CHAPTER 7

FORENSIC SCIENCE AND SCIENTISTS: PROFESSIONAL ETHICS, QUALITY AND JUSTICE

Forensic science, the sibling of the discipline of law, is the application of science to law. It can be considered as a discipline helpful for the effective enforcement of the laws and rules of conduct. It helps the criminal justice system by supplying valuable information, which cannot be detected solely with the help of legal brain. In reality, there is no such separate discipline known as forensic science; it is rather a blend of various scientific disciplines like biology, physics, chemistry and other related scientific subjects. Though, medicine one of the major related disciplines in the forensic science does not come under the head because it is a distinct discipline known as legal-medicine or forensic medicine. Similarly there are many other distinct disciplines known as forensic psychology, forensic pathology, forensic odontology etc. Nevertheless, one can rightly say that forensic science is the genus and all other related disciplines are its species.

Any one who is researching to find out the historical background of forensic science may find that the scientific detective writer Sir Arthur Conan Doyle developed it. He through his fictional character Sherlock Homes shows how the criminal investigators successfully investigate crimes applying the principles of serology, fingerprinting, questioned documents and firearm identification. There are many other persons as well who can be called as the pioneers in developing forensic science. The prominent persons in the brief list are Mathieu Orfila, Alphonse Bertillion, Francis Galton, Leone Lattes, Calvin Goddard, Albert S. Osborn, Hans Gross, Edmond Locard etc.
1. The Role of the Crime Laboratory and Forensic Scientist

The crime investigation laboratories or the forensic science laboratories play a prominent role in the collection of evidence and its evaluation. In a crime laboratory there will be two set of persons, one for the collection of evidence (crime scene investigators) and the other set examines the evidence samples collected by the scene investigators. In some countries there are separate wings for the collection of evidence. Scientists having special qualification in scientific subjects like chemistry, physics, biology etc fill the common posts in the crime laboratories. Nowadays there are persons having special qualification in forensic science. If they are not specially qualified in forensic science discipline, they will be trained in their related fields. For example, a forensic scientist qualified in biology will get adequate training in the field of DNA typing. Almost in all countries the posts in the forensic science laboratories except forensic scientist trainees are appointed through promotion, based on their experience and progress. The hierarchical order of the scientists from the lower level to the upper starts from the forensic scientist trainee to scientist I and scientist II. The Director manages the crime laboratories. And there will be a system Director, laboratory's quality assurance director, crime lab unit supervisor and crime scene unit supervisor. At present the services of the forensic science laboratory can be divided into several units. They are the Physical science unit, Biology unit, firearms unit, document examiners unit, toxicology unit, fingerprinting unit, DNA typing unit, polygraph unit, voice print analysis unit etc.¹

2. **Ethical Dimensions in Forensic Science**

Ethics has been defined by Frabkena as "a branch of philosophy; it is moral philosophy or philosophical thinking about morality, moral problems and moral judgments".\(^2\) However, ethics in its strict sense is different from morality. Ethics is based upon knowledge and thinking; morality is based upon belief and feeling. Ethics is a standard that determines the behaviour of an individual. It is a rule of conduct recognized among the right thinking persons. They have the capacity to discern right from wrong. Unethical acts often occur when a person acts in a wrong and unjust manner or when he turns his mind to an improper way in contradiction to the rules or norms prevailing in the society. It is difficult to elucidate the parameters of ethical acts and unethical acts. It depends to a great extent on the circumstances in which one has taken or reached a decision.

However, there are borderline situations in which a person strongly believes that he had acted ethically but others may criticize his action as unethical. Similarly there are situations in which one may justify or strongly believe that the act performed by one is ethical, but in reality they know that there may be some more possible alternative.

A person's behaviour is shaped from his childhood. Actually children were taught by their parents to behave as good persons and tell truth always but later their conduct will be influenced by different persons in society throughout their life. A person's personality will be affected to a great extent when he is with his friends and colleagues.

From this background one can evaluate the attitude of a forensic scientist to ethics. A lawyer's outlook to professional ethics is different from that of

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scientists. The lawyer's ethics always depends on his duties towards his client and court. A lawyer is not expected or duty bound to tell the truth because he is under a duty to his client when he accepts the vakalathnama to conduct the case. Unlike lawyers, forensic scientists are under an obligation to tell the whole truth before the court of law. Moreover, he has certain duties towards the society, victim, suspect and prosecution. His duty to the society is based on the trust reposed in him by the general public. All forensic labs were run with the public fund and therefore as a government agency they are responsible to give a correct result. For that they must perform efficiently and effectively. Similarly they are equally responsible to the prosecution, victim and suspect. There are plenty of instances in which scientific opinion or results became important. Sometimes the prosecution's case may entirely depend on the report of the forensic expert or his opinion. Therefore, forensic scientists and laboratories shall guarantee that the judicial system can rely on the works done by them. In law, forensic witnesses are considered differently from other witnesses. They are expected to function in an impartial and unbiased manner. As a forensic expert working under the control of police and prosecution is not only responsible to them but also to the suspect and victim. While analyzing the crime samples, he is duty bound to establish the points that will helpful for establishing the culpability of the suspect or for exonerating him from the criminal liability.

3. Schools of Ethical Thought

There are mainly two schools of ethics. The forensic science community generally follows the principles formulated by these schools. According to one school of ethical thought, the justification for an act done by one person depends on the consequences of the act. The school argues that the right course of
action is always the one that produces the best outcome.\(^3\) The ethical thinking of this school is similar to the Benthamite principle, maximum happiness to the maximum number of people. However, this way of thinking has been criticized by saying that the maximum human happiness principle will come in contradiction with valuable individual interests. For example, in an accident claim instituted by a wife and her three children against the death of her husband, one of the important issues to be decided was whether the death of the husband was caused by accident or heart failure. If the death is due to heart failure, the claimants will not get any sum from the insurance company. Considering the pitiable condition of the wife and three children, the medical witness who examined the victim testified before the court that the cause of death was accident, though it was actually caused by heart failure. Here the individual interest of the insurance company was seriously affected by the ethical decision taken by the medical expert on the basis of maximum happiness to the maximum number of people.

The other school argues that the ethical thought of a person should be guided by the ethical principles that are absolutely right and not based on some desired end like maximum happiness to the maximum number of people. This school suggests that a profession shall formulate its own maxim that will govern its professional action. If after applying that maxim, the men in that profession would not agree that it cannot be equally guided every person, can be considered as non ethical. This principle was criticized by commentators saying that (1) there cannot be any absolute maxim suitable for all situations. Sometimes it may come in contradiction with the universal law of nature; (2) an

absolute maxim may come in conflict with another absolute maxim. No one can obey both maxims simultaneously.

From the analysis of the principles laid down by the different schools, it is submitted that the forensic scientist and profession shall have recourse to the general principles outlined by the schools, however, it is not advisable to have absolute deference to those principles. Therefore, it is better to take the general values formulated by those theories and then enact a special ethical code, which matches the profession and persons.

4. Obstructions Against the Ethical Practice in Forensic Science

Obstructions to ethical practice in forensic science are manifold. In this part some of those obstructions are discussed.

(A) Unethical Practice of a Forensic Expert regarding his Qualifications and Credentials

In the interface between law and science, what distinguishes a forensic scientist from other witnesses is his qualification and special knowledge. The weight of his evidence entirely depends on the experience he has in a particular field in which he is going to testify. The experience-based capacity of an expert in giving evidence has resulted a sea change during the past 50 years. Thus at one time a forensic scientist practicing in bioscience could adequately give evidence on areas like examination of blood, other biological fluids and so on. But now the science of biology has developed much and separate disciplines like biotechnology and molecular biology have evolved in the field of expert forensic evidence. Therefore, a very wide knowledge about those subjects is necessary for giving evidence as experts in those subjects. A survey of lawyers and scientists associated with the American Academy of Forensic Sciences identified
competency as the most significant ethical problem in the field.\footnote{Peterson and Murdock, "Forensic Sciences Ethics: Developing an Integrated System of Support and Enforcement", 34 J. Forensic Sci. 749, at 751(1989).} Section 1(b) of the Code of the American Academy of Forensic Science states "Every member of the AAFS shall refrain from providing any material misrepresentation of education, training, experience or area of expertise".\footnote{Code of Ethics for the American Academy of Forensic Science, 31 (3) J. Forensic Sci. 798-799 (1986).} Same view was expressed by D.S. Manhas and J.R. Gaur of the State Forensic Science Laboratory, Himachal Pradesh suggesting two ethical requirements (1) Forensic scientists should be technically competent and employ reliable methods of analysis; (2) Forensic scientist is to be honest with respect to his qualification or experience and confine his report to area of his expertise.\footnote{"IXth All India Forensic Science Conference", Shimla (1995) Bureau of Police Research and Development, (Ministry of Home Affairs, Government of India, New Delhi), p.411.}

From these statements it is clear that the ethics in forensic science requires a forensic scientist to announce correctly his expert status when he is going to testify as expert in a particular subject. He should not overstate or exaggerate his qualifications or experience. For example, it is unethical to say one's qualification as PhD if he has only a master's degree on the subject. Similarly, he must disclose correctly the number of articles he had published on a subject and the number of seminars and training programs he had attended. Experts on forensic ethics say that even guessing the dates and programmes attended inaccurately when the defence lawyer asked him while cross-examining will amount to misrepresentation of status.\footnote{Don Harper Mills, A Special Communication, "Comments from the Perspective of the AAFS Ethics Committee Chairman", 42(6) J. Forensic Sci. 1207-1208 (1997).}
Professional incompetence of a forensic scientist is also considered as a serious ethical challenge. Every forensic scientist is ethically obliged to state his competency on a particular scientific examination. For example, if a bioscientist having no experience in DNA typing accepts the responsibility of a police case for DNA testing, he is doing that against the ethical values in forensic science, even though he succeeds in that examination. An author on forensic ethics has stated that a forensic scientist who knows that he is unqualified to give a scientific opinion on a matter is "cheating" when he seeks to do so.⁸

John F. Kelly and Phillip K. Wearne have cited a typical example for professional incompetence. Fred Salem Zain was a police forensic expert in West Virginia and Texas for nearly fifteen years. Hired as a chemist by West Virginia's police crime lab in 1979, he testified as an expert in dozens of rape and murder cases about tests he had never done and results he had never obtained. In 1989, Zain became head of serology at the Bexar County Medical Examiner's office in San Antonio, Texas. When asked to review Zain's work, a Dallas forensic specialist found fraud and falsification. In one case, Zain had testified about blood evidence when no blood had even been found; in other cases he reported as having performed tests which his lab was incapable of doing.⁹


Experts in forensic science have stated that even the biggest crime lab in the world cannot be immune from such unethical acts.\textsuperscript{11} For example, a report of the internal FBI investigation in 1974 shows that one Thomas Curran, an examiner in the FBI lab's serology unit was declared a record having perjury, incompetence and falsification. He fraudulently testified in a trial that he had bachelor and masters degree in science, actually had no degree in anything.

Similarly it is unethical for a forensic scientist to testify regarding the qualification, credibility of a report, and experience of another forensic scientist, if he is not eligible for the same. A prominent writer and professor in forensic science and law of the George Washington University has pointed out many instances regarding the unethical behaviour of forensic scientists while testifying in criminal cases.\textsuperscript{12} In one case an FBI serologist testified that he had a master's degree in science, but in fact he had not even completed his graduation. Similarly court discovered in time the bogus claims about qualifications made fraudulently by laboratory technician, serologist, psychologist, arson expert and ballistic expert.\textsuperscript{13}

\textsuperscript{11} Recently John F. Kelly and Phillip K. Wearne in their article has stated that "In the cauldron of the courtroom, testifying beyond one's expertise becomes common, especially under the FBI's system, where auxiliary examiners, often civilian scientists, actually do the tests, but principal examiners, invariably FBI agents, have tended to do the testifying. All too often the fingerprint expert is invited to comment or even speculate on the bloodstains, the firearms expert on the nature of the bomb explosive, the documents examiner on the tool marks. When only one expert is appearing in a multidiscipline case, it's tempting for prosecutors or defense lawyers to go for an opinion; it's also tempting for examiners to embellish, exaggerate, or even lie about their credentials..." John F. Kelly and Phillip K. Wearne, \textit{Tainting Evidence}, supra n.9, at p.16.


\textsuperscript{13} \textit{Ibid.}
Partialities and Bias

Forensic science means the science that helps the legal machinery in finding out the truth which having the scientific bearing, but in reality it became the science that helps the law enforcement authorities. From very early days it was said, "skilled witnesses come with such a bias in their minds to support the case in which they are embarked..."\textsuperscript{14} Here it is worthy to quote a passage from an Indian decision:

It must be borne in mind that an expert witness, however impartial he may wish to be, is likely to be unconsciously prejudiced in favour of the side which calls him. The mere fact of opposition on the part of the other side is apt to create a spirit of partisanship and rivalry, so that an expert witness is unconsciously impelled to support the view taken by his own side. Besides, it must be remembered that an expert is often called by one side simply and solely because it has been ascertained that he holds views favorable to the interests.\textsuperscript{15}

Nowadays forensic scientists come before a court of law to deliver their valuable opinions for those who called them. Scientific witnesses employed in the forensic science laboratories may think that they are the part and parcel of the law enforcement authorities and their only duty is to assist them in getting conviction of the accused. Actually this is a misconception of the forensic scientists about their duties. Once James E. Starrs, the professor of forensic science and law of the George Washington University rightly stated that the "bias among the forensic scientists is as prominent as a bump on a coloratura’s nose."


\textsuperscript{15} Harisingh v. Lachhmi Devi, (1921) Indian Cases, Vol- LIX, at p.220.
The term "bias" in forensic context needs special understanding. In forensic setting the term "bias" means a scientist's direct or indirect, intentional or unintentional partial findings, which may result in prejudice to one side and benefit to the other. Bias may be institutional or personal.

Personal bias of a forensic scientist is mainly caused by their employment with the law enforcement authorities. Almost all forensic laboratories are under the tight control of the police administration, which works according to the likes and dislikes of the law enforcement authorities. Starrs gave a very good illustration of police pressure in an article. In a murder case by shooting, the police investigator from the Midwest gave a 45-calibre pistol to a ballistic expert for analysis and said, "we know this guy shot the victim and this is the gun he used. All we want to do is to confirm what we already know so we can get a warrant to get the scumbag off the street. We will wait. How quick can you do it." This illustrates how the personal bias of a forensic scientist can administer a mortal blow to his ability as an impartial scientist to testify as a forensic expert.

Institutional bias has been well defined by Starrs as "manifested by the policies, programmes, or practices of an agency, an organization or a group, whether public or private, or any of its personnel which benefit or promote the interests of one side in a court room dispute, while either denying or minimizing the interests of the other side." The benefit or detriment caused to a party is only the effect of institutional bias and its real purpose is to protect the vested interests of the laboratory and its existence. Sometimes bias may occur even to protect the vested interests of the scientists who had conducted the analysis.

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An apt illustration for institutional bias comes from the legal story of William C. Thompson, published in the online Internet journal, Scientific Testimony. William C. Thompson was called by a criminal defence lawyer at Los Angeles, to attack the prosecution's DNA evidence against Marshall, charged for rape. In this case a commercial laboratory known as Genetic Design had performed the DNA typing of the vaginal samples from the victim and confirmed that the DNA banding pattern consistent with the defendants. But William C. Thompson could not observe any match of Marshall from the autorads. Therefore, he suspected examiner bias in interpreting DNA test results of Marshall. He claimed that the laboratory had failed to use an objective method for scoring the bands in the DNA profile. In his view the laboratory had instead used subjective procedures that were actually biased against the defendant. But against this claim the scientist for the prosecution had fraudulently stated that the DNA test was conducted in an objective manner. From the repeated investigations conducted by Thompson, found that the objective band sizing varied significantly depending on the person who was doing the computerized scoring. The test result including or excluding Marshall as a rapist depended ultimately on a subjective judgment.

A survey conducted by Garrett News Service (USA) in 1994, had found eighty-five instances since 1974 in which prosecutors had knowingly or unknowingly used tainted scientific evidence leading to the conviction of innocent or exculpating of the guilty. In the same period, forty-eight people sentenced to death were freed after convictions were found based on fabricated evidence or because exonerating or exculpatory evidence was withheld.\footnote{John F. Kelly and Phillip K. Wearne, Tainting Evidence, supra n.9, at p.8.}
Examiner's Bias in Forensic Testing

The weight of forensic scientific evidence depends on the judgment of the forensic scientist, especially the way in which he came to that judgment. In almost all forensic scientific techniques, the subjective judgment of the expert is necessary for its interpretation. For example, in a forensic DNA typing, an expert can give three types of results: (1) clear inclusions i.e., by declaring a match between two samples; (2) clear exclusions i.e., showing a difference in match between two samples; (3) ambiguous or uncertain comparisons. The former two cases will not make a problem while interpreting the DNA test results, however the third one will make confusion in the mind of the expert and it will affect the DNA test results. If analysts were blind to the expected result when they made these determinations, then their reliance on subjective judgment would create few problems. In most forensic laboratories, however, analysts are not blind when they “score” DNA tests. Analysts often are in direct contact with detectives and hear all about the case. They may even see themselves as part of the law enforcement team, whose job is to help “make the case” against an obviously guilty suspect. These circumstances create a danger that analysts may intentionally or unintentionally become biased toward the police theory of the case when making subjective determinations.

As an illustration, it is appropriate to mention the case described by the prominent scientific witness, William C. Thompson from his experience. In People v. Marshall, Genetic Design, a commercial laboratory in North Carolina, gave a strong proof that suspect no.1 i.e. Marshall and suspect no.2 were

20 Un reported case as cited in ibid.
involved in the case for the charge of rape and kidnapping. The laboratory report indicated that the DNA test had produced powerful evidence against both suspects - a five-locus match between each of them. The report gave no indication that the evidence against Suspect 1 was weaker than that against Suspect 2. But later the examination of the underlying autorads confirmed a clear, unambiguous match with Suspect 2, but indicated the evidence against Suspect 1 was ambiguous and equivocal.

When the case came before the trial court William C. Thompson appeared as co-counsel for Marshall. From the very initial stage he suspected that the forensic scientist who had performed the DNA test had fallen under examiner bias. His suspicion regarding this was based on the fact that the analyst who performed the DNA analysis had previous knowledge about the historical background of the crime against both suspects. Therefore he feared that the analyst might intentionally or unintentionally have conformed his judgment to the police theory of the case, which held that his client was one of the rapists. So he raised concerns about examiner bias during the pretrial phase of the case; however, the prosecution took the position that the autorads had been scored objectively by a computer-assisted imaging device. The prosecution contented that a scanner was used to create a digital image of each autorad and the images were scored by a computer programme that detects the presence of bands in each lane according to their optical density, making the process entirely objective. In order to contradict this contention, Thompson obtained a court order, which required the forensic laboratory to re-score the autorads with the computer-imaging device with the help of an independent expert. During the time of re-scoring, the claim that the process was objective evaporated.
Thus through this case he shows that a forensic scientist may draw damningly incriminating conclusions from data that are ambiguous or even exculpatory. He cautioned that if a forensic scientist behaved in the like manner, innocent people were far more likely to be falsely incriminated through biased interpretation of ambiguous DNA test results. According to him, analysts sometime rely on other evidence in a case to resolve ambiguities in DNA test results. Similarly in this case the analyst got all information about the other evidence from the police party before the interpretation of the DNA test results against the suspect. This is a clear-cut case, which highlights the pitfalls involved in over-reliance on ambiguous and misleading test results.

(C) The Problem of “Hired guns” as Forensic Experts

The other important problem that erodes the ethical values in forensic scientific evidence is the assembling of “hired guns” as forensic experts. The term “hired guns” means forensic experts who like advocates in a case try to make the case best for whom he was called and hired. Such type of experts may even state opinions in derogation of the theories or applications of their scientific field. They are the persons who will give the ethical majority a bad name. The percentage of hired guns are probably smaller than the ethical scientists, however, it is difficult for the judiciary to distinguish the hired guns from the honest experts. The hired guns will make their own theory and techniques suitable for the case in hand for contradicting the evidence of the other side. Normally these types of witnesses will testify for toxic tort litigations and litigations based on causation.

(D) Interference by the Police and Prosecution

A forensic scientist is duty bound to the court; he cannot act as a witness of the police or the prosecution even though the police gave the cases for the scientific analysis. It has been generally accepted that if a forensic expert is answerable to the police he is apprehended to be not working independently. Almost all forensic scientific laboratories are under the police departments and therefore it is doubtful whether forensic scientists can deliver their opinion freely without the interference of the police personal. Therefore, one can reasonably suspect that police interference will be there at various stages of forensic functioning. The normal practice is that the police as crime fighters will collect the necessary materials from the crime scene and hand over them to the forensic experts for analysis. Here the police will always insist on the forensic authorities to make evidence for incriminating the suspects and to assume the role of an advocate in convincing the prosecutor or judge that there is probable cause to believe that the accused committed the alleged crime. Thus the control of police starts from the collection of evidence to the final conclusion made by the forensic scientist on that particular piece of evidence. Collection of evidence is the stage at which forensic scientists have the least control. At this stage police officers collecting the evidence can decide what to collect and they will normally collect only such evidence as will incriminate the accused and exclude the evidence exculpating the accused.

A research\textsuperscript{23} conducted by Joseph L. Peterson and his co-researchers shows that there is no assurance that the physical evidence gathered by the police from the crime scene will be examined. In most crime laboratories, the evidence remains in the storage until an investigating officer requests that it be examined.

(E) Extraneous Influence of the Forensic Scientist

Extraneous factors or information connected with the case may influence the examiner to a great extent and compel him to reach a conclusion in line with other evidence in the case. M.J. Sacks and his co-authors in their article "Contest Effects in Forensic Science"\textsuperscript{24} pointed out the psychological reason for this influence:

An elementary principle of psychology is that context and expectations influence people's perceptions and interpretations of what they observe. There are several terms which refer to this basic phenomenon, or particular aspects of it- observer effects, contest effects, expectancy effects, cueing, top-down processing, perceptual set, and others- depending upon details of the process... or its setting, or the theoretical model offered to explain the phenomenon.\textsuperscript{25}

Sacks had pointed out the circumstances in which a forensic scientist may be extraneously influenced; (1) direct communication between investigators and examiners; (2) cross-communication among examiners; (3) reversing one's


\textsuperscript{25} Ibid. at 79.
findings in the light of domain-irrelevant evidence; (4) selective re-examination of evidence.26

5. Quality in Forensic Evidence and Justice

In a tragic evening of 1974, City of Birmingham, in England witnessed two heavy bomb blasts, which presented an unending grief to the kith and kin of 21 victims. The occurrence agitated the British government, which took immediate action to catch the culprits. Law enforcement authorities took this case as a challenge and arrested six Irishmen who had boarded a train at Birmingham station immediately before the blast. Police found the debris of a chemical in their hands, which were proved as nitrates, through chemical analysis. From the evidence, the police confirmed that they were the actual culprits of the bomb blast case, applying the reasoning that the nitroglycerine was a common ingredient in explosives. They were charge sheeted and when the case came up for trial, the forensic scientist testified that there was ninety-nine percent probability that the substances found on the hands of the accused were nitroglycerine. The scientist established the fact with the help of a test known as "Greiss test". Jury convicted all the accused. After 16 years it was determined in an appeal that the "Greiss test" was unreliable and the chemical, nitroglycerine can be found in common things like soap, cigarette packages as well as old playing cards. The prosecution also stated that the nitrate in soap could give positive results and so contamination could have arisen when the bowls where cleaned before the chemical testing. The conviction was overturned in 199127.

26 Ibid. at 85-86.
The chemical, nitroglycerine ruined the life of six men. This is not a single instance of miscarriage of justice. The fallibility of forensic evidence can be traced out from leading legal and forensic literatures. Therefore, it is necessary that forensic evidence must be handled very carefully and all possible efforts should be made to minimize the risks that forensic science can give misleading evidence to the courts. The courts should insist that there must be some guarantee both from the forensic science community in general and individual forensic scientists in particular that quality scientific evidence will reach the court of law.

6. Quality Assurance in Forensic Evidence

Quality is a criterion fixed by the society for determining the standard of a particular thing or service. Quality is generally defined by J.M. Juran as “freedom from deficiencies—freedom from errors that require doing work over again (rework) or that result in field failure, customer dissatisfaction, customer claims, and so on.” However, this definition cannot be taken as suitable for forensic science service. The meaning of quality may change occasionally. For instance, the quality in forensic lab means “fitness for purpose in the laboratories of the

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forensic science service"30 and quality of forensic service means one "achieved by the competent forensic practitioners that work under the guidance of a quality system and with the right philosophy of approach".31 Thus the quality of forensic evidence always depends on various factors like validation of a particular technique, quality of the instruments used for analysis, competency of the persons employed for the analysis, standards provided for avoiding contamination, accreditation of the laboratory, certification to the proficiency of forensic personal and the crime laboratory to conduct tests and to evaluate the continued capacity of analysis, technical support personnel and the quality performance of the laboratory. Since 1990’s judiciary also insists various factors to be considered for evaluating the quality of forensic evidence. The United States Supreme Court in Daubert v. Merrell Dow Pharmaceuticals32, formulated major guidelines for evaluating the quality of forensic evidence:

1. The known or potential error rate of the technique used for the forensic analysis;

2. The general acceptance of the technique in the relevant scientific community;

3. Has the technique been peer reviewed? ;

4. Whether the scientific theory is testable or tested? ;

5. Standards adopted for the application of the technique in a particular occasion.

32 (1993) 125 L Ed. 2d 469.
These guidelines can be considered as effective, however the judge of the Ontario court in *R v. Johnston*\(^3^3\) formulated some more effective guidelines. His Lordship insists on considering the following factors:

1. The potential rate of error;
2. The existence and maintenance of standards;
3. The care with which the scientific technique has been employed and whether it is susceptible to abuse;
4. Whether there are analogous relationships with other types of scientific techniques that are routinely admitted in to evidence;
5. The presence of failsafe characteristics;
6. The experts qualifications and stature;
7. The existence of specialized literature;
8. The novelty of the technique in its relationship to more established areas of scientific analysis;
9. Whether the technique has been generally accepted by experts in the field;
10. The nature and breadth of the inference adduced;
11. The clarity with which the technique may be explained;
12. The extent to which basic data may be verified by the court and the jury;
13. The availability of other experts to evaluate the technique;
14. The probative significance of the evidence.\(^3^4\)

Keeping these things in mind one can consider the factors necessary for the proper evaluation of the quality of forensic evidence.


\(^{34}\) *Ibid.* at 415.
(A) Validation of a Particular Technique

In forensic setting the term "validation" simply is a process by which a novel forensic technique is demonstrating to show that it is fit for the purpose. In this process it involves stating very clearly the purpose of the method, specifying in detail what the method must be able to do to provide results that satisfy the purpose, developing the method, establishing its performance characteristics and limitations, and then showing by experimentation that the method will consistently achieve its purpose.\(^35\) Actually through validation process, what the inventor of the forensic technique aims is to put the entire merits and demerits of the technique to the scientific world. In a validation process the person who validates the technique will considers a range of issues like sampling, recovery, accuracy, precision, limit of detection, specificity, linearity, working range, repeatability, matrix effects, robustness, environmental susceptibility, and uncertainty of measurement. Almost all validation process of novel forensic techniques will be published in standard forensic science journals. Here it is worthy to consider the validation process of a forensic technique published in a reputed journal of forensic science. If another person or laboratory has already validated a method and if one wishes to adopt that method, there is no need for the later to go through the entire validation process, however, the person or laboratory that adopted the method must verify that the method works perfectly in their hands.\(^36\)

It is also well accepted in the forensic scientific community that once a particular technique or method is validated or verified, the laboratory using that technique must ensure that each and every process in that technique is under the absolute control of that laboratory. For example, in the case of a DNA typing


\(^{36}\) R. Bramley, "Quality in the Laboratory" 43 *Science and Justice* 104-108.
method the typing scientist or the technician must check the proper functioning
of the electrophoresis machine, computer system and if there are any
measurements, their correctness in interpreting the DNA results etc.\textsuperscript{37}

(B) Competency of the Forensic Practitioners

Competency is the all-round performance of the forensic scientist in his
forensic job. M.J. Fereday and I. Koop explain the term competence in forensic
setting. According to them “competence is about performing the role, for
example of a forensic scientist, competently. It is about demonstrating
competence in the work place and not the classroom, that is to say about
actually doing the job. It is not, directly, about qualifications and training. A highly
qualified person need not be “occupationally competent”.\textsuperscript{38} Competence is a
mixture of knowledge, skills and their application and behaviours or attitudes.
Fereday distinguishes the application of forensic science from other scientific
knowledge. He insists that the special knowledge in the application of forensic
science and the understanding of the forensic process is essential for a forensic
scientist. According to him a forensic scientist must be a person capable in
applying scientific knowledge to the solutions of forensic problems.\textsuperscript{39} Similarly
Fereday states that the application of “technical skills” means the application of
“forensic skills” and it involves the assessment of the requirement of a case,

\textsuperscript{37} \textit{Ibid.} at p.104.

\textsuperscript{38} M.J. Fereday & I. Koop, “European Network of Forensic Science Institutes (ENFSI)
99-103; same stand has taken by R. Bramley by saying that “competence is about
performance on the job. The required level of performance for the job has to be
specified and an independent assessment has to be carried out to confirm that this is
being consistently attained on casework. Training is the means by which the scientist
is taught what is required to meet the performance standard. Qualifications can be a
means of recognizing achievement of the standard, but only if based on assessment
against the standard in the work place, R. Bramley, “Quality in the Laboratory”, 43

\textsuperscript{39} \textit{Ibid.} at 102-103.
interpretation of forensic data and report writing. He says, "It is the "forensic skills" which are key – to us the modern forensic scientist is a "forensic data processor" with the accent on "data processing" and not "data generation"." Fereday also gave more importance to the behaviour of the forensic scientist for determining the competency.

(C) Proficiency Tests

The relevance of the forensic scientific evidence always depends on the reliability of the test conducted. Before 1970s, there were no scientific procedures to test empirically; the primary responsibility for ensuring the reliability of forensic results almost vested with the individual scientist or with his laboratory. At that time when a scientific evidence came before the court of law, judges had placed two techniques to test the integrity of the evidence (1) by appointing well reputed and competent scientific experts (2) using its own legal techniques like voire dire and cross examination. This situation has changed when the government in some countries like United States and United Kingdom introduced a new programme known as the "crime laboratory proficiency testing". The primary purpose of the proficiency tests is to evaluate the efficiency of the individual examiner or a group of examiners or even the performance of the laboratory itself. Ordinarily two types of proficiency tests were conducted (1) an "open proficiency tests" in which the individual who or the laboratory which may going to be tested had prior knowledge that he was going to be tested (2) the "blind proficiency tests" in which the person who may subjected to the test did not have advance knowledge that he was going to be tested. In this case the samples for the test would be giver as in the normal case. As far as the forensic

40 ibid. at 103.
scientific laboratories and scientists were concerned the blind proficiency tests are better than the open proficiency tests. Only through the blind proficiency tests, one can find out the routine testing efficiency of the scientist as well as the laboratory.

The crime laboratory proficiency testing as its full strength was started in 1974, when the National Institute of Law Enforcement and Criminal Justice gave adequate grant to the Forensic Science Foundation for manufacturing and issuing a series of twenty-one tests, covering a broad range of evidence types to the voluntary participating forensic laboratories. The testing results shows that there are serious problems in examination and interpretation of the samples. The project staff and advisory committee had reported several reasons for these problems. They are mainly, misinterpretation of test results by examiners who were careless or lacked necessary training or experience, mislabelled or contaminated samples, inadequate data bases and faulty testing procedures.

Until 1981, the participation of the crime laboratories in the proficiency testing was only an elective form of quality control. This practice has changed by the establishment of the laboratory accreditation system in 1981 and the examiners certification system in 1993.

(D) Accreditation of the Crime Laboratories and the Accrediting Bodies

Forensic laboratory accreditation is a process by which the accrediting bodies measure the laboratory or system of laboratories against certain standards formulated by the recognized forensic scientific groups. These standards are written procedures consensually made by the members of the

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forensic scientific working groups all over the world. In United States, two type of working groups were established by the Federal Bureau of Investigation and National Institute of Justice; (1) Scientific Working Groups and (2) Technical Working Groups. Members of the groups include subject matter experts, forensic examiners, laboratory managers, academicians, researchers, law enforcement officers, legal practitioners and representatives of other appropriate groups.42

Various accreditation bodies were constituted all over the world to inspect and accredit the crime laboratories. The most prominent among them are the American Society of Crime Laboratory Directors (ASCLD), National Association of Testing Authorities in Australia (NATA), Standards Council of Canada (SCC) and European Network of Forensic Science Institutes (ENFSI).

7. Accreditig Bodies

(A) American Society of Crime Laboratory Directors (ASCLD)

The American Society of Crime Laboratory Directors was officially formed in 1974. Fortunately, during the same period of the birth of the ASCLD, the Law Enforcement Assistance Administration (LEAA) of United States took initiative and gave adequate fund to the Forensic Science Foundation to conduct a national voluntary proficiency-testing programme. The reports of the proficiency-testing programme pointed out serious concerns about the quality of work performed in some of the nation’s crime laboratories. This agitated the newly formed ASCLD to take immediate action and to establish standards for the operation of forensic laboratories. As a result, the first committee of the ASCLD was appointed and the committee considered and worked on various programs that could be used to evaluate and improve the quality of laboratory operations.

42 Jami J. St. Clair, supra n.1.
The committee considered individual certification, a self-assessment programme and an accreditation program based on external peer review as a possible means of achieving the goal. By June 1981, the committee had been renamed as ASCLD Committee on Laboratory Accreditation. In 1982, during an informal meeting of the Board, the Chairman announced receipt of the first applications for accreditation from the eight laboratories of the Illinois State Police and as at the end of March 2004, there were 259 laboratories accredited by ASCLD/LAB. The directors of all accredited laboratories are members of the Delegate Assembly of the board. On February 4, 1988, ASCLD/LAB was incorporated as a non-profit corporation in the State of Missouri.\textsuperscript{43} The Crime Laboratory Accreditation Programmes of the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) are voluntary programmes in which any crime laboratory may participate to demonstrate that its management, personnel, operational and technical procedures, equipment and physical facilities meet established standards. Accreditation is one part of a laboratory's quality assurance programme, which also include proficiency testing, continuing education, and other programmes to help the laboratory provide better overall service to the criminal justice system. ASCLD/LAB now offers accreditation under two programmes. Any Crime Laboratory seeking accreditation, whether for the first time or renewing accreditation, may elect to seek accreditation under either the ASCLD/LAB Legacy Programme or the ASCLD/LAB-International Programme. The ASCLD/LAB Legacy Programme is the programme under which laboratories have been gaining accreditation for more than twenty years. Information on the Legacy Programme may be obtained by selecting the Legacy link. The ASCLD/LAB-International Program is a new

\textsuperscript{43} \url{www.ascld_lab.org}
programme, which was approved by the Delegate Assembly by mail ballot in 2003. The ASCLD/LAB-International programme is based on the ISO 17025 standards and the ASCLD/LAB-International Supplemental Requirements. The Supplemental Requirements are based on the essential elements of the ASCLD/LAB Legacy program and the ILAC G-19 standards. Information on the International Programme may be obtained by selecting the International link.44

(B) The National Association of Testing Authorities, Australia (NATA)

The National Association of Testing Authorities in Australia is one of the oldest and excellent accreditation providers in the world. It was founded on 1947. The accreditation of forensic science laboratories is one among other scientific laboratories for which NATA offers accreditation. In order to get accreditation under NATA, it insists the labs to comply with ISO 17025 standard.45 In 1994, NATA and ASCLD signed an agreement for joint inspections and accreditation of the forensic science laboratories in Australia. However, by 2000 to the increase in the number of technical staff in Australia, compelled the labs in Australia to apply in NATA only for their accreditation. The inspection of the labs for the accreditation is conducted by one NATA staff officer and one or more technical assistants. NATA gives accreditation for the labs dealing with controlled substances, toxicology, forensic chemistry, criminalistics, and forensic biology including DNA typing, ballistics, document examination, fingerprints, crime scene investigation and paternity testing. If a lab is accredited by NATA, it requires the accredited laboratory to conduct annual proficiency testing and review of those

44 www.ascldlab.org
45 www.nata.asn.au
tests by the Proficiency Review Committee established by the Forensic Science Accreditation Advisory Committee.45

(C) Standards Council of Canada (SCC)

In Canada, the accreditation process started in 1994, when the Canadian Society of Forensic Science formulated a committee to study the accreditation of forensic laboratories. This committee functioned with consensus with the Standards Council of Canada and in 1999 a guideline known as 1999 CN-P-1578 was enacted. For the accreditation of laboratories the body follows the ISO standards. After the inspection of the laboratories, the accreditation will be granted by the Chair of SCC and the members of the task Group laboratories. The period of accreditation will be for 4 years. A re-assessment will be conducted one year after the accreditation is granted and biennial visits will be conducted after the first year of accreditation.47

(D) European Network of Forensic Science Institutes (ENFSI)

The European Network of Forensic Science Institutes was established 10 years ago to keep the European Forensic Science at the forefront of the world. ENFSI functions through its committee known as the Quality and Competence Committee (QCC). The ENFSI members are the directors of the member laboratories. A board had been constituted and in that board there are three standing committees known as the Standing Committee for Quality and Competence, Standing Committee for Expert Working Groups and the Standing Committee for ENFSI Open Activities. In 2003, among 50 members of the ENFSI only five have an accredited laboratory. The laboratories of the Forensic Science

45 Jami J. St. Clair, supra n.1, at pp.100-101.
47 www.scc.ca
Service in England are accredited by the United Kingdom Accreditation Services to ISO 17025 and by the British Standards Institute to the ISO 9001 standards.\(^{48}\)

(8) **Certification of Forensic Science Laboratories and Certifying Bodies**

Forensic science certification is a recognition given by the prominent forensic organizations, regarding a person’s knowledge, skills or ability in the forensic subject or an institution’s capability in conducting forensic works. The American Board of Criminalistics defined certification as “a voluntary process of peer review by which a practitioner is recognized as having attained the professional qualifications necessary to practice in one or more disciplines of Criminalistics”\(^{49}\). There are various certifying bodies all over the world; among them the prominent are the American Board of Criminalistics and the International Association for Certification.\(^{50}\)

A sound quality assurance is essential for a laboratory and those persons working in the laboratory to consistently improve their laboratory practices. This will help ensure, and support, the integrity of the results reported from a laboratory, and provide interested parties with information regarding the laboratory’s credibility to perform the tests reported. It is through the implementation of a quality system that the integrity of the laboratory results are maintained, and competency proven. A laboratory that is not committed to a quality analysis jeopardizes not only their work product, but their integrity as well. Everyone using the laboratory services can be confident that the reported results


\(^{49}\) www.criminalistics.com/ABC/

\(^{50}\) For more details about the certification of crime laboratories see, www.theiai.org and www.criminalistics.com/ABC/
are accurate, reliable, and reproducible with the use of a properly administered quality program.

9. **Accreditation of Forensic Laboratories in India**

A Technical Committee appointed by Chairman, National Accreditation Board for Testing and Calibration Laboratories (NABL), developed NABL Specific guideline document on accreditation of Forensic Laboratories in June 1998. Accreditation of Forensic Laboratories under NABL was launched during a special meeting held at India Habitat Centre, New Delhi, on 2nd May 1999.

(A) **Aims & Objectives of NABL are:**

1. To promote, coordinate, guide, implement and maintain an accreditation system for laboratories suitable for the country in accordance with the relevant national and international standards and guides.

2. To ensure that all measurements either during calibration or testing by accredited laboratories are traceable to appropriate national or international standards maintained at National Physical Laboratory (NPL) and at Bhabha Atomic Research Centre (BARC) through an unbroken chain of comparisons.

3. To encourage Proficiency Tests or Inter-laboratory comparisons in order to ensure accuracy, reliability and reproducibility of test results.

4. To ensure that the accredited laboratories adhere to all the conditions of accreditation, by periodic surveillance.

5. To organize Awareness Programmes on all aspects of laboratory accreditation for the laboratories by various means including seminars, workshops and laboratory-industry-accreditation body meets etc.
6. To acquire traveling standards and artefacts for conducting studies on
measurements by the accredited laboratories and thereby to help
improve reliability and reproducibility of results.

7. To establish and maintain strong linkages with international and regional for
a such as International Laboratory Accreditation Conference, European
Accreditation Cooperation for Laboratories, Asia Pacific Laboratory
Accreditation Cooperation etc. and to take active participation in
Plenary Sessions, Committee Meetings etc. in order to keep pace with
the latest developments and for promoting Bi-lateral.

8. To undertake all the activities, which shall promote undertaking, Bi-
lateral or Multilateral Recognition Agreements between NABL and
laboratory accreditation bodies in other countries so that test results of
NABL accredited laboratories become acceptable in all countries.

10. Proficiency Testing Programme

The NABL will conduct an inter-laboratory proficiency testing of all
laboratories that are members of the NABL. The testing standards are in
accordance with the ISO or IEC guide 25 of 1990. Till 2000 NABL has completed
16 inter-laboratory proficiency testing programme while 9 others are nearing
completion. This enables the laboratory to know confidentially from NABL its
performance in terms of Z score, which is an indication of departure of the result
from the assigned value. Therefore, laboratory gets a chance to improve its
performance in subsequent studies.

11. Conclusion

Real justice is over and over again depend on the truth finding process. It
is an indisputable fact that forensic science service is playing a prominent role in
this truth finding process. But the recent flaws made by the minority group of experts in the discipline deteriorate the trustworthiness of its service in the legal community. Once a famous criminalist Paul L. Kirk has rightly said, "Physical evidence cannot be wrong; it cannot be perjured; it cannot be wholly absent. Only in its interpretation can there be error. Only human failure to find, study, and understand it can diminish its value." Therefore, what should be seriously taken in to consideration is regarding the improvement of forensic scientific discipline in its entirety. The foregoing analysis makes clear that the failure of concerned authorities to use "blind procedures" for interpreting test results contributes to the production of inaccurate conclusions in lab reports and courtroom testimony. Similarly, "examiners bias" may come as the real terminators of the integrity of the output of the discipline. Since forensic labs have never allowed a detailed look at the caliber of their work, only fragmentary information is available. Those fragments, however, reveal a consistent pattern of unacceptable errors and inaccuracies. The proficiency testing conducted by some countries against forensic labs and personnel's indicate the dangers posed to criminal justice. Incorrect analyses can lead to miscarriage of justice not only by condemning the innocent, but also by helping to free the guilty.

These and other flaws in the discipline will make serious warp of the image of the entire service. Therefore, it is high time to think about the renovation, which is necessary in the system. As a first step it is better to introduce a "National Quality Control Body" in order to fix the quality and standards of the forensic laboratories and personals. The other important thing is that there must be uniformity among all forensic laboratories regarding the investigation and

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reporting of the results. This can be achieved by providing fixed protocols.\textsuperscript{52} Forensic laboratories, however, frequently perform analyses without adhering to established procedures. The major drawback of the absence of a scientifically verified protocol is that the forensic laboratories may fix their own standards in testing the evidentiary samples. Subjectivity and bias in forensic analysis can be effectively checked by way of regular training and re-evaluation of forensic results. Compulsory blind proficiency testing programmes can achieve the efficiency and quality of the forensic laboratories. The criminal justice system also needs to know about the quality of individual laboratory performances, both to spur more accurate and reliable performance and to dispense justice.

\textsuperscript{52} Protocols are lists of instructions for performing scientific procedures. Good protocols are tested procedures that, if followed, assure that the desired results are most likely to occur.