HISTORY OF FORENSIC SCIENCES

INTRODUCTION

Crime in some form or the other has existed since the beginning of human race. With the advancement in science and technology the concept of crime as well as the methods adopted by criminals in its commission have undergone a phenomenal change. On one hand the intelligent criminal has been quick to exploit science for his criminal acts, on the other hand the investigator is no longer able to rely on age old art of interrogation and methods to detect crime.

DEFINITION

The term forensic is derived from the Latin word forensis which means belonging to courts of justice or to public discussion and debate. It therefore means the science which is used in courts for justice. Criminalistics is synonym used in U.S.A.

History of Forensic Science started from Archimedes (287-212 BC), the man behind the exclamation ‘Eureka,’ as the father of forensic science. He had exulted when he had found out that a crown was not made of gold, (as it was falsely claimed) by its density and buoyancy. After Archimedes we come to know of another early forensic science application by Soleiman, an Arabic merchant of the 7th century. He used fingerprints as a proof of validity between debtors and lenders.

In the 700s, the Chinese also used the fingerprint concept. In the 1000s, Quintilian, a prosecutor in the Roman courts, used a similar method to solve murders. The first document that mentions the use of Forensics in legal matters is the book Xi Yuan Ji Lu (translated as “Collected Cases of Injustice Rectified”) written in 1248 by Chinese author Song Ci.

Forensic science became quite widespread in 16th century Europe. Medics began to use their knowledge to investigate the cause of death. Ambrose Paré, a French army surgeon, two Italian surgeons, Fortunato Fidelis and Paolo Zacchia were some of the pioneers in this field.

Then we have a series of written record like “A Treatise on Forensic Medicine and Public Health” by the French physician Fodéré and “The Complete System of Police Medicine” by the German medic Johann Peter Franck and the first dissertation on systematic document examination published by François Demelle of France. In 1686, Marcello Malpighi, a professor of anatomy at the University of Bologna, identified the fingerprint method.

In the 18th century, many scholars did some groundbreaking work in Forensics. Swedish chemist Carl Wilhelm Scheele and German chemist Valentin Ross led the way. England also solved a number of murder cases using forensic science. For instance, in the year 1784 in Lancaster, John Toms was convicted of murder, when a torn bit of a newspaper in a gun was found matching a leftover paper in his pocket.
In the 19th century, scholars like Thomas Bewick, an English naturalist, Spanish professor of medicinal/forensic chemistry Mathiew Orfila, John Evangelist Purkinji, professor of anatomy at the University of Breslau, to name a few, made history in forensic science.

Eugène François Vidocq is another name in record since he established the first detective force, the Sûreté of Paris. Then can we forget Arthur Conan Doyle who wrote the first Sherlock Holmes case in Beeton’s Christmas Annual of London?

In the 20th century, there was no stopping the forensic timeline. It was the time when we got the Federal Bureau of Investigation (FBI). The FBI launched its Automated Fingerprint Identification System (AFIS) with the first computerized scans. With the arrival of the computer, there was no looking back. Today there is no crime solving without forensic science. The History of Forensic Science is there to prove its worth.

DEVELOPMENT OF THE SCIENCE THROUGH AGES

In the beginning of the 19th century, natural sciences began to develop rapidly. Justice was always in search of impartial evidence, as against testimony of unwilling, hostile, indifferent witnesses. At the same time, Sir Arthur Conan Doyle, through his fictional character Sherlock Holmes popularized scientific crime detection methods. This help publicize amongst scientists and investigators that science could aid in criminal detection. most pioneering work originated in Europe. many can be cited as contributors in building the foundation.

MATHIEU ORFILA
Father of modern toxicology. In the early part of the 19th century he established in Paris methods of scientific chemical analysis of poisons, which are in use even today.

ALPHONSE BERTILLON
of France was 1st to evolve a scientific system of personal identification. in 1879 he developed the science of ANTHROPOMETRY, a systemic procedure of taking a series of body measurements to facilitate distinguishing one individual from another. With the invention of photography he was the first to use it in criminal investigation. IN 1881, he began to take standard pictures of all French criminals and file them in the Bureau of Identification than in Paris. His efforts have earned him the distinction of being known as the Father of Criminal Investigation.

FRANCIS GALTON
of U.K. undertook the first systemic study of fingerprints. He developed a methodology of classifying the fingerprints for filing purposes. in 1892, he published a book on fingerprints giving a sound statistical proof of uniqueness of individualization through fingerprints.

HANS GROSS
of Austria, a lawyer by profession, spent many years studying the principles of criminal investigation. He published a book on criminal investigation (later published in English), a classic in 1893, ‘Handbuch fur Untersuchungsrichter’.

EDMOND LOCARD
in 1910 established a police laboratory in Lyons and later founded the Institute of Criminalistics at the University of Lyons. He propounded the famous PRINCIPLE OF EXCHANGE, which forms the basis of forensic examination of physical evidence.

**KARL LANDSTEINER**
in 1901 discovered that blood could be grouped into different categories. Following this Dr. Leone Lattes of Italy devised a relatively simple procedure for determining the blood group of dried bloodstains and immediately adopted this technique for criminal investigation.

**CALVIN GODDARD**
a U.S. army colonel perfected the science of ballistics. He developed a comparison microscope for comparison of crime and test fired bullets to determine whether or not a particular weapon was used in the offence.

**ALBERT OSBORN**
developed fundamental principles of document examination, which gave acceptance to documents as scientific evidence by the courts. In 1910 he wrote the classic QUESTIONED DOCUMENTS which is primary book of reference for document experts.

During the post World War I period, Locard's successes in the application of scientific methods in criminal investigation served as an impetus for formation of police labs in Berlin, Vienna, Sweden, Finland and Holland. This was followed by formation of a forensic lab in Los Angeles Police Department in USA in 1923. In 1932, FBI organised a national lab, which offered forensic services to all the law enforcement agencies in USA by establishing Metropolitan Forensic Sciences Laboratory at Scotland Yard in 1935.

After World War II there was a sudden spurt in crime rate due to large scale availability of firearms. Further, due to mobility an documentation organised and white collar crime proliferated. Western countries had to mobilize scientific aids to combat the growing menace.

Today U.S. alone has about 250 labs. A small country as UK established 11 more regional labs in different parts. Another development was the creation of central research establishment in Aldermaston in 1966, wholly devoted to basic research in forensic science. Japan has a huge national research institute of forensic science in Tokyo and several regional labs. West Germany set up over 21 forensic labs. Italy 13, France 4, Canada 7 and Switzerland 4.

**APPLICATION OF FORENSIC SCIENCE**

1. Identification of Criminals or Victims
2. Solving Mysteries
   - Past crimes (unsolved or wrongfully convicted)
   - Cause, Location, Time of Death
   - Paternity cases
3. Cyber crimes
4. Corporate Crimes (Enron)
5. Voice Analysis
6. Application of DNA as evidence
7. Prevention vs. Reaction
8. Catastrophes & Wars
   - ID remains of victims (either civilian or soldiers)
   - ex. Holocaust or Katrina
For the search of WMD’s
Stockpiled or stored weapons from past wars

PRINCIPLES OF FORENSIC SCIENCE
There are 7 basic principles of Forensic Sciences

1. LAW OF CIRCUMSTANTIAL FACTS

“Facts do not lie, men can and do,” hence the importance of circumstantial evidence is as good as oral evidence. Oral evidence depends upon so many factors such as power of observation, assimilation, auto suggestion”.

The purpose of evidence in courts is to prove or disprove the existence of a fact. The level of proof or evidence presented must be solid enough to convince the court that such fact is true beyond a reasonable doubt, especially in criminal trials. In civil trials however, the standard of proof is often based on whether the true existence of the fact is more probable than not. Circumstantial evidence, therefore, carries different weight in criminal and civil trials.

Circumstantial evidence, in spite of its indirect nature, may be of great value, for instance, in highlighting inconsistencies between the behavior of a suspect and his allegations, thereby “filling in the blanks” of a probable crime scenario. For instance, although a suspect was unseen at the crime scene, the tire prints found on the scene match those of his car and a similar car was seen in the vicinity of the crime scene around the time the crime was committed. Or, sometime before the crime, the victim may have told a friend that they were afraid of the suspect, or a neighbor overheard a bitter and violent argument between the victim and the suspect in the recent past. Circumstantial evidence may be presumptive and inconclusive, admitting rebuttal by the other part, or, on the contrary, its quantity and pattern may be strong enough to substantiate a prosecution where other types of evidence are scarce and by themselves inconclusive.

One recent example of use of circumstantial evidence was the trial of Scott Lee Peterson, where the evidence presented was essentially circumstantial. A day after reporting that his eight-months pregnant wife was missing (December 23, 2002), Peterson was considered a suspect, because investigators found he had several extra-marital affairs since his marriage, and had recently been in a relationship with another woman. Petersen alleged that at the time of his wife’s disappearance he was fishing at the Berkeley Marina, and was innocent. In April 2003, the remains of an unborn baby and the partial remains of a woman were found on the shores of the San Francisco Bay. Autopsy and other forensic tests identified the remains as those of his wife and her baby, although where, how, and when she died was not specifically determined. The FBI and forensic teams conducted extensive investigations at the Pettersen’s house, as well as searching Scott Peterson's boat, truck, toolbox, clothes, and personal objects, in search of forensic evidence of violence such as bloodstains or weapons. No physical piece of forensic evidence was identified that could link Peterson to the murder of his wife.

Although the prosecution could not present any physical evidence of Peterson's involvement with the crime, and the defense tried to defuse the circumstantial evidence, in November 2004, the jury convicted Scott Peterson of first degree murder for killing the wife “with special circumstances,” and of second degree murder for killing his unborn baby. That December, the jury recommended a death sentence for Scott
Peterson. In a press conference, the jurors declared that they had found Peterson guilty, in part, because of his demeanor. Circumstantial evidence including Peterson's change in haircut and color immediately after the crime, buying a car in his mother's name, and testimony by his ex-lover that he frequently lied and said he was a widower previous to the crime, weighed heavily with the jury.

One case where forensic evidence supported circumstantial evidence was California vs. Orenthal James Simpson in 1995. Nicole Brown, the ex-wife of famous football player and actor O. J. Simpson, was killed with her friend Ronald Goldman, on June 12, 1994. Evidence from the crime scene pointed to Simpson as a suspect, and he was later arrested for the crime.

The prosecution relied on forensic physical evidence along with circumstantial evidence to build the case against Simpson. Circumstantial evidence included footwear prints at the crime scene that matched Simpson's size, failure to keep an arranged appointment with the police to turn himself in, initiating a two-hour-long highway journey in a white Ford Bronco with police in pursuit, a left-handed glove found among Simpson's belongings that matched a bloody right-handed glove found at the crime scene, a documented history of domestic abuse against Brown, previous telephone calls made by the victim in which she relayed fears of being physically injured by Simpson to the police, and a letter from Simpson given to a friend that indicated an intention to leave the country in disguise.

Forensic evidence supported much of the circumstantial evidence. More than 40 bloodstains were tested for DNA fingerprinting, and each could be linked with either the victims and/or to Simpson. These samples were taken from the primary crime scene area, the secondary scene area, Simpson's Ford Bronco, and from Simpson's home. DNA profiles that matched the victims were found in blood taken from the crime scene and from Simpson's Bronco.

In spite of the circumstantial evidence, often supported with forensic evidence, the jury declared O. J. Simpson not guilty of murder in 1995. A civil jury, however, used much of the same evidence to convict Simpson on a civil court in 1997, and awarded the victim's families over 30 million dollars in damages.

In some countries, circumstantial evidence in the absence of other more solid testimonial and material evidence is not admissible in criminal courts. Circumstantial evidence is considered relevant to a case as an explanatory complement to existing testimonial and/or forensic evidence of indisputable accuracy. Controversy about the two cases above described continues among jurists and other experts, due to the perceived quality and relevance of evidence presented in each of those trials.

2. LAW OF PROBABILITY

the identifications, definite or indefinite, are made consciously or unconsciously, on the basis of probability.

Introduction:
Communicating and Interpreting Statistical Evidence in the Administration of Criminal Justice Statistical evidence and probabilistic reasoning place intellectual demands on most of the professional participants in criminal proceedings, including lawyers, judges and expert witnesses. There is no room for complacency; errors and misunderstandings relating to probability and statistics have contributed towards serious miscarriages of justice. Every professional participant in
criminal proceedings should ideally acquire sufficient knowledge of probability and cultivate the practical competence needed to interpret statistical information correctly in order to fulfil their respective roles in the administration of criminal justice. Probability is one specialised dimension of logical reasoning. Criminal justice professionals may or may not find it illuminating or convenient to employ the formal tools of probability and statistics in their own professional practice, but they do need to be able to recognise these techniques and successfully decode them when they are invoked or implicitly relied on by others. Moreover, the prospect of implicit or unconscious reliance on probabilistic reasoning places an even greater premium on vigilance. In short, judges, lawyers and expert witnesses should be responsible producers and discerning consumers of statistical information and probabilistic reasoning whenever they are introduced into criminal proceedings.

1. Probability and Statistics in Forensic Contexts

Statistics are generalisations derived from observations of the empirical world. Statistical reasoning is characteristically inductive. Probability, by contrast, is a way of measuring uncertainty which is projected onto the world and thereby helps us to formulate and implements rational plans of action. Probabilistic reasoning is deductive. Both topics may be regarded as overlapping but conceptually distinct parts of the larger human endeavour of reasoning under uncertainty, of which criminal adjudication is one important manifestation. Probability obeys mathematical axioms with powerful real-world applications, which include important aspects of evidence and proof in criminal proceedings.

Statistics has many forensic applications, but it must be approached with care and interpreted correctly. There are many equally valid ways of presenting statistical data. For example, the mean, the median, the mode and the standard deviation are alternative ways of summarising estimates which emphasise different aspects of relevant data. The question is not whether these alternative estimates are “right” or “wrong”, but rather whether they are suitable for particular purposes. Thus, confidence intervals are regarded as appropriate expressions of uncertainty in social science and elsewhere, but they are not an appropriate way of evaluating evidence in criminal proceedings because they are irremediably arbitrary and unjustifiably cause valuable evidence to “fall off a cliff”. The validity of statistics is a function of sampling techniques and other methodological considerations, which need to be taken into account when assessing inferential conclusion based on statistical information. Probability theory can help with these assessments. In the final analysis, statistical inferences can only be as good (or as poor) as their underlying data.
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