiary system is disinclined to accept.

Moreover, on each occasion, systematic evidence assessment of competence of judges and lawyers altogether may be short of scientific know-how to comprehend evidence and assess it in a casual way. Lawyers' necessity mark attempts to recognize the complicatedness of precise study and terminology if they remain to wholly understand challenging processes and outcomes and influence in the permissible field. One contemporary progression in the scientific area that has had a considerable and almost compelling impression on the lawful occupation is the advancement of untruth uncovering and Norco-Analysis in unlawful cases (Forensic science & its techniques, 2011).

Generally, forensic science is the use of scientific knowledge to discover the reply asked by the judicial arrangement. Those replies might concern civil or criminal acts. Presently it is as well greatly linked to the scientific area. Forensic science is employed to respond to criminal issues, which respond through the match with illegal material, biological evidence, firearms that are possibly traced at the scene of the crime. Besides this, through the aid of suggestion evidence and imprint evidence like marks, enervate ways and footwear impresses and entirely further evidence that may be traced at the spot of crime, the requisite responses for criminological assessment can be established with the assistance of forensic scientific techniques ([Innovative methods of forensic science, 2011](#)).

The evidence located at the spot of occurrence is usually shaped in the offence lab, and it is the limb of forensic science which is utilized in the media broadcasting and portrayed in novel dramas and series. Moreover, forensic science has further branches. It is employed in resolving clashes, as in forensic accounting that is the learning and assimilating of accounting data. When one mentions forensic economics, it speaks about the part of forensic science that calculates financial loss bringing about the failure of trade, domestic supplies or trade earnings.

In forensic technology, one would be capable of detecting the reason for the breakdown of a gadget or composition. Conversely, forensic anthropology is a limb of forensic science that aids in the identification and upturn of any decomposed vestiges of a person. When the legal machinery requires lingual knowledge, forensic linguistic is commonly have recourse to it; odontology is the subdivision of forensic science that sees to the learning of teeth.

A supplementary limb of forensic science is forensic photography, in which a perfect imitation of a spot of occurrence to be produced in the law court is engaged. Forensic psychology and psychiatry are taken into contemplation by the court of law for proving human conduct in a legal issue. Forensic science in which the consequence of medicines and venoms on a person is studied is recognized as toxicology.

In the area of entomology, one learns the effect of insect's traced in, on and surroundings of an individual, s vestiges. Through its aid now, it is possible to detect the place of casualty and time of demise, and in case the corpse was stirred from the spot subsequent to expiry. Thus, it is observable that forensic science performs an effectual function in resolving intricate and uncertain matters (Forensic Science, 2010).

The utilization of modern science, which cuddles up all disciplines like Chemistry, Ballistic, photography, Physics, Brain Fingerprinting, Toxicology, Narcotics, DNA Profiling, Norco-Analysis, Biology, etc. in criminal law, is usually known as forensic science in the area of law. The main purposes of forensic science are the discovery, gathering, packing, haulage and analysis of corporeal evidence and biological substance etc. A few of the innovations in forensic science are briefly thrashed out underneath ([Advancement in forensic science, 2011](#)).

Norco-Analysis Test

Narcosis is a condition of unconsciousness stimulated by intoxications. To administer narcotics as a curative relief in maniac is thought to be reminiscent of the utilization of opium for cerebral mayhem in ancient Egypt. During the beginning of the 20th century, medicinal men began utilizing scopolamine accompanied by morphine and chloroform towards stimulating conditions named as "nightfall doze" at the time of delivery to the women as these have the result of tranquilizer. Nevertheless, scopolamine was as well recognized to generate a condition of bewilderment, disorder and memory loss throughout the times of drunkenness.

Narco-analysis is a method through which a person is placed into slumber or consigned to partly drowsy condition by way of chemical inoculation and was after that questioned being in that trance-like condition; otherwise, the practice of inoculating a 'truth serum' medicine into a person /accused to stimulate partial cautiousness, and then questioning the person/accused. This procedure has been employed to increase the remembrance of a witness ([Ramanatha & Aiqer, 2005](#)).

In 1922, Robert Ernest House, an American physician, while thinking that a related method possibly is employed to cross-examine the accused in

questionings of a charge. In view of that, he prearranged for two alleged criminals for examination who were facing trial, and their guiltiness appeared to be proved. In the course of that examination, all the two persons refuted the accusations, and after the trial, they were declared innocent. It showed the way to Robert House to the conclusion that a man who is in the influence of scopolamine cannot tell a falsehood, as there is no motive or thinking ability.

During the course of Norco-Analysis examination as a person has no control to sense owing to the cause of medicines that were inoculated to him, the scheme and research attracted a lot of public interest and notice and hence paved the way to the beginning of Norco-Analysis in crime investigation ([Das & Kumar, 2011](#)).

DNA Profiling

One of the most recently developing and largely dependable means of enquiry popular criminological knowledge remains DNA summarizing. DNA is known as an acronym of phrase, "Deoxyribose Nucleic Acid". Commonly it is a natural matter that is found in all live cells and which provides a living being's hereditary drawing. DNA can be taken from a large range of resources such as plasma, osseous matter, spit and semen, et cetera ([Sharma, 2008](#)).

In the year 1869, DNA was foremostly found out by Fredrick Micscher. In 1984 in England, Sir Alec J. Jeffery opened a way to utilize DNA as criminological examination and the situation stayed primarily employed in the well-known Endbury case in which two girls were sexually molested then killed ([DNA test and its relevance in forensic science, 2008](#)). Ever since then, scientists have built up different methods like RFLP (Restriction Fragment Length Polymerase), and soon after, one more system known as PCR was developed ([Polymerase Chain Reaction Technique, 1872](#)). PCR had improvements over RFLP as it obtains a smaller quantity of samples and reproduces them in multiples. It is faster and gainful. It as well facilitated the evaluation of extremely tainted samples, and for that reason, it is a very commonly pursued technique of DNA profiling. DNA analysis is very much effectual since each person's DNA is matchless excepting the identical doppelgangers. The likelihood of DNA matching is one in three billion. Furthermore, it is reliable as it is impossible to be interfered with. DNA examination may be utilized in a variety of cases so as to ascertain the descent of a baby and recognize disfigured corpses etc. Forensic DNA scientists inspect evidence from the scene of the crime to prove the presence of a person if there happens to be a biological substance, such as blood, saliva, semen, or skin cells. After the serological detection of biological matter, it is processed through a DNA typing procedure to generate DNA profiles from the evidence of the crime scene and the accused are compared with each other to discover the offender of the crime.

PFSA's DNA and Serology unit offers the DNA typing services in the following criminal matters like homicide/assassination, bodily attack, molestation/or other sexual assault, criminal's paternity, terrorist/bomb explosion incidents, suicides, hit and run and vehicle accidents.

Fingerprints

Fingerprints have been applied in the investigation of crime for over a century and are considered one of the most relevant and reliable pieces of proof. All individual souls come into this world with a distinctive pattern of the ridge on the finger pier. The grooves, which are in plenty in per pirated stomas, shape an outline that continues permanent till death. Albeit the hide is detached, the similar prototype will be apparent when the crust restores. A number of the distinctive samples established in fingerprints are curves, rings, and spirals. Greases from sweat glands assemble on these ridges. As soon as we touch a thing, a little quantity of the greases and other objects on the fingers are deposited on the exterior of the article that is contacted. The prototypes deposited by such materials, which amass beside the creases on our fingers, frame the fingerprints that police search for at the spot of an offence. It is the distinctive prototypes formulated by these creases which prompt the police to keep proof of citizen first fingerprints. To obtain anybody's impressions, the tops of one's fingers remain firstly soaked through blot. The impressions are located next turned around, one by one, on a flat plane to leave an impression that may be saved. Fingerprints saved as proof may be contrasted with fingerprints on record or else obtained from an accused ([Fingerprint utility in forensic science, 2013](#)).

Scores of fingerprints originated at scenes of crime are not perceptible. These hidden (concealed) impressions, that frequently imperfect and taken numerous modes. The primitive then very commonly cast-off scheme is to utilize dust like face precipitate, for instance, ninhydrin, to clean the exterior. The dust glues to greasy materials on lithograph building sketch noticeable. After that, the tumout can be pictured and taken off the exterior by means of a strip to which the dust sticks on. To look for fingerprints on permeable substances like paper, forensic experts apply smokes of iodine or cyanoacrylate. These smokes eagerly accumulate on greases in lithograph sketches and may be snapped. Since 1978, argon lasers have as well been utilized to observe hidden fingerprints. Once enlightened by a beam from an argon laser, a hidden feature is frequently pretty perceptible. Perceptibility under laser beam can be developed by initial cleaning of the feature with lustrous fingerprint dust.

Fingerprints are not the lone implicating outlines that an offender may drop in the rear. Lip marks are often originated on tumblers. Footprints and the mud deposited on the mark might be matched with which were spotted in an exploration of a suspect's dwelling. Tire impressions, nibble scratches, toe marks, and impressions of naked feet might as well supply valuable proof. In eventualities whereof the identification of a casualty is complex owing to tissue decay or demise resulted from blasts or tremendously serious accidents, a deceased's teeth can be utilized for similarity with the ontological reports of the absent person ([Forensic science fingerprint, 2012](#)). Each coin has two sides. All the skills or data produced can be utilized or misused by the consumer. However, that cannot be utilized as a stand to discard the progression of the knowledge.

Relation of Criminological Discipline with Criminology Inquiry: An Examination

The offence took birth with the mortal society. Similarly, too the punishment to the offender in one shape or the other was as well there in civilization. Following the enforcement of different laws, the offenders are made to face criminal proceedings before the judicial forum for the determination of guiltiness or blamelessness of someone. The conventional ways have not proved very productive in achieving the requisite condemnation ratio. In the current decade, owing to the utilization of information and methods of forensic science, there has been a comparatively big boost in the condemnation of different offences; however, even then, the condemnation ratio is not in equilibrium with the offences perpetrated. In the criminal investigation and the administration of justice, forensic science is certainly a multipurpose instrument ([Veeraghavan, 2004](#)). Forensic science may be described as a criminological topic. In further terms, the scientific reading otherwise examination of the offence may be phrased as criminological knowledge. Together through the progress of scientific knowledge, the technological expertise and outline of our culture are as well altered to deal with everyday expansion. For that reason, the offenders also frequently use diverse methods for carrying out different offences with the public. Thus it has to turn into trouble aimed at law and enforcing organizations to curb offences prospectively. In lieu of such curbing, a call for criminological discipline happens to be a necessary precondition at the end of the investigating agencies.

The scientific checking of a forensic expert connects a lost linkage or reinforces the investigation by supplying neutral proofs, accordingly facilitating the bench to reach a decision about the offenders and appropriate sentences. The area of learning or evaluation of forensic scientists is extremely broad-ranging, distractible and volatile. Usually, the task and assignment of forensic scientists are exceptionally perilous, arduous and risky as well. Since they have to tackle the valuable displays relating to different types of offences, for instance, assassination, sexual assault, blood, saliva, weapons, bullets, explosives, and explosive materials, alcohol, cannabis, opiate, impure petrol, kerosene, diesel, et cetera and automobiles engaged in mishaps, different sorts of coats, implements applied in housebreaking, inflammation etc. diverse sorts of venoms and toxic materials, hairs, skinny vestiges and vegetation or creature remains. Excluding these, forensic scientists as well scrutinize the counterfeit signs and papers together with the photogenic scrutiny of every stuff displays. Some important display coming across in the process of investigation requires being meticulously checked to verify or controvert its link with some offence or offender. Basically, the forensic scientists are to inspect the essential displays attached with different types of offences described in the provisions of P. P. C. and different concerned enactments and the legislations of the country. Dissimilar to other studies and investigative stuff, forensic scientists are needed to apply restricted extent and sum of substances usually dropped after or taken away by the offenders.

In order to improve the compilation of reveals for diverse sorts of investigations, forensic scientists are frequently called upon to the crime spot in order to lend a hand to the investigating agencies in finding out the evidence by way of scientific investigation. Up to now, the responsibilities and functions of forensic scientists generally have been thrashed out. The position and character of forensic scientists of various divisions in relation to their relevant and particular area of job must also converse.

Allow us to talk about forensic physicists. Normally the essential proofs which are secured from the crime spot are scanned by the scientists of this branch. In addition, relative researches of varied inkings and blots of instruments etc., utilized in the perpetration of offence are as well completed in this branch. Forged engine or chassis numbers or refurbishment of a rubbed out digit on hard plates is also established through the experts of the branch. Examination of coatings, glasswares, and stamp marks of the forestry department may remain checked by those experts to ascertain the related information concerning the resolve of inkings of the perpetration of offences and offenders.

Furthermore, the experts of forensic chemistry are evenly active in finding evidence of offence and discovery of offenders by their diverse modes of examination. For example, a criminological chemist has to verify non-adulteration of petrol, diesel and kerosene out of specimens. They are furthermore to decide alcohol worth, opium, ganja and other chemicals examination of explosives and such on. On or after their different modes of examination, they must ascertain details banked on those examining officers could discover signs of certain offence.

Criminological environmentalists must as well been performing a significant and admirable part in probing biological traces concerned with the offence. It is the biologist who has to examine the necessary traces beginning from a microorganism to an upper place or a creature and as well their elements and creations. From the emaciated remainders, a biologist has to conclude the gender, source, figure, and age of the dead body. He is to recognize from the head by employing placing over the process and thus assist the investigating officer in arriving at a decision regarding a certain offence. In case of death under suspicious circumstances, the biologist has to determine the reason for demise. He has also to examine diverse noxious vegetation substances in cases where vegetation venom is used in the perpetration of offences.

Hence, as regards the ballistic area of criminological knowledge, that can be declared as an airborne scientist be present solely one that determines if the certain gun was employed or not at all in the commission of the offence. He, too, has to check up the categories of guns and bullets employed in the perpetration of offence. He as well has to find the particulars relating to firing ranges, space, track, and position of fire. Subsequent to getting the views of a ballistic expert, the investigating officers may arrive at a logical end regarding a certain offence. Aside from the diverse guns and bullets, a ballistic expert is as well supposed to check up on the explosive materials which are these days generally utilized for committing terrible offences.

A toxicologist establishes the inklings of the offence in which poisonous substance is employed. In every such case, may it be unintentional, suicidal or deliberate, a toxicologist examines the internal organs and other related substances from which he ascertains the worth and extent of the venom made use. Out of the account of a toxicologist, the investigating officer can generally find crucial signs for identifying the concerned offenders. Likewise, the court also finds constructive evidence for arriving at an end in any specific case.

A text specialist inspects the diverse sorts of manuscripts straightly or implicitly concerned with a matter of falsification. The matters of forgery can be of varied forms; however, every one of these is scrutinized by the script specialist. Out of the findings of a manuscript checker, the investigating officer can certainly discover the actual offender of a specific offence. Excluding the fake signs or papers, a script specialist time and again furnishes assessment on typed documents, period of the script and the era of the ink utilized for lettering a questioned paper. Thus the views of a writing specialist also assist the court to arrive at the decision to meet the goals of fair dealing.

In view of the above debate, it can be found that forensic scientists, by just type of their job, are obliged to ensure justice to the general public. To tell the truth, forensic scientists are playing a critical part in lessening the menace of offence and as well to eradicate the core reasons of offence from society.

As a result, it can be emphasized that Forensic science is attaining a firm position in the field of effectual offence deterrence, particularly in the fields where the more complicated exercise of existing tools is common. Everyone, it necessitates top- rank collaboration amongst countries that can facilitate them to deal with criminality. It is evident that mutual support will not be solely sufficient, and this move will call for a system of capable forensic laboratories sprawling over the whole world. Forensic science laboratories are necessitated to be well employed in the war with criminality. In order to achieve this, an excellent range of rapport is needed to be set up and retained. It is furthermore noteworthy that synchronization is compulsory for such assistance, and looking for endorsement in keeping with a worldwide approved yardstick, for instance, ISO/VIEC 17025, will ultimately bringing together by way of outcome. Since ISO/VIEC 17025, a global yardstick in modern development, has been an instrument that assists forensic science laboratories on the way to certification that can be watched not just in Europe but as well in the remaining sphere of criminological discipline. In the preamble part, ISO/IEC 17025 proposes that

recognition of trying in addition quantification products amid jurisdictions ought to be eased if laboratories abide by this worldwide yardstick and if they acquire certification from an organization that has joined in reciprocal acknowledgement contracts with counterpart organizations in other jurisdictions utilizing this global benchmark. Additionally, this is stressed that utilization of this worldwide index is to support cutting-edge and synchronization of yardsticks processes. The backdrop of criminological knowledge collaboration in Europe is to be clarified through means of a present European forensic science system, i.e. ENFSI, so as to better comprehend the recent position of forensic science in Europe.

So, scientific evidence is an inexorable aspect of contemporary court proceedings. The flawed examination of scientific proofs would rob the contestants of court proceedings of the benefits of credence given to such proofs by the judges and thus weaken the appropriate performance and trustworthiness of the judicial system. In the USA, over 140 persons condemned on the charge of assassination were cleared using DNA examination, which is adequate to establish its usefulness. The illegitimate justice structure is founded proceeding justice-based plus reasonable doctrines. The function of judicature is to conscientiously appreciate technical proofs and evaluate them without being influenced by business promotion attached to the technical innovations patented for utilization as trade.

Conclusion

In conclusion, our criminal justice structure must be developed in order to move heaven and earth to safeguard a guiltless one and to ensure that an offender does not go scot-free at the expense of a guiltless soul. Our criminal justice system espouses that let hundred culpable ones be spared but let not one guiltless to suffer. It is the most opportune time for us to build up our system to the point that none of the offenders escapes without being penalized for their offence, and none of the victims is being deprived of justice which upsets the entire structure. Hopefully, the whole such advancements of forensic science would be a powerful instrument in the grip of the citizens resisting offence in order to sufficiently equip them and let the scheme function in order to ensure an increasingly proper and secure spot to reside in calm and prosperity. The application and adoption of these modern concepts in policing in our country can be helpful in reforming these conditions of criminal justice condition in Pakistan.

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