



**DNA PROFILING & FORENSIC SCIENCE:
FROM TRACING EVOLUTIONARY
DISCOVERIES TO THE DNA TECHNOLOGY
(USE & APPLICATION) REGULATION
BILL, 2018**

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ABSTRACT

DNA Profiling has become imperative with the change in technology and its significance in aiding the criminal justice system as well as for the administration of Justice. This has seen several countries enacting legislations in place. However, the legislations have been disputed to be tangents to Right to Privacy, leading to establishment of safeguard measures in various countries. In the case of India, although we have different legislations in place permitting DNA as evidence in courts of law. The various jurisprudential aspects through establishment precedents, sometimes proved hot and cold. Henceforth, with developments of technology, it is seen as necessary to enact a law in place, which resulted in the Present 2018 Act.

This paper commences as to how fiction influences the world of Eugenics in the socio- political and historical events in America & Russia and then proceeds to analyze the evolutionary aspects of Forensic Science with specific reference to DNA analysis as used for admission of evidence in India with a brief outline in other countries as well, and as a generalized perspective. Whilst the first half of the paper focuses on these origins as well as evolution

of DNA analysis in countries, as well as in specific to India, the Second half of this paper focuses on **THE DNA TECHNOLOGY (USE & APPLICATION) REGULATION BILL, 2018**, along with emphasis on the Right to Privacy Aspect which has been a very debatable topic since the last decade. The paper finally concludes with the suggestions to the 2018 bill taking into consideration its lacunae's.

Keywords: DNA Profiling, Eugenics, The DNA Technology (Use & Application) Regulation Bill, 2018, Forensics, discovery, history, privacy

1. RELEVANCE TO FORENSICS

Miranda:

O wonder!
How many goodly creatures are there here!
How beauteous mankind is! O brave new
world
That has such people in't!

Prospero:

'Tis new to thee.
*The Tempest Act 5, scene 1, 181-184,
William Shakespere*

1.1 The World of Fiction & DNA

**1.1.1 The Tempest by William Shakespeare
and A Brave New World by Audlous
Leonard Huxley**

*This is the beginning to the Novel "Brave
New World" by Audlous Lenoard Huxley,
wherein his novel revolves around genetic
engineering, and was set in the year 2540,
but was written in the year 1932! By*



analyzing the above quotation from the Tempest written by William Shakespeare, and Huxley's novel, one can find both, similarities & contradictions as well as parody and one could construe, that the nature of Huxley's novel could be taken to be a parody of the above quotation! For, there were too many goodly creatures, who were human embryos are made to travel through a conveyor belt in the bottles, during which time, they are conditioned (possibly by sleep learning or hypnopaedia) to belong to one of the five castes, Alpha, Beta, Gamma or Epsilon.

The parody comes within purview as there were many of these goodly creatures that were produced, in a brave new world, set in 2540, only to turn out how beautiful the mankind is (meant to be taken in a satirical way)! Alphas were taken to be the top most, conditioned to be thinkers and leaders, tall and smart, with the succeeding classes in decreasing order of qualities, with Epsilon destined to be menial labourers. The novel revolves around the characters of Bernard Marx, Lenina Crowne and the director and his son John, their lives, their castes affecting their behaviour. The similarities between the Tempest and this novel, begins with John, who gets excited about stepping out of his secluded atmosphere to the world of Bernard and the director, genetically engineered, and gets excited and quotes it from the Tempest comparing it to a brave new world, like the innocent Miranda in the Tempest, for as Prospero, says, his initial excitement can be attributed as John was new to it, like Miranda in the Tempest, only to realize at the end how wrong he was. John growing angrier and angrier with the methods of the way the society is

conditioned and him eventually committing suicide.

1.2 Literature Review of other Novels on Eugenics in various perspectives

The first attempts to use genetic-engineering techniques to cure genetic deficiency diseases have already been made, and the possibility of eliminating such diseases has become a commonplace background element. The notion that a radiation-affected world might desperately require such processes of repair is ironically developed in David Jackson's *When We were Good*, 1981 and Christopher Hodder-Williams's *Post-Holocaust: The Chromosome Game*, 1984. The use of somatic engineering for cosmetic purposes is the focus of such stories as "Cinderella's Sisters", 1989, and "Skin Deep" by Brian M Stableford. The possibility of further altering the human condition by genetic engineering remains much more controversial. The plight of ordinary humans growing old in a world already inherited by their engineered super children is explored in *Anvil of the Heart*, 1983 by Bruce T Holmes. Other alarmist tales in a similar vein include Robin Cook's *Mutation* 1989 and Geoff Ryman's *The Child Garden* 1989, which feature very different developments of the assumption that programmes of improvement involving genetic-engineering techniques might have unforeseen and unfortunate side-effects. Twenty-first-century tales dealing with such issues include Orson Scott Card's *Shadow of the Hegemon*, 2000, a book in his extended Ender series revealing that one of its many ultra-gifted children is supremely so owing to a genetic tweak that also leads



to giantism and early death; Margaret Atwood's *Oryx and Crake*, 2003, whose Post-Holocaust setting comes after a bioengineered plague and is littered with genetic hybrids.¹

1.3 Relevance of the Novels: Eugenics & the World

The relevance of the above novels to genetics and DNA has been one of the main reasons, for citing and discussing these novels in this dissertation to outline the foresight of a futuristic society based on DNA modifications which could lead to adverse consequences.

The novel was set in the period between world war 1 and world war 2 and has addressed the concept of 'Eugenics' (coined by Sir Francis Galton in 1883) which is focused on improving the genetics of humans, by focusing on certain traits, to build an improved human race. However, there is negative Eugenics which is taken to mean as the exact opposite of positive Eugenics (focusing on improving favorable traits), which has been the face of researches conducted by several countries, particularly, America and Russia.

1.3.1 Influence in/by America

During industrial revolution, there was an outbreak of population in America and this was particularly so, in the labour class, which America believed to be a burden on the society. The conducted research on race

degeneration and decreasing the population by reducing reproduction in this so called weaker class and studies were conducted in Eugenics Records Office (ERO), Cold Spring Harbour, New York. This movement took place in 1990's led by Charles Davenport and Harry Laughlin. Laws were enacted for forced sterilization in various states of America.

1.3.2 Influence in/by Europe

In Europe, it took a very horrendous with the turn of events. Whilst forced sterilization can be considered as a horrendous thing, Europe has taken the horror to the next level, with Adolf Hitler spearheading the way during the second world war in Eugenics Studies. His quest to eliminate inferior races, as was coined by him, to include jews and gypsies, and to make gene pool pure and the establishment of concentration camps and the resulting holocaust, shows the dangers of genetic and DNA Engineering.

2.1 EVOLUTION IN RESEARCHES THAT LED TO THE DISCOVERY OF DNA

It is misleading to use the term 'Origin of DNA', for the DNA has ever been in existence in the human genome and had been ever evolving, henceforth, the term 'discovery' is made use of, for it is the man who discovered, not invented it, though the term as it is coined in its present day use can be studied etymologically. Nevertheless, the use of mere expiation of this term by the scientific community by merely shortening from its constituents particle, fails any attempt to explore its etymological origins.

¹ *Genetic Engineering*, THE ENCYCLOPEDIA OF SCIENCE FICTION, (Nov 23, 2019 10:00 PM) http://www.sf-encyclopedia.com/entry/genetic_engineering



Although, the discovery of DNA has been increasingly attributed to James Watson and Francis Crick in 1950's, one must ignore the efforts made by researchers in the past, whose efforts made possible the discovery of DNA by 1953. Kossel (1853-1927) started work on nuclein in Hoppe-Seyler's laboratory in 1879 and was able to demonstrate in that year the occurrence of a base, hypoxanthine, in the breakdown products of nuclein. In 1908 Phoebus Aaron Levene (1869-1940) entered the field of DNA research and soon became its leader.² Experiments by, among others, Louis Pasteur and Rudolph Virchow demonstrated that new cells can only arise from other cells, Virchow in 1855, rebutting the notion of spontaneous generation of new cells from lifeless matter, which had prevailed for a long time. In parallel to these breakthroughs in cytology, the basic concepts of heredity and evolution were being worked out. The publication of Charles R. Darwin and Alfred R. Wallace's theories of evolution by natural selection occurred in 1858 by Darwin and Wallace, 1858. In 1865, Gregor Mendel discovered the laws of heredity through his breeding experiments with peas which were "rediscovered" in 1900 by Carl Correns, Hugo de Vries and Erich von Tschermak. Observations by Theodor Boveri, Walther Flemming, Ernst Haeckel, and Edmund B. Wilson—to name but a few of the protagonists—combined the emerging fields

of cytology and genetics and laid the foundation of cytogenetics.³

As far as the study of the pure DNA was concerned, two ways were theoretically open to the investigators. They could either break up the DNA molecule and determine its components, or study the molecule as a whole, as was done after the 1920s when Staudinger had developed the principles of polymer chemistry. For the next fifty years the two great leaders in this research were A. Kossel and P. A. Levene. Yet it took another forty years before it was determined, in 1953, how these constituents are put together. Conclusive evidence for the hypothesis that DNA was the carrier of hereditary characters was obtained by the Americans Oswald T. Avery, Collin M. MacLeod and Maclyn McCarty in 1944.⁵ 19th century saw the rise of studies in molecular biology that marked a shift of the studies in macro-organisms as a whole to its micro constituents, like their cells. Matthias J. Schleiden and Theodor Schwann concluded that both animals and plants have

² Ernst Mayer, *The Growth of Biological Thought: Diversity, Evolution and Inheritance*, THE BELKNAP PRESS OF HARVARD UNIVERSITY PRESS CAMBRIDGE, 815 (1982), (Oct 26, 2018, 1:00A AM)
<https://philpapers.org/rec/MAYTGO-5>

³ Ralf Dahm, "Friedrich Miescher and the discovery of DNA", Volume 278, Issue 2, *DEVELOPMENTAL BIOLOGY*, 15 February 2005, <https://doi.org/10.1016/j.ydbio.2004.11.028>

⁴ *Supra* note 2 at 814- 815

⁵ Petter Portin, "The birth and development of the DNA theory of inheritance: sixty years since the discovery of the structure of DNA", Vol. 93, No. 1, *JOURNAL OF GENETICS*, 296 (2014) ; see generally ROBERT CECIL OLBY, *THE PATH TO THE DOUBLE HELIX: THE DISCOVERY OF DNA*, (1994)



cells which are structured to form their respective organs and tissues, making these complex organisms. Hence, the tracing of the discovery of DNA inevitably brings us into light the preceding discoveries that led to the culmination of the discovery of DNA. Its success in genetically modified organisms and cloning and its extensive research in the future of DNA shows us exciting prospects.

2.2 DNA PROFILING: AMBIT & SCOPE

DNA profiling was developed a few years later in 1984 by English geneticist Alec Jeffreys of the University of Leicester, and was first used to convict Colin Pitchfork in 1988 in the Enderby murders case in Leicestershire, England. Thus began the journey of DNA research.⁶ This is the process of determining the characteristics of each individual's genes and DNA and is often used in forensic investigation. Although, DNA profiling is exclusively discussed in respect of forensic science and investigation, its applications in various fields are far reaching including in medicinal research for finding solutions for incurable diseases⁷, medical research⁸ plant, microbial

soil research.⁹ This also included biodiversity and animal studies¹⁰, studies of species and population, including plants, animals and humans¹¹ etcetera.

Alizadeh & [Maximilian Dieh](#), "Circulating tumour DNA profiling reveals heterogeneity of EGFR inhibitor resistance mechanisms in lung cancer patients", NATURE COMMUNICATIONS, (2016), (Nov 22, 2018, 7:00 PM) <https://www.ncbi.nlm.nih.gov/pubmed/27283993>

⁸ See generally, [Esther Chow-Shaffer Barbara Sina William A. Hawley John De Benedictis Thomas W. Scott](#), "Laboratory and Field Evaluation of Polymerase Chain Reaction-Based Forensic DNA Profiling for Use in Identification of Human Blood Meal Sources of *Aedes aegypti* (Diptera: Culicidae)" Volume 37, Issue 4, JOURNAL OF MEDICAL ENTOMOLOGY, (2000), (Nov 1, 208, 5:09 PM)

<https://academic.oup.com/jme/article-abstract/37/4/492/839169?redirectedFrom=fulltext>; See also, [Holger Heyn & Manel Esteller](#), "DNA methylation profiling in the clinic: applications and challenges", volume 13, NATURE REVIEWS GENETICS, 679–692 (2012), (NOV 15, 2018, 4:09 PM) also available at <https://www.nature.com/articles/nrg3270>.

⁹ See generally, [De Etta K Milla, Kristen Fitzgerald, Carol D Litchfield & Patrick mGillevet](#), "A comparison of DNA profiling techniques for monitoring nutrient impact on microbial community composition during bioremediation of petroleum-contaminated soils", Volume 54, Issue 1, JOURNAL OF MICROBIOLOGICAL METHODS, (2003), (Nov 12, 2018 3:50 PM)

<https://www.sciencedirect.com/science/article/pii/S0167701203000071?via%3Dihub>
¹⁰ See generally, [B Amos, C Schlotterer, D Tautz](#), "Social structure of pilot whales revealed by analytical DNA profiling", Vol. 260, Issue 5108, SCIENCE, 670-672 (1993), pp., (Nov 4, 2018, 2:48 PM)

<http://science.sciencemag.org/content/260/5108/670>
¹¹ See generally, [Garth Mowat and Curtis Strobeck](#), "Estimating Population Size of Grizzly Bears Using Hair Capture, DNA Profiling, and Mark-Recapture Analysis", Vol. 64, Issue No. 1 THE JOURNAL OF

⁶ [Ananya Mandal](#), *History of DNA Research*, MEDICAL NET, (Oct 31, 2018 7:09 PM) <https://www.news-medical.net/life-sciences/History-of-DNA-Research.aspx>

⁷ See generally, [Jacob J. Chabon](#), [Andrew D. Simmons](#), [Alexander F. Lovejoy](#), [Mohammad S. Esfahani](#), [Aaron M. Newman](#), [Henry J. Haringsma](#), [David M. Kurtz](#), [Henning Stehr](#), [Florian Scherer](#), [Chris A. Karlovich](#), [Thomas C. Harding](#), [Kathleen A. Durkin](#), [Gregory A. Otterson](#), [W. Thomas Purcell](#), [D. Ross Camidge](#), [Jonathan W. Goldman](#), [Lecia V. Sequist](#), [Zofia Piotrowska](#), [Heather A. Wakelee](#), [Joel W. Neal](#), [Ash A.](#)



3. OUTLINES OF DNA PROFILING: FORENSIC MEDICINE & INVESTIGATIONS

“He decided to cut it up (using his butcher skills) and deposit the parts all over Brooklyn, apparently thinking police wouldn’t figure out that they belonged to the same person. Which poses the question: exactly how many people’s body parts did he think they would suppose were lying around the city?”

— Bridget Heos, [*Blood, Bullets, and Bones: The Story of Forensic Science from Sherlock Holmes to DNA*](#)

3.1 OVERLAP OF SCIENCE AND LAW FOR USE IN FORENSIC SCIENCE

Forensic science has always seems as mysterious and intriguing aspect to mankind, for it held in its captivity, the answers to problems that one could not solve, in the very genes of the man kind who is predisposed to commit crimes in as much as his brethren who made revolutions in medicine through the study of genetics and DNA. No wonder that most of our generation has grown up watching Byomkesh Bakshi, CID TV series and reading Sherlock Holmes, Agatha Christie, Patricia Cornwell with her Dr Kay Scarpetta Val McDermid, James Patterson. Leaving the fiction apart and limiting this work to perspectives in Health law in India, DNA Profiling has become an essential element in Forensic investigations for its use in identifying criminals, absolving the innocent

of the guilt, and aiding the court to deliver justice. Whether it is determining the paternity, post mortem analysis, fingerprint testing, identifying perpetrators of grievous crimes like rape, sexual abuse, murder and the like, the significance of Forensic science has come a long way from its beginnings with the development of medical science and innovative technologies. Forensic scientists can be viewed as archeologists in a crime scene wherein they recreate the entire scene from implausible situations using deductions, science and modern techniques and technologies. For instance, on arriving at the scene of crime, they might examine minute details like knife, traces of hair, fingerprints, blood and document other details for crime scene reconstruction.

Science and law are not exclusive or tangent subjects, although they differ in their approach and methodologies. Whilst science appears to be confined only to research and natural world and law that of the society and ethics, they are not mutually exclusive. Use of argumentation, hypothesis, experimentation and empirical studies in sociological aspects of law to study its functioning in the society is based on the scientific temper. Similarly, law does affect science in either encouraging or discouraging research, for instance, DNA profiling bill in India is being debated as to whether it is against right to privacy, if the court passes any judgment against it, research will be in turmoil and may not be able to proceed further. Science as relevance to Forensic science arose with the study of plants and their medicinal properties, especially the poisoning effect of certain plants. As medicine evolved, the fields of science have become specialized and

WILDLIFE MANAGEMENT, (2000), (Nov 6, 2018, 2:19 PM) <https://www.jstor.org/stable/3802989>



separated for specialization in study into various fields like chemistry, biology, physics and their subsequent sub divisions. It is also to be noted that the relation between law and science has been highlighted by rules overlapping **WHICH INCLUDE THE RULES OF INSANITY, MCNAUGHTON RULES, AND VARIOUS LEGISLATION WHICH HAVE AN ELEMENT OF SCIENCE IN THEM, INCLUDING THE PRENATAL DIAGNOSTICS ACT, Narcotic Drugs and Psychotropic Substances Act, 1985, among others.**

Ever since the discovery of DNA, its potential uses has not merely created ripples in medical society, but also in that of law and society and the mechanism of functioning in a society. Not merely can the doctors formulate medicines as per the unique characteristics of each person or affirm the paternity or maternity of a child, its use in forensic science have enabled to identify the perpetrator, absolving the innocent from the guilt, especially so when prima facie evidence is lacking. **The ambit of DNA profiling is wide and far reaching, extending to the domains of formulation of medicines by identification of diseases specific to genes, forensic science, establishing the paternity of a person, protection of Biodiversity, etcetera.**

3.2 HISTORY AND EVOLUTION OF FORENSIC SCIENCE

It was believed that the origins of Forensic Science can be traced back to Romans and Greeks. We are all aware of reading about Archimedes, when studying about volume of

objects in Mathematics in our high school years.

The tale goes on like this: the king complained that the goldsmith cheated on him by replacing gold with some other substitute metal, and Archimedes went on to determine the volume and weight of the crown and confirmed that the goldsmith cheated on the king. Can we consider this as the beginning of Forensics, on confirming the conviction of the wrongdoer by use of science? Well, one can only document in as much as it is included and documented, as to how far has forensic been in existence and in that specific terminology may be difficult to

3.2.1 Autopsy

Autopsy, which is also a part of forensic science to determine the cause, time and other reasons surrounding the death of a person can be traced back to 44 BC which was officially recorded and in Egypt in 3000 BC. Early Roman Dynasties also used forensics to acquit the innocent and punish the perpetrators in 1st century. “*Etu Brutus*”, sighed Julius Caesar when he died and if not for Antony’s orative skills, Caesar’s death would not have been avenged. This is what we read in literature. However, despite Antony’s persuasive speech, one cannot ignore the use of forensics wherein Antistius performed autopsy on the body of Caesar, which confirmed 23 stabs that Caesar put through, before finally giving in to the wound in his chest. It looks like literature became a symbolic representation of science when Brutus gave Caesar, heartbreak by betraying him, and the wound that caused the death of the Caesar which went through his chest!



In Bolgna, the first legal autopsy was performed in the year 1302, which was later copied by Italy and France. However, this may not be the actual origins as there was a Chinese book on autopsies published in 1247, titled "*The Washing away of wrongs*" or "*Xi Yuan Lu*" by Song Ci.

3.2.2 Microscope & developments in Forensic Science: Pathology, toxicology and study of weaponry

The discovery of microscope in 1590 led to the discovery of red blood cells and minute details which are beyond the power of human eye could now be examined with the help of microscope, which brought in many more discoveries in medicine.

Walter McCrone was identified as the father of Microscopic forensics for his valuable contribution. In 16th century, the change in body, including that of organs, color changes, and internal changes due to diseases or violent deaths were studied in pathology. The origin of toxicology as a discipline can be traced back to the discovery of arsenic poisoning in the victim's stomach to solve a murder case by the use of chemistry, which would otherwise be untraceable in 1832 by the chemist James Marsh who used the test to determine arsenic poisoning by in corpses by Carl Wilhelm Scheele in 1773. The father of modern Toxicology, Mathieu Bonaventure, helped in detection of blood through presumptive blood detection tests. Others who made valuable contributions in this field include Sir Robert Christenson. with the development of weaponry, the study of tools became an inclusive subject of

Forensics and criminology, wherein bullet matching helped trace the weapon from which it is fired, for instance, the conviction of John Tams who used pistol in the murder of Edward Culshaw in Lancaster. However, due to dearth of expertise, it was not until 1926 that it was used as evidence in the court of law, which was developed by Henry Goddard of Scotland Yard and Calvin Goddard. In fact, something considered as aesthetic as photography also became a part of Forensic science to trace the criminals. One of the notable persons who used photography include Richard Leach for documenting the record of prison inmates in

3.2.3 DNA Fingerprints & analysis

Forensic science became more popular with the discovery of use of fingerprints to identify the criminal due to the uniqueness of each fingerprint as researched by Henry Faulds and William James Herschel and which was implemented in criminal investigations by Sir Francis Galton (classified fingerprints) and Edward Henry (development of fingerprint analysis) . However, it is observed that the use of fingerprints in its crude form for identification purposes has been used from prehistoric times by pressing of hand and fingers into clay and rock in 700 BC, by Babylonians for business transactions, Arabia in 7th Century BC and Chinese use of clay seals, etcetera. It was further developed in minute details by Professor Marcello Malpighi characterizing details like the whorls, spirals, loops and ridges in 1686. The world's first fingerprint bureau was established in the year 1892 in Argentina. Others who made significant contributions



in fingerprint analysis include, Juan Venetic, Sir Edward Richard & Henry Forrest. Nevertheless, due to his contribution to the science of fingerprints, Sir Alec Jeffery's was considered the first to develop the DNA profile through fingerprints in 1984.

A forensic scientist faced with a red stain on shirt, must first determine if it is blood, which requires a presumptive test that produces a color change if positive. These tests first appeared in the late 1800's. Determining the species and type of blood requires techniques refined before the great depression. DNA analysis spilled out of molecular biology and the forensic world in the 1980's. Leone Lattes was considered as the father of bloodstain identification. Nevertheless, many Scientists have played a peripheral and unintentional role in the creation of forensic sciences and few would have labelled them as such. The playbill includes: several Nobel Laureates; alchemists such as Jabir (700), Paracelsus (1493- 1541), Albertus Magnus (1193-1280), Robert Boyle (1627- 1691), Isaac Newton (1627- 1727), chemists such as Wilhelm Bunsen (1811- 1899), Eduard Buchner (1860- 1917), and Johann Adolf Von Baeyer (1835- 1917), biologists such as Gregor Mendel (1822- 1884). Others in include Charles Darwin (1809- 1882) and his cousin Sir Francis Galton (1822- 1911), Joseph lister (1827- 1912), and Karl Landsteiner (1868- 1943), forensic practitioners such as M.J.B. Orfila (1787-1853), Kirk, Milton Helpert (1902- 1977), and Bernard Spilsbury (1877- 1947), and the occasional odd historical figures such as Alfred Nobel (1833- 1896), Oliver Windell Holmes (1809- 1894), several members of

the Du Pont family, Sigmund Freud (1856-1939).¹²

The examination of fibers, dust and all the traces left by the criminal are used to confirm identity of the suspect. With the discovery of DNA and its analysis, the power of forensics for use in criminology increased tremendously. A UK database was first established in 1996. Fast forward to the 21st century, computer reconstructions have become more popular. In fact, the cause of death of the kings in tombs of Egypt could now, not only be discovered, but their bodily reconstruction as to how they looked like could now be made.

3.3 DEVELOPMENT OF FORENSIC SCIENCE IN INDIA

3.3.1 Ancient Era

The science of fingerprinting has always been a part of ancient Indian Culture and civilization.¹³

A Hindu Scripture, *Samudra Shastra* compiled by Samudra Rishi (though was used in the field of astrology and not forensic science, reference may be made to highlight the discovery of fingerprints) tells a great deal about fingerprinting, which

¹² SUZANNE BELL, CRIME AND CIRCUMSTANCE: INVESTIGATING THE HISTORY OF FORENSIC SCIENCE, 5- 6, (2008)

¹³ G S Sodhi & Jasjeet Kaur, " *Indian Civilization and the science of Fingerprinting*", Vol. 2(2), INDIAN JOURNAL OF TRADITIONAL KNOWLEDGE, 126- 136 (2003), (NOV 16, 2018, 4:56 PM)

<http://nopr.niscair.res.in/bitstream/123456789/19355/1/IJTK%202%282%29%20126-136.pdf>



identifies three types of finger prints, two of the common types being, *Sankhas* (corresponding to loops), *Chakras* (corresponding to whorls), while the third type, *seeps* (corresponding to arches) and many other characteristics such as *apuran java*, *padam*, *aax* which are concurrent to *fork*, *lake*, *hook* and *island*.¹⁴

3.3.2 Medieval Era

It was a rather common practice among rulers of Medieval India to sign the routine documents, but to put their handprints on more important ones, who include Shah Jahan, Jahingir, and Aurangazeb.

3.3.3 British Era & Independent India

Sir William Herschel used fingerprints to prevent repudiation of signatures while working with criminal suspects as an Indian Civil Servant, when in 1877, the fingerprints of the pensioners are taken in order to prevent the relative taking the money after the death of the pensioner. While researching on the history of fingerprinting, they came across several archive records which throw light on the key role played by two Indian police officers, Sub-Inspectors Azizul Haque and Hem Chandra Bose, in the advancement of the science of fingerprints. The so-called Henry's System of Fingerprint Classification was actually worked out by them. Today, nearly all the nations of the world follow Henry's method for maintaining criminal record. The world's first fingerprint bureau was set up at Calcutta (now Kolkata) in 1897, mainly by

their efforts. In addition, Bose invented the telegraphic code system for fingerprints and published it in 1916.¹⁵

Nevertheless, their efforts were not as famously recognized in the world. In 1968, the Ministry of Home Affairs, Government of India, set up a Forensic Science Laboratory for Delhi Police and the Central Bureau of Investigation under the administrative control of the Central Bureau of Investigation. This laboratory now provides expert opinion on various aspects of Forensic Science concerning crime investigation. Apart from Delhi Police and the CBI, it also provides assistance to the Central Government Departments, State Forensic Science Laboratories, Defense Forces, Government Undertakings, Universities, and Banks etc. in criminal cases. The expertise available at the CFSL is also utilized in teaching and training activities conducted by the CBI, Lok Nayak Jai prakash Narayan, National Institute of Criminology & Forensic Sciences, Police Training Institutions, Universities and Gov.¹⁶

¹⁵ G. S. Sodhi and Jasjeet Kaur, "The forgotten Indian pioneers of fingerprint science", Vol. 88, Issue No. 1, CURRENT SCIENCE 185- 191, (2005) (Nov 12, 2018, 7:08 PM) <https://www.semanticscholar.org/paper/The-forgotten-Indian-pioneers-of-fingerprint-Sodhi-Kaur/cd3b38c0943b776caf414200bca0644f46aa9520>
¹⁶ Dr. Gopal Ji. Misra & Dr. C. Damodaran, "Perspective Plan For Indian Forensics", 6, MINISTRY OF HOME AFFAIRS GOVERNMENT OF INDIA, NEW DELHI.

¹⁴ *Ibid* 13



3.4 FORENSIC LABORATORIES: ESTABLISHMENT AND EVOLUTION

3.4.1 International Institutionalization & DNA testing

Professor Edmond Locard with his background in law and medicine (Father of Criminalistics, his important contribution being the Locard's Exchange Principle) set up the first crime laboratory in the attic of the police station in 1910, France. In 1924, the first American Police Laboratory was established by August Vollmer. It is ironical that the successful Federal Bureau of Investigation which was set up in 1908 did not have its own forensic laboratory for crime till 1932. The Father of FBI is J. Edgar Hoover who served as a director in the 1930's, wherein law enforcement agencies in US were offered forensic services by the national laboratory during his reign. Hence, it must be noted that the Jeffrey's technology evolved and new technologies were developed by forensic experts, DNA profiling came into existence and laboratories were set up all over the world.

DNA was used as Evidence in the United States for the first time on a Florida man, Lee Andrews who was accused for rape in 1987 wherein the conclusiveness of the evidence led to his conviction for 22 years for all the rapes that he has committed. Although, DNA tests have become popular, especially as use as identity test which was made available by Dr Jeffrey's, in 1980's, it was not until 1988 that FBI started using DNA testing.

However, as regards to use of Forensic Science, FBI started using polygraph

machines and using the lie detection tests. In its beginnings, about 200 pieces of evidence were worked by FBI for an year, and 200,000 in 1990's and today over 600 per day as criminal evidence, which shows the widespread use of forensic medicine in legal system. O.J. Simpsons case is described as the crime of the century in 1994 and in the case of Tennessee, USA, mitochondrial DNA analysis was used for the first time in 1996.

In case of UK, DNA evidence as a basis for conviction was used for the first time for the conviction of Robert Melias in 1987. Fast forward to the present era, different countries are formulating for the process of standardization and harmonization as in the case of council of European Union, which in its attempt to create a European Forensic Area and that of European Forensic Infrastructure development created a "Vision for European Forensic Science 2020." This includes exchange of information relating to forensic science between the states. A Project Committee CEN/TC 419 was formed for development of standards in EU for provisions in the processes of Forensic Science which span from the start to the reporting and exchange of data though the processes of recognition, recording and the like with an aim to ensure this integrity of forensic processes. It must be observed that this 2020 program is not confined to accreditation of forensic laboratories alone but also harmonization of knowledge of forensic experts and training, especially so due to varied regulations of EU countries which makes it an even more complex process.



The European Network of Forensic Institutes (ENFSI) will assist the European Commission to make progress in the following areas:¹⁷

- accreditation of forensic science institutes and laboratories;
- respect for minimum competence criteria for forensic science personnel;
- establishment of common best practice manuals and their application in daily work of forensic laboratories and institutes;
- conduct proficiency tests/collaborative exercises in forensic science activities at international level;
- Application of minimum quality standards for scene-of-crime investigations and evidence management from crime scene to court room;
- recognition of equivalence of law enforcement forensic activities with a view to avoid duplication of effort through cancellation of evidence owing to technical and qualitative differences and achieving significant reductions in time taken to process crimes with a cross-border component;
- identification of optimal and shared ways to create, update and use forensic databases;
- usage of advances in forensic science in fight against terrorism, organised crime and other criminal activities;

- forensic awareness, particularly through appropriate education and training of the law enforcement and justice community;
- Research and development projects to promote further development.

3.4.2 Indian Scenario

Present day Indian forensics, as chronicled, owes its genesis to several British – initiated ventures such as Chemical Examiner’s Laboratory (Madras, 1849), Anthropometric Bureau (1892), Finger Print Bureau (1897) etcetera. Having subsequently undergone clubbing / regrouping / spreading, as of now, there are 28 State / Union Territory Forensic Science Laboratories (State / UT FSLs) along with their Regional FSLs (32 RFSLs) and Mobile FSLs (144 MFSLs); they are mostly with the respective Home Department either directly or through police establishment.¹⁸ The first Chemical Examiner’s Laboratory was, therefore, set up for this purpose at the then Madras Presidency, under the Department of Health, during 1849. Later, similar laboratories were set up at Calcutta (1853), followed by one each at Agra (1864) and Bombay (1870). The British Government of Bengal felt the necessity of identifying the handwritings on the secret documents connected with the Indian independence movement and, therefore, created the post of Government Handwriting Expert of Bengal. Mr. CR Hardless, the then Superintendent in the

¹⁷ Gabor Kovacs & Mónica Nogel, “The Accreditation Of Forensic Laboratories As Component Of Realizing The European Forensic Science 2020 Concept”, EUROPEAN POLICE SCIENCE AND RESEARCH BULLETIN 25-26 (2014), (Nov 2, 2018, 7:57 PM) <https://bulletin.cepol.europa.eu/index.php/bulletin/article/view/96>

¹⁸ Nivedita Grover, Isha Tyagi, “Development of Forensic Science and Criminal Prosecution-India”, Volume 4, Issue 12, INTERNATIONAL JOURNAL OF SCIENTIFIC AND RESEARCH PUBLICATIONS, (2014)



A.G.'s office in Bengal, was appointed to this post in 1904.¹⁹

This set-up was shifted to Shimla in the year 1906 and was placed under the control of the Director, CID. When the science of examining human blood developed in India, it became possible to examine blood and seminal stains in criminal investigations. Realising the importance of Forensic Serology, an institute named as Serology Department' was established in Calcutta in 1910. During the year 1915, a Footprint Section was established under the CID, Government of Bengal, which helped the police authorities to identify criminals through the examination of footprints collected from the scene of crime. During 1917, a Note Forgery Section was set up under the CID, Government of Bengal, to undertake the examination of forged currency notes. In 1930, an Arms Expert was appointed and a small ballistic laboratory was set up under the Calcutta Police to deal with the examination of firearms.²⁰ A Section was set up for examination of bullets, cartridge cases, firearms, etc., used in committing crime under the CID in Bengal was created in 1936. In 1952, Calcutta, the first state forensic science laboratory was established in India. 1960 saw the set up of The Indian Academy of Forensic Sciences (IAFS).

However, the role of CFSs got diluted in mid 1990's, as forensic laboratories were set up in most of the states in India. Hence the utility of three CFSs at the national level was questioned. The First Forensic DNA Typing facility was established at CFS, Calcutta in 1998.

3.5 Cold Cases & DNA Profiling: Forensic Science

Using DNA to Solve Cold Cases is intended for use by law enforcement and other criminal justice professionals who have the responsibility for reviewing and investigating unsolved cases. This report will provide basic information to assist agencies in the complex process of case review with a specific emphasis on using DNA evidence to solve previously unsolvable crimes. Although DNA is not the only forensic tool that can be valuable to unsolved case investigations, advancements in DNA technology and the success of DNA database systems have inspired law enforcement agencies throughout the country to re-evaluate cold cases for DNA evidence. The development and expansion of databases that contain DNA profiles at the local, State, and national levels have greatly enhanced law enforcement's ability to solve cold cases with DNA.

Convicted offender databases store hundreds of thousands of potential suspect DNA profiles, against which DNA profiles developed from crime scene evidence can be compared. As law enforcement professionals progress through investigations, however, they should keep in mind the array of other technology advancements, such as improved ballistics and fingerprint databases, which may

¹⁹ [RK Tewari](#), & [KV Ravikumar](#), "History and development of forensic science in India" vol 46, issue 4, BUREAU OF POLICE RESEARCH & DEVELOPMENT, MINISTRY OF HOME AFFAIRS GOVERNMENT OF INDIA, (2000), (Nov 18, 2018, 7:47 PM)

<http://www.jpgmonline.com/article.asp?issn=00223859;year=2000;volume=46;issue=4;spage=303;epage=8;aulast=Tewari>

²⁰ *Ibid* 19



substantially advance a case beyond its original level.²¹ Moreover, it is to be noted that DNA Profiling is not merely used to solve cold cases, but also that of determination of propensities of being a criminal.

4. The DNA Technology (Use and Application) Regulation Bill, 2018: A Concise Note

The 2018 bill on DNA technology does not address as to whether this is applicable in case of DNA profiling for medical purposes and is seen as an ambiguity. However, it must be observed that DNA profiling does apply to civil matters, for instance in determination of paternity, which can be seen both from civil and criminal perspective, depending upon the circumstances of the case. DNA profiling with the consent of the individual in medical fields is a boon for research as well as the individual, but if the records that were taken for criminal matters are used for analysis in medical records of the convict, it will lead to his violation of rights. Nevertheless, the use in civil cases of determination of paternity shows the significance of DNA profiling. Hence, although in some cases, using DNA profiling beyond the matters of the criminal cases, can lead to blatant violation of rights of the individuals, it is not so in all the cases and safeguard have to be provided for.

²¹ John Ashcroft , Deborah J. Daniels & General Sarah V. Hart, “ *Using DNA to solve cold cases*”, NIJ SPECIAL REPORT, U.S. DEPARTMENT OF JUSTICE OFFICE OF JUSTICE PROGRAMS, (2002), (Nov 27, 2018, 11:09 PM) <https://www.ncjrs.gov/pdffiles1/nij/194197.pdf>

Without the reports of committees like Malimath Committee, A.P Shah Committee, this bill would not have proceeded in the pace that it now finds itself. These committees would not have been formed without the explicit consent of the government to form an institutional framework to study on these issues. Furthermore, the analysis from other countries like US shows the necessity of institutional framework and government policies (for instance the new government that came in US back then, formulated the Justice for All Act, 2004).

5. Possibility of Misuse of DNA Profiling: Right To Privacy

Whilst one cannot turn a blind eye to the potential and current importance of DNA Profiling in the society, the recent spurt of invasion into privacy cases, is not merely confined to social media sites by world wide web, governments and corporations, but also that of the human genome, vying for maintaining human genome data bank for research and inventions. Prima facie, it appears that research would endeavour to find innovative solutions for problems plaguing the society, including illness, crime and the like. Nevertheless, one cannot ignore the Right to Privacy of each individual is inherent in his Right to Life and it is not uncommon for the leak or misuse of such data banks, which might result in devastating warfare, including biogenetic weapons by genetic engineering and research, resulting in biological warfare or even in a minuscule level as to control the minds of the individuals, which though seldom seems like a near possibility, which



is Nevertheless, not a impossible option in the distant future.

6. Suggestions to the [The DNA Technology \(Use and Application\) Regulation Bill, 2018](#)

- Although the 2018 bill on DNA Technology endeavours and places few safeguards to prevent violation of privacy, they are not sufficient. Hence, a separate Privacy Act has to be enacted.
- A separate databank for criminal and civil purposes has to be established as the requirements and necessity of DNA Profiling in each case is different.
- The bill does not address as to whether medical profile could be created. Although this may to have been contemplated under the bill, the reference through express prohibition is necessary.
- Since, the bill authorizes the sharing of information with foreign governments, regulations have to be expressly mentioned in the bill, to prevent misuse of information, resulting in violation of rights of individuals, which is especially the case for unknown individuals an missing persons.

CONCLUSION

DNA profiling has been in the limelight ever since the discovery and its researches in Eugenics. With the development of technology, it is also widely being used in the administration of justice in courts of law. Various countries have different legislations

in place in order to address this issue and ensure safeguards are provided for protection of Right to Privacy of the Individuals. Although, in India, by virtue of existing legislations, the admissibility of DNA as evidence in cases is considered and precedents are laid down, there is no specific Act which is passed for use and regulation of this DNA Technology. The DNA Technology (Use and Application) Regulation Bill, 2017 is yet to be passed by Rajya Sabha. addressing the roadblocks or hindrances to the present bill. Furthermore, the Right to Privacy is not just seen as hindrance in our country, but in all the countries across the world for the implementation of similar Acts. However, instead of viewing it from the perspective of a hindrance or a roadblock, if it is seen from the perspective of caution sign to protect the human rights of the people. Seen from this perspective, what appear as a roadblock is actually a constructive criticism and a warning signal to prevent violation of the rights of the people.

Furthermore, following A.P. Shah Committee recommendations which is considered as a significant report on Privacy as suggested after the 2012 Act in consonance or implemented in the present 2018 bill paves the way for a safe and secure technological developments, in general and in specific to legal mechanisms.
