

WEBINAR REPORT | 23RD JULY 2020

*“FORENSICS: AN
IMPORTANT NEED OF THE
SOCIETY”*

*Department of Anthropology,
University of Delhi, Delhi*

FORENSICS

Edited By: Dr. P.R. Mondal
Report Compilation: Mr. Rajeev
Moderator-cum-Reporteurs: Dr. Suman Dua,
Dr. Sonali Walia, Dr. Astha Bansal, Mr. Rajeev

ABOUT THE SEMINAR

Crime is a universal phenomenon of human society. From the Dawn of human civilisation till today the natures, types or patterns of crimes are changing in accordance with the development of the society. In India, after the independence the population have increased many folds and simultaneously crimes also have increased significantly. The notion of the civilised human society is that nobody should escape after committing a crime and not a single innocent person should be punished. Therefore, the knowledge and techniques of forensic science are very much necessary to identify the accused persons.

“Forensics” is the application of the basic sciences for criminal investigations. The first written account of forensic science application for solving criminal cases was written in the book “Xi Yuan Lu” (i.e. washing away of wrongs), China, in 1248 by Song Ci (1186-1249).

The Department of Anthropology, University of Delhi, was organized webinar on “FORENSICS: An Important Need of the Society” which provided a common platform for forensic scientists, research scholars and students for exchange of knowledge and new ideas. Various sub themes were covered in this webinar as follows:

- Forensic, education and society
- Trends and challenges in Forensic science
- Forensic branches and its role
- Digital Forensics and its challenges

ORGANIZING COMMITTEE

A one day forensic webinar on **“FORENSICS: AN IMPORTANT NEED OF THE SOCIETY”** was organized by the Department of Anthropology, University of Delhi under the chairmanship of Prof. P.C. Joshi (Head of the Department) on 23th July 2020. The members of the organizing committee are:



Dr. P.R. Mondal
(Convener)



Dr. K.N. Saraswathy
(Co-Convener)



Dr. Avitoli Zhimo
(Co-Convener)

Program Coordinator & Report Compilation: Mr. Rajeev

Moderator-cum-Reporteurs:

- **Morning Session:** Dr. Astha Bansal & Mr. Rajeev
- **Afternoon Session:** Dr. Suman Dua & Dr. Sonali Walia

Anchors: Ms. Pallavi Mohanty & Ms. Aditya D Krishna

RESOURCE PERSONS

The eminent academicians and forensic scientists were enlightening the webinar by sharing their precious knowledge and experiences. There were nine resource persons as given below with their titles of talks:



“ Teaching of Forensic Science”

Prof. P.K. Chattopadhyay

Formerly Professor & Founder Head,
Department of Forensic Science,
Punjabi University, Patiala, India.



“ Forensics- An Important Need of the Society: An Appraisal”

Prof. Arup Ratan Bandyopadhyay

Head, Department of Anthropology,
University of Calcutta, India.



“ Problem and solution of questioned document examination”

”Dr. S.C. Mittal

Director, Premier Forensic Science Institute,
Delhi.



“ Effect of preservation on forensic blood samples and its impact on Forensic Reporting”

Dr. Suminder Kaur

Sr. Forensic Chemical Examiner,
DNA/Biology Unit, RFSL, Chanakyapuri,
New Delhi, India.

“FORENSICS: AN IMPORTANT NEED OF THE SOCIETY”



“ Importance of the palm prints in forensic investigations”

Dr. P.R. Mondal

Associate Professor,
Department of Anthropology,
University of Delhi, Delhi.



“ Impact of forensic report in solving the crime”

Dr. Deepa Verma

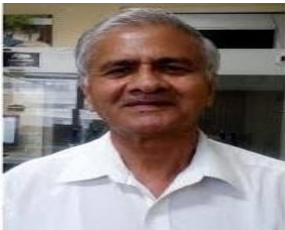
Director,
Forensic Science Laboratory,
Govt. of NCT of Delhi, Delhi.



“ Forensic Chemical Sciences: Branches, Trends, Challenges”

Dr. Kavita Goyal

Assistant Director (Chemistry),
Forensic Science Laboratory,
Govt. of NCT of Delhi, Delhi



“ Forensic Evidence in Sexual Assault Cases”

Dr. K.P.S. Kushwaha

Senior Faculty (Human Biology),
LNJN, NICFS, Rohini, Delhi..



“ Challenges in Digital Forensics-A need for New Approach”

Dr. Deepak Raj Rao

Assistant Professor (Computer Forensics)
LNJN, NICFS, Rohini, Delhi.

PROGRAM SCHEDULE

SESSION	NAME OF THE SPEAKER	TOPIC	MODERATORS/ ANCHORS
Inauguration Session (09:30 A.M. - 10:00 A.M.)	Dr. P.R. Mondal	Introductory Note	Ms. Pallavi Mohanty & Ms. Aditya D krishna
	Prof. P.C. Joshi	Inaugural Address	
Morning Session (10:00 A.M - 01:45 P.M.)	Prof. P.K. Chattopadhyay	Teaching of Forensic Science	Dr. Astha Bansal; Mr. Rajeev
	Prof. Anup Ratan Bandyopadhyay	Forensics - An Important Need of the Society: An Appraisal	
	Dr. S.C. Mittal	Problem and solution of questioned document examination	
	Dr. Suminder Kaur	Effect of preservation on forensic blood samples and its impact on Forensic Reporting	
	Dr. P.R. Mondal	Importance of the palm prints in forensic investigations	
Afternoon Session (02:15 P.M. - 03:30 P.M.)	Dr. Deepa Verma	Impact of forensic report in solving the crime	Dr. Suman Dua; Dr. Sonali Walia
	Dr. Kavita Goyal	Forensic Chemical Sciences: Branches, Trends, Challenges	
	Dr. K.P.S. Kushwaha	Forensic Evidence in Sexual Assault Cases	
	Dr. Deepak Raj Rao	Challenges in Digital Forensics- A need for New Approach	
Vote of Thanks (05:15 P.M. Onwards)	Dr. Avitoli Zhimo	-	-

Webinar Summary

Highlights:

- Department of Anthropology, University of Delhi, organized a one day webinar entitled “**FORENSICS: AN IMPORTANT NEED OF THE SOCIETY**” on 23rd of July 2020.
- The nine eminent & renowned speakers of Forensic Science field were delivered lectures and enlighten the participants with their precious knowledge.
- The Webinar was attended by nearly 500+ participants from different regions of India and other countries and make it a successful event.

The webinar was inaugurated by **Prof. P.C. Joshi**, Head of the Department & Pro-Vice Chancellor of University of Delhi. During his addressing in the webinar to the participants Prof. Joshi said that Department of Anthropology, University of Delhi have very long association with forensic science. When very limited institutes having forensic science way back in 1967. The Department of anthropology conceptualized the certificate course in forensic science. We have very long association and know we have master course in forensic science. Forensic science is conclusions are reviewed by the judicatory therefore, forensic science is highly objective and forensic science is the mother of science because it has amalgamation of methodology and technique of different discipline of science. India is having very important contribution in forensic science like fingerprinting.

Two essential component of forensic science are hypothetical detection method and secondly is the method of indirect observation. India needs law is required for training people of forensic science and there is problem application of forensic science. At the level of constable, the new technique and application did not reaching their. It resulted into weak forensic science investigation which affects justices system. Many times some time deliberately and some time mistakenly the conclusion will not approachable. We need to have forensic scientist

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investigating the crime taking them to logical conclusion with the help of latest techniques available.

The forensic science is very important for society for justices. The future of forensic science is very bright. Because we are going to society in which justices are required. In the last he delivered his good wishes and good luck to organising committee members, speakers and participants for the fruitful outcomes conclusions coming up from this webinar.



Morning Session (10:00 A.M.-1:40 P.M.)

The morning session of the webinar was anchored by Ms. Pallavi Mohanty & Ms. Aditya D Krishna and was moderated by Dr. Astha Bansal and Mr. Rajeev. The session was addressed by Prof.P.K. Chattopadhyay, Prof. Anup Ratan Bandyopadhyay, Dr. S.C. Mittal, Dr. Suminder Kaur, and Dr. P.R. Mondal.

The *first lecture* of morning session was delivered by **Prof. P.K. Chattopadhyay** on the topic “**Teaching of Forensic Science**”.

Prof P.K. Chattopadhyay talked about forensic field dealing with the how should we process, how should be taught, how should be analysis and handed. Forensic science is the application of basic science and application for justice. Criminal investigation is a component of forensic science. He quoted Justices P.V. Chakarvati mentions that criminal investigation is a part and forensic science is broader parts.

In Delhi University, He got opportunity to contribute in formulation of forensic science syllabus. Since it is not a basic science, those who want to apply basic science they have basic knowledge of science. The syllabus should contain an overview of all the subjects. The minimum qualification for admission is bachelor degree in any branch of science. Teaching curriculum should be so designed to give a broad overview covering various aspects of the subject (Forensic Science).

The writing of reports, participation in debates, seminars, case discussions and moot courts gives additional learning horizon for the students. In forensic study, the practical must includes examination of various exhibits involving known samples of various kinds simulated and actual case materials such as biological materials, chemical & toxicological analysis, physical evidences, handwriting & questioned documents, dactyloscopy, ballistics & explosive, and psychiatry etc.

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He focused his lecture on the internship programme in a laboratory which provided actual field knowledge of chain of custody, maintenance of case files, quality assurance, crime scene visits and court attendance.

He explained basic principle of forensic science i.e. Locard's principle of exchange which stated that whenever two things are in contact with each other there is always the mutual exchange of material between them. The human hand and foot contains pores surface by which the oil, sweat and other material excrete out. Due to these secreting materials, various prints were developed like develops finger prints, palm prints, toe prints and sole/ foot prints on different surface.

“The blood or semen that the perpetrator of a crime deposits or collects – all these and more bear mute witness against him. This is evidence that does not forget. Physical evidence cannot be wrong: it cannot perjure itself, it cannot be wholly absent ... only human failure to find, study and understand it can diminish its value.”

In the last he quoted Barry Scheck and Peter Neufeld (founded- Innocence Project, 1992) statements that is “DNA testing is to justice what the telescope is for the stars; not a lesson in biochemistry, not a display of the magnifying glass, but a way to see things as they really are”.

The screenshot shows a PowerPoint presentation titled "TEACHING OF FORENSIC SCIENCE" by P.K. CHATTOPADHYAY. The slide content includes the title, author name, and a list of bullet points. The author is identified as a former professor at Punjabi University, Patiala, India, and a visiting professor at Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, Africa. A video feed of the presenter, Prof. P.K. Chattopadhyay, is visible in the top right corner.

The *second lecture* was delivered by *Prof. Anup Ratan Bandyopadhyay* on the topic **“Forensics - An Important Need of the Society: An Appraisal”**

Forensic comes from the Latin word “forensic” meaning forum. During the time of the Romans a criminal charge meant presenting the case before the public. Both the person accused of the crime and the accuser would give speeches based on their side of the story. The individual with the best argument would determine the outcome of the case.

Forensic Science is the application of science to those criminal and civil laws that are enforced by police agencies in a criminal justice system. Forensic science is an applied science and often called “criminalistics “. Forensic science is defined as the use of science and technology to enforce civil and criminal laws. It includes many other areas of science. Forensic science is needed for assistance in our legal system; increasing crime rates, new or changed laws. New crimes eg: cybercrime, new weapons, response to Public concerns and response to law enforcement concerns. Forensic Science applies chemistry, biology, physics and geology to civil and criminal law. It places physical evidence into a professional discipline. Thomas Dwight (1843 - 1911) is credited with being the Father of Forensic Anthropology (1877). In 1976, T.D. Stewart (1901 - 1907) defined forensic anthropology as “that branch of physical anthropology, which for forensic purposes, deals with the identification of more or less skeletonised remains known to be, or suspected of being human.” Snow offered a broader definition to include “problems of medical jurisprudence” and also paternity issues. If we

compare civil and criminal law -Civil law is filed by a private party i.e: a corporation or an individual. The penalty is that a guilty defendant pays the plaintiff for losses caused by their actions and no incarceration. While in criminal law -It is filed by the government. The penalty is that a guilty defendant is punished by incarceration, fine paid to the government or execution (death penalty).The crimes are divided into 2 classes : misdemeanours or felonies. Sir Arthur Conan Doyle popularized physical detection methods in a crime scene and developed the character of Sherlock holmes. He had a considerable influence on popularizing scientific crime detection methods. Mathieu Orfila (1787 - 1853) the father of Forensic Toxicology; In 1814, Treatise on detection of poisons and their effects on animals. Alphonse Bertillon (1853-1914) the father of Criminal Detection. He devised the first scientific system of personal identification, using body measurements known as anthropometry in 1879.Francis Galton (1822 - 1911) conducted the first definitive study of fingerprints and their classification. In 1858 Sir William Herschel required finger prints and signatures on civil contracts. Leone Lattes (1887 - 1954) devised a simple procedure for determining the blood type (A, B, O, AB) of a dried blood stains. Calvin Goddard (1891 - 1955) used a comparison microscope to determine if a bullet was fired from a specific gun. Albert S.Osborn (1858 - 1946) developed fundamental principles of document examination. He was responsible for the acceptance of documents as scientific evidence by the courts. Edmond Locard (1877 - 1966) demonstrated how the principles developed by Hans Gross could be incorporated into a workable crime lab. Locards exchange

principle states that once contact is made between two surfaces a transfer of materials will occur.

Since the 1960's the number of crime labs increased due to the courts demanding secure scientifically evaluated evidence. There was more crime, drug related crime, greater need for physical evidence and use of DNA Profiling. There are seven Central Forensic science laboratories functioning in the country. Six CFSL's are under Directorate of Forensic Science Services. Three CFSL's are at Chandigarh, Kolkata and Hyderabad. Apart from one Central Forensic Science Laboratory (CBI) is located at New Delhi. Under XII Five Year plan government has proposed for up gradation of the same. CFSL Hyderabad is a centre of excellence in chemical sciences .CFSL Kolkata is the oldest laboratory in India in biological sciences. CFSL Chandigarh in physical sciences. Many local crime laboratories have been created solely for the purpose of processing evidence. Currently most of their energy and funds are used to analyze drugs and DNA. In 1932, John Edgar Hoover first established a national forensics laboratory to support all law enforcement in U.S. The oldest American forensics laboratory in California created in 1923 by August Volmer. Basic services provided by full service crime laboratories: Physical Science Unit -applies the principles and techniques of Chemistry, Physics and Geology to the identification and comparison of crime scene evidence. Biology unit -identifies dried blood stains and body fluids, compares hairs and fibres, identifies and compares botanical materials such as wood and plants and performs DNA analysis. Hairs have definite criteria, other than vegetable and synthetic fibres. Fire arms Unit

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examines fire arms, discharged bullets, cartridge cases, shot gun shells and ammunition of all types. Document examination Unit - analyzes handwriting, paper and printers of documents. Photography Unit - examines and records physical evidence at the crime scene and at suspects location. Optional services provided by full service crime labs -Toxicology Unit - examines body fluids and organs in order to determine the presence and identification of drugs and poisons. Latent Fingerprint Unit: Processes and examines evidence for latent prints i.e. those found on surfaces. Polygraph Unit: Uses lie detectors, an essential tool of the crime investigator rather than the forensic scientist. Voiceprint Analysis Unit: Involved in cases of telephone threats or tape recorded messages. Investigators may be able to connect a voice to a particular suspect. Evidence - Collection Unit: Incorporates evidence collection into a total forensic science service. The functions of the forensic scientist are: Analysis of physical evidence, expert witness, specifically trained evidence collection technicians. Other Forensic services: Death can be classified into five different categories: natural death, homicide, suicide, accident or undetermined manner of death. Forensic pathology - the cause of death can often be determined by performing an autopsy. After a human body expires there are several stages of death - Rigor Mortis -immediately following death, the muscles relax and then become rigid, shortening of muscles. Livor Mortis - the blood begins to settle in the parts of the body closest to the ground due to gravity. Algor Mortis - the body temperature cools. Other Forensic Services:

Forensic anthropology involves the identification and examination of skeletal remains in order to determine if the remains are of human or another type of animal. If human, ethnicity, sex, approximate age and manner of death can often be determined.

Forensic Entomology: It is a study of insects and their developmental stages. It can help to determine the time of death by knowing when those stages normally appear in the insect's life cycle.

Forensic Psychiatry: It is a study of human behaviour and legal proceedings in both civil and criminal cases. In civil and criminal cases, competency needs to be determined.

Forensic Odontology: An odontologist can match bite marks to a suspect's teeth or match a victim to his dental x-rays. It results in identification of an unknown individual.

Forensic Engineering: It is used to analyze construction accidents and the causes and origins of fires or explosions.

Forensic Analysis: It includes organic and inorganic analytical techniques.

Organic analysis of unknown substances includes analytical techniques such as: chromatography, UV- visible and infrared spectrophotometry and mass spectrometry.

Inorganic analysis includes techniques such as the emission spectrum of elements, atomic absorption Spectrophotometry, neutron activation analysis and x-ray diffraction analysis.

Development of Forensic Anthropology: The history of forensic anthropology is closely linked with that of physical anthropology and related specialities within forensic science. Before the late

18th century and continuing to some extent subsequently, skeletal analysis within the forensic context was mostly an applied area of anatomy. Anatomists and physicians would apply their knowledge of skeletal anatomy and its variation as best they could use general knowledge, the few techniques that existed in text books and their experience.

Jean - Joseph published cadavers ranging in age from foetus to young adult and how such proportion changed with age. Matthieu Joseph -Bonaventure Orfila in two medico-legal textbooks supplemented Sue's measurements and explains to evaluate stature from incomplete remains. Paul Broca (1824-1880) worked on neuroanatomy and putting skeletal interpretation on a more scientific footing. He developed the osteometric board, goniometer and stereograph. The European roots -Broca's area of speech (Homo habilis). Paul Topinard (1830 - 1911) wrote on stature estimation. Etienne Rollet in Lyon, France compared long bone lengths with cadaver length. Karl Pearson, 1899 presented regression equations. He gave mathematical contributions to the theory of evolution; on reconstruction of the stature of prehistoric races. He is also focused on evolutionary issues, palaeo-anthropology, growth and development, and studies of archeologically recovered human remains, although anthropologists remained active in modern cases involving issues of paternity and other legal problems. Forensic anthropology in Germany used techniques of physical anthropology to assess the parentage of displaced children and those of disputed paternity. Thomas Dwight (1843 -1911) the father of American Forensic Anthropology, won a prize for an

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essay on the medico - legal identification of the human skeleton in 1878. Ale's Hrdli'cka's wrote 'The Human Skeleton in Forensic medicine'.

In 1972, During the development of Forensic Anthropology, formation of the physical anthropology section of the American Academy of Forensic Sciences (AAFS). In 1977, The American Board of Forensic Anthropology (ABFA) was formed and in 2003, the Forensic Anthropology society of Europe (FASE) was formed. The basic objective of the criminal Justice is to protect the innocent and punish each perpetrator of crime. Alarming thing is the low rate of conviction. Most of the criminal prosecution, at the end of the trials, sinks into acquittals. When a guilty is acquitted - The society gets the punishment and the confidence of the people in the efficacy of the system is greatly shaken.



University of Calcutta  কলিকাতা বিশ্ববিদ্যালয়

**Forensics - an Important Need of
the Society: An Appraisal**

Arup Ratan Bandyopadhyay, *M.Phil., PhD*
Professor, Department of Anthropology
University College of Science, Technology &
Agriculture
University of Calcutta

PROF. ARUP RATAN ...

The *third lecture* was delivered by *Dr. S.C. Mittal* on the topic **“Problem and solution of questioned document examination”**.

Dr Mittal began the presentation with his experiences of investigating the various cases. He said that he received several cases in questioned documents to examine like addition, alteration, and typewriting but sometimes he received rare cases and he further discussed those rare cases. He talked about the unusual cases writing on the wall, on any instrument, on the table, bathroom tiles anywhere but he stressed that these cases are still identifiable. He further explained the type of handwriting and how to identify it. He explained the principle for handwriting as God has given two hands and a single brain. The structure of handwriting comes from the memory of the brain; the brain gives a signal to hand and hand performs handwriting. He added in handwriting instrument could be pen, pencil, brush, chalk etc.

The first case he discussed was from the UK, while conduction post mortem, forensic experts observed some written messages on the abdomen of the dead body. They sent it to forensic laboratory for examination. Dr. Mittal gave stressed that while examining any document or written evidence, the utmost step is to preserve the evidence by photography. He emphasized that whenever you observe any unusual writing on the surface, before conducting any test it must store by a photograph. He continued discussing the above case that on examination of the ink, experts found that ink used was of the German origin. They searched the pen of German origin and found the pen in the house of nearby person. When dyes were tested and compared

with the written handwriting on the dead body the convict was discovered.

In India also he had found numerous cases where the written evidence was found on the human body. In one case the handwriting was found on the sole. In another case, the lady was shot dead, while dying he had written on her hand "I was killed by this [Name] person". Firstly, the writing was identified. In this case, the writing instrument was lipstick and hands were the writing surface. He discussed another difficulty in document examination, the cases in which the notes were written in capital letters. In those cases, he recommended asking the suspect to write in capital letter and it could be identifiable. He further discussed the case in which the lady was found hanging and the suicide note was written on the wall. He compared the written suicide note with the deceased handwriting and it was found that suicide note was not written by her. It was the case of murder and not suicide. She was first murdered and later hanged on.

He also discussed the case from Delhi University, where some lawyers wrote something objectionable on the wall in the Department of Botany. They took the photograph and the handwriting was examined. The dispute between the lawyer and the police was solved. The person who wrote this was a very important person between police and lawyers.

Mr. Mittal said that individuals can write with any instrument like pen, pencil, brush, or by hand, the basic character of handwriting would not change. It could be identifiable. Some of the handwriting sometimes is difficult to examine like the handwriting on the wall or larger surface, in that case, a larger

size sample could be used. He explained that in the case large paper must be fixed on the wall and asked the person to write with full arm movement. It would be possible to identify. If the handwriting was written on paper it should be matched with the paper sample, if it is written on the wall or big surface in that case it should be matched with full arm movement handwriting. Cursive writing is different from normal writing. He suggested while doing the signature always do initials in one go, never lift it, it makes it difficult for a forger to copy it.

Another case from Rajouri Garden, daughter in law of income tax officer committed suicide. she wrote a suicide note with the help of soap on the bathroom mirror. They examine the writing of the mirror. They first took the photograph of the wet writing. Later on, while examination they noticed that there were streaks which made it difficult to examine, as those streaks disturbed the other handwriting characters. They also took the sample from staff and asked them to write with soap and they noticed the individual character and streak. He said that despite manipulation the individual natural features would not change.

He emphasized that the biggest challenge in document examination is the determination of the age of the document. He cited an example of an examination and interpretation of questioned documents. He said ‘we cannot determine the exact time when one’s hair starts growing, so how can we determine the exact age of a document’. He discussed some company case in which the paper was inserted. He asked for the recent pages and 10 years old pages of that company and by using UV fluorescence

he found that the degree of radiation was different in both papers. Hence it resolved the issue.

He referred the case from B.R Sharma of Hitler's dairy. Some people claimed that the diary was written by Hitler and some people showed doubt. On examination, it was found it was not written by Hitler. The thread that was used to stitch the dairy was not used at that time. A similar case was discussed of Swami Dayanand, when the book was examined it was found that it was not written by Swami Dayanand as they had used a ballpoint pen. The book was written in the 18th century and at that time ballpoint pen was not discovered. He urged while examining the documents always look the history. He also explained the non-destructive technique for document examination.

He explained about the case study on obliterated documents in which eight thousand was changed into eighty thousand by adding an extra zero. He urged not to leave space while filing the cheque. He further explained the cases forged cheques and alterations were done in name. He concluded the presentation by describing the difficulties in examining the scan documents and provided some suggestions about the same.



The ***fourth lecture*** was delivered by ***Dr. Suminder Kaur*** on the topic **“Effect of preservation on forensic blood samples and its impact on Forensic Reporting”**

In her lecture, Dr. Suminder kaur described the UV spectral changes in haemoglobin and DNA laboratory samples due to period of times. In study Li et al (2011) try to see the UV spectral changes of haemoglobin, there is something called soret band. They found there is change in color from red to dark brown and further if there is not proper preservation then it will be yellow. So, the Li saw that strongest peak at 415 nm is known as soret band and also in the fresh blood sample he also observed two more peak 540 & 576nm he said beta and alpha peak. So, according to him if haemoglobin is intact in blood sample then there is a strong peak in 415nm and there are also weaker peak 540 & 576 nm. If these peak present then we can said there is no haemoglobin is intact in the blood sample and it in the form of HbO₂ and met-Hb.

Dr. Suminder Kaur explained the Li et al., 2011 graph of spectral and lifetime characteristics of the haemoglobin, there are two types of blood stain one fresh blood stain dark line and peak at 400 and two smaller peaks in between 500 and 600. But after 15 day old blood will again isolated the haemoglobin of blood stain and did the spectroscopy you can see the two smaller peak of shown whereas peak at 415 also slightly sifted to 400 nm. This is also perversely reported.

The objective of her study was to analyse the possible visible spectral changes in Haemoglobin (Hb) and DNA from

blood gauze samples and separated from best to worst preservation status sent to forensic laboratory for analysis.

The sample I found according to color were reddish brown/ Maroons - Best, Dark brown- Moderate, Yellowish/Green- poor, Greenish/ blackish- worst preservation.

For the study, the samples were taken from 1cm² sample for isolated haemoglobin from one side and DNA isolation from other side. After isolating haemoglobin, sample was analysis on nanodrop spectrophotometer and UV visible spectroscopic profile. Both isolated Haemoglobin and isolated DNA subject to spectrophotometer. And in case Hb spectrum data were collected between 350-550 nm. They were expecting two minor peak in fresh blood but did not find in our forensic sample so, be reducing over spectral data from 350 to 550. Just to see there is proper haemoglobin peak of 400 nm which we said a soret band. For DNA spectral data was collected form 190-840 nm. Before performing serological analysis, DNA typing we must observed the quality and quantity of HB/ DNA must be estimated.

There have been several reported cases indicating “No Reaction” in serological analysis (ABO blood grouping) in badly preserved samples but till date no one had shown the visible spectroscopic correlation of Hb and DNA degradation of forensic blood samples with their preservation.

It was observed that putrefaction of human blood sample is directly associated with the degradation of nuclear DNA inside cell, which usually happens due to digestion of DNA into small fragments by the released enzymes. The sorate band is observed above 0.03 -0.05 and above at delta lambda sorets. Decrease in the

smoothness of graph which describes the difference between best preserved to worst.

Dr. Suminder Kaur showed Table that is represented the sample condition and spectroscopic parameters of haemoglobin and DNA among best preserved samples. Column no.1 contain sample no., Column 2 contain year of preservation, then color, smell wet/dry, packing- plastics or envelop, absorbance all above 0.05 and above. DNA is pretty high quality in all most seven sample whereas the purity of DNA also between 1.70 - 1.80.

The graph of these samples can be compared and analysis by Li graph, The Soret band in-between 410-415 so there is slight shift because these are forensic sample. The peaks are all above 0.05 which indicate well preserved sample.

In case of moderate, there is difference between dry and wet sample. Some dry samples were semi dry so, they were air dried. Different mode of preservation shows no difference. Colours of the sample were reddish brown to dark brown. The qualities of DNA were good and quiet substantial for forensic point of view.

The next table Dr. Suminder Kaur showed represents the sample condition & spectroscopic parameters of Haemoglobin & DNA among Moderately Preserved Samples. Spectral data of the these sample, the peak has intact of 0.05 now it reduce the peak indicated the haemoglobin degradation in this case has started.

Other parameters are poorly preserved and worst preserved. These are the matter of concern for the forensic scientist for analysis. In this case, poorly preserved the spectral parameters show delta Absorbance soret ranging between 0.01-0.03 at delta lambda soret peak at round 410 nm. Decrease in the peak height,

slight distortion in the curve. In worst preserved sample show distorted line with no specific peak at delta lambda solet peak 410 nm with delta Absorbance solet ranging between 0.001-0.01 and not suitable for serological analysis.

In third table, Dr. Suminder Kaur described the sample condition & spectroscopic parameters of Haemoglobin & DNA among Worst Preserved Samples i.e. the poorly preserved sample, the samples are greenish yellowish, dark brown and foolish smelling because of stored in plastic container. We already instruct the police person and hospital staff for not to use plastic containers for blood sample preservation because it will completely distorted / degrade the sample. In this case the absorbance is very low the peak is very weak and DNA analysis the DNA analysis the amount is insufficient for analysis. It will be resulted into 2-3 samples for DNA analysis. Haemoglobin is +2 these result are not liable in forensics. Poorly preserved sample the peak is weak and distortion is present. Due to negligence and handling this type of sample were sent to FSL for analysis which is very difficult to analysis.

The worst preserved samples most of them actually give a reaction few of them hardly agglutinated. So, we are not reporting these samples. The sample is already chewed down, the bacterial and fungal growth in this case the quality of result affected.

Spectral profiles of worst samples did not any peak which indicated enzymatic reaction. All the components were break down by enzymatic activities. From this graph we can say that the judge or judiciary can predict that this is the case or mis-handling and worst preservation samples.

These information is very important to analysis the badly or worst preserved samples. Absorption-elution assay is carried out in order to detect the presence of antigens in ABO blood system. We found the best preserved the DNA and haemoglobin is the best. But worst preserved sample those the haemoglobin is distorted unable to detect serological analysis but we try to analysis found DNA STR profile can be generated.

We found is time since the collection of blood sample has no directly impact on preservation of haemoglobin content of RBCs and DNA. Serological examinations are useless in foul smelling blood stains but can still provide good amount of DNA. All the sample collected 2013, experiment conducted in 2018 also resulting into best of haemoglobin and DNA. But if the sample is not preserved well it will not give test even one month old sample.

Serological examination falls in falsest smelling sample. The stability of DNA in varied preserved samples is far more than haemoglobin. Preservation and right sample will give high graph but worst preserved sample give distorted result.

Suggestions for effective preservation are the proper collection of samples and safe transport to avoid forensic sample degradation. Police person play a vital role for collections and preservation of the sample. If sample were not well preserved then forensic scientist will not able to give a proper report. If the sample were semi dry or wet they should air dry before transportation. Strict guidelines, according to FSL manual, should be followed during collection. The other factor affect the samples were temperature changing and humidity level throughout the

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year in Indian subcontinents is also responsible along with bad preservation of blood stained articles.



Afternoon Session (02:15 P.M.-03:30 P.M)

The afternoon session of the webinar was anchored by Ms. Pallavi Mohanty & Ms. Aditya D Krishna and was moderated by Dr. Suman Dua and Dr. Sonali Walia. The session was addressed by Dr. Deepa Verma, Dr. Kavita Goyal, Dr. K.P.S. Kushwaha and Dr. Deepak Raj Rao.

The *first lecture* of afternoon session was delivered by **Dr. Deepa Verma**, on the topic **“Impact of forensic report in solving the crime “**

She explained about the Society and origin of crime, It is well known fact that neither the earlier society was free of crime nor it is likely to be. This is due to gaps in the society that arise due to varied reasons i.e Power and poverty – some people are rich and have power whereas others are suffering from poverty. There is an enormous gap between mighty and poor. There are many pressures in life because of partialities in available resources. People are running after unrealistic lustre. There is a gap in the literacy rate. Crime has become rampant in the recent times. Types of crime in society are: forgery, cheating and financial frauds/scams. There is threatening and psychological fears /pressures. Society is faced with hideous crime against children such as pornography videos, kidnapping and extortion of money. Women face crime and sexual assault. There is black mailing for undue favor. Robbery, suicide and murder are the common forms of crime in society. Poisoning and sedatives are used in murders and robbery. Riots are also a form of crime.

Youth are exposed to narcotics and drugs. Explosives and bomb blast materials are produced to do crime. There is smuggling of fire arms and gang wars. There is tampering in photographs, video graphs and voice records. Various crimes happen due to concealment of information /truth pertaining to instances related to crime. Cybercrime has increased.

The national crime record data of India is a total of 50,74,634 cognizable crimes in 2018, which is 1.3% more than the crime held in 2017. During 2018, registrations of cases under IPC have increased by 2.3%. A total of 29,017 cases of murder were registered during 2018, showing an increase of 1.3% over 2017. The crime against women -2018.31.90 % of crime against women is due to cruelty by Husband or his relatives.27.60% crime is due to assault on women with intent to outrage her modesty. 22.50 % is kidnapping and abduction of women.10.30% is due to rape of women. The abduction data shows 48.106 % for women and 15.250 % for men. Cybercrime has increased tremendously; it was 12187 in 2016, 21593 in 2017 and 27002 in 2018. The conviction rate of 2018 is as follows: murder (41.4%), rape (27.2%), Kidnapping and Abduction (29.2%),rioting (18.8%) and hurt (32.6%).

The role of forensics in this scenario of crime is to support investigation, to identify the piece of evidence and materials, to acknowledge it as case property and registration of cases. The conduct tests with validated techniques and standard operating procedure according to manuals. Then, prepare reports and scientific opinions and finally to depose in Hon'ble courts as

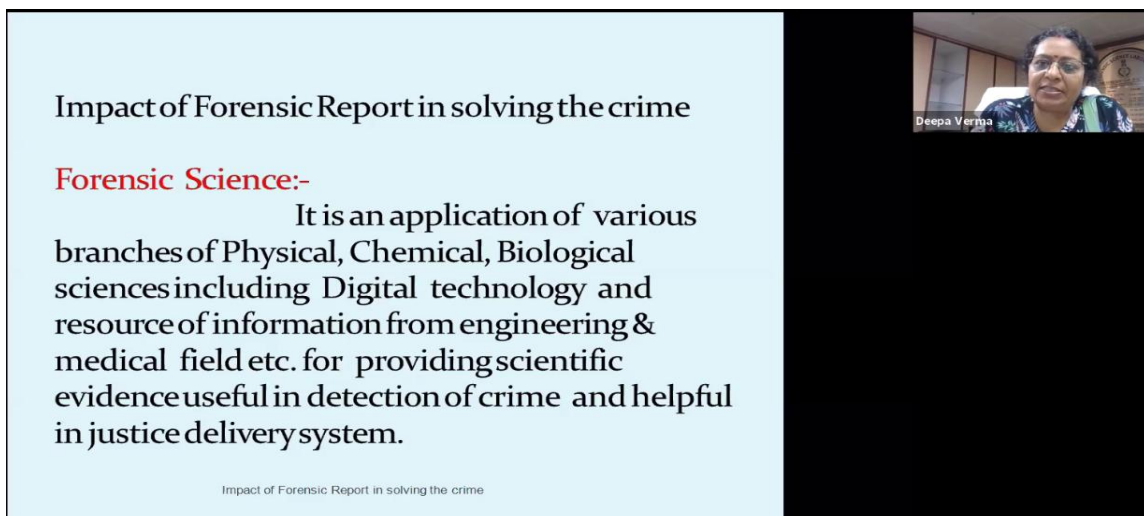
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expert testimony. It is the duty of forensic experts to provide necessary training and support, as and when required.

For forensic science to help the society -more qualified professionals are required. More specialized courses are required accompanied by research activities. Government should support more projects and provide financial support. A good laboratory infra -structure needs to be maintained. Good job opportunities and promotional avenues need to be created. Ethically it is important to respect mankind, and social individualities. We should have strong spirit of belongingness towards nation.

The effect of forensic support to society: Since, finding of forensic examination reports of any dispute matter are impartial and scientific, thorough and qualitative, authentic and accurate. Therefore these are more reliable than public witness or oral evidence due to permanent recorded nature.

This is the reason that forensic science is much supportive in criminal trial and justice delivery system. Hence, this leads to higher conviction rates, which ultimately leads to better structure for crime free society.



Impact of Forensic Report in solving the crime

Forensic Science:-
It is an application of various branches of Physical, Chemical, Biological sciences including Digital technology and resource of information from engineering & medical field etc. for providing scientific evidence useful in detection of crime and helpful in justice delivery system.

Impact of Forensic Report in solving the crime

Deepa Verma

The *second lecture* of afternoon session was delivered by *Dr. Kavita Goyal*, on the topic **“Forensic Chemical Sciences: Branches, Trends, Challenges”**.

The objective is to Study the application of chemistry principles to forensics. What is basic chemistry? What are the branches of forensics? Which are the branches of forensic chemistry at present and which branches are to be added in future? It is important that reports are generated using scientific tools for legal justice delivery system. These days judiciary relies on scientific reports. We should be careful in reporting -what we have seen and reported, it should be in the language of common man, so that judge can deliver proper judgement. Latest trends are changing; colour test was used to study. Now there is increase in technology, we should be aware of how to apply the modern methods. We should be able to apply modern methods .There are challenges faced by forensic scientist. What is science? It is to know the things and to do the things. In knowing and doing things, we use tools and techniques that is technology. In due course we gain knowledge. The use of technology and science to solve crime is forensic science. Due to advancement of technology, various branches have developed - chemistry, biology /DNA finger printing has become important. Previously in documents only cheque bouncing and property sale deed papers were dealt with but now many other fields are taken into consideration. Cybercrime has increased .Based on requirement; many fields are included in the study. Forensic science branches are SOC, toxicology, Psychology, ballistics, physics, anthropology, engineering and mathematics. Environmental forensics is

increasingly used. In crime scene examination, where there is crime involved eg: accidental fire-relevant exhibits are to be searched. At the scene of crime systematic, logical and keen observation needs to be done. We have to watch the scene of crime in a disciplined way to look into it and subsequently inferences need to be drawn. Scene of crime needs to be protected, to give a proper insight and correct physical evidence. It should be systematically approached and logical interpretation should be done. Only then inferences can be drawn. Proper photography should be done to record how things were there, videography would help in reconstruction of the scene of crime. Instruct the investigating agency to preserve it. In case of acids-glass containers should be used. Ganja to be saved in paper bag or cloth bags, not in airtight container-it will get fungus. Careful segregation of relevant material should be done for eg-suppose a dry cleaning factory examination or cosmetic factory explosion, then look into relevant material and don't collect all the things. In the dry cleaning factory, which solvent could have caused fire? Investigating agency should be in a position to identify the relevant. Sometimes they are visible, others like finger prints need to be found, lifting of exhibits should be done properly, isolate them and then go for DNA examination. Instruct the authority-the order to be followed, in case of biological and chemical exhibit, some coordination is required .If sulphuric acid is stored in plastic bottle, everything will be lost, it has to be stored in glass bottle. Everything should be preserved according to the requirement. Toxicology embraces volatile poisons-drugs -volatile poisons like phosphine, cyanide etc. identify presence of drugs

and poisons in body fluids, tissues and organs. Alcohol is intoxicating, more than 30 ml is punishable under law. Drugs-tranquilizers, neutral drugs, pesticides, herbicides and metallic are under poison. Arsenic was used as slow poison; calcium fluoride is the laxman Rekha. Zinc phosphide is rat poison. In Arson fire, it has to be put off. Initial action to put out fire, few components are lost or diluted in the process. Stupefying agents like datura are used to make a person unconscious and looted. Other types of poison are Crushed glass, animal poison, bird poison. Anomaly-in shilajit case-duplicate packets or duplicate compounds were found. It is important to know original or duplicate. Narcotic effects central nervous system-provokes physical dependence on opium, charas, ganja and tremendous. psychotropics-they effect central nervous system-amphetamines. Category of narcotics-opium, morphine,-cannabis, hashish ,hallucinogens, stimulants-enhance body activities -cocaine, depressants -barbiturates, phenargan. It involves lot of safety measures. Explosives-organic explosives include, rdx, inorganic-ammonium nitrate should be distinguishable. Stability of crime scene is to be maintained. IEDS have come up , they have to be checked. Remnants will be left at scene of crime. Carry organic solvent wash. Gather much and much area, organic material. Role of toxicologist is to identify one out of thousands drugs or poisons -that has caused the crime. He should find the quantity dissipated in the body. He should be in a position to link toxic substance which caused death heroin-morphine .He should check the metabolite. Sample should be tested soon. He should take relevant exhibits within a reasonable degree of scientific

certainty. The report should not be challenged. There are limited resources and time. So, first do ground work, well recognised literature should be consulted. Apply technical expertise to solve crime. Segregate what is required, it should be easily understandable to legal authorities. Analytical techniques should be accurate. Techniques should be sensitive, if small quantity is present, you should detect it. It should not be prone to contamination. There should be easy sample preparation and least prone to be contamination, less time consuming- reliable, user friendly. Trap volatile poisons, it can be regenerated back. Different instrumental techniques used are -Gas chromatography, spectrophotometer, thin layer chromatography with mass spectrometer, High performance liquid chromatography. Screening is done through Marquis test for alkaloids, colour test for different components. Immunoassays are gaining importance .For confirmation-gas chromatography, thin layer chromatograph, FT-IR is done. Gas chromatograph -MS, UV-Vis Spectrophotometer, FT-IR , HPTLC , HPTLC-MS ,LC-MS - the various instrumental techniques. During court testimony, there should be good communication skills, so that judge can understand, you should think ahead like a chess game. Formulate answers in commensuration with report , use technical terms to explain. Results should authenticated by world class laboratory .NABL ensures high quality reports. Maintain international standards. No more use of single poison rather there is use of synergistic poisons, use of medicines for poisoning.31 million people suffer from drug disorders. Trends show that there is change from heroine to tremadols. It is important to understand

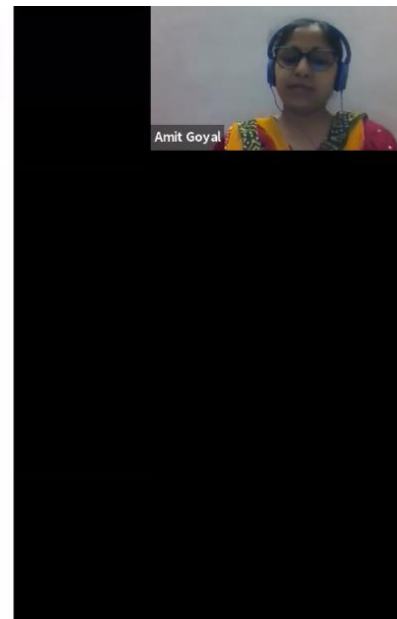
the trends, India is a significant source of sub- standard illicitly manufactured products branded and marketed as tramadol - seized worldwide. Most of the Tramadols were reported to have originated in India. FSL Delhi maintains the quality. The challenges today are - technical expertise, proper skill, proper training, dedication, expertise, resource management, application of acquired knowledge and expertise with others. Forensic is an active and demanding career.



Forensic Science



- ▶ **Science:**
 - To know the things
 - To do the things
- ▶ **Technology:**
 - Knowledge gained through science – applied by means of tools and techniques
- ▶ **Forensic Science:**
 - Use of science & technology in investigation of crime
 - Science pertaining to law/ science applied for law enforcement



The third lecture of afternoon session was delivered by **Dr. K.P.S. Kushwaha** on the topic **“Forensic Evidence in Sexual Assault Cases”**

Dr. K.P.S. Kushwaha deliver lecture on Sexual assaults. Evidence materials are: Types of biological fluids/tissues, impression/marks, botanical evidence and miscellaneous evidence a material. The constituents of blood are Plasma, Platelets, WBC and RBC. WBC has nucleus and mitochondria and DNA in the nucleus. HLA was used in forensic analysis earlier. RBC has Antiserums which are blood determinant substance. Platelets are not of much significance.

Blood Identification can be performed by Microscopic Identification of cells, chemical tests and crystal test (confirmatory), Spectrophonetic Identification, Electrophoretic Identification, Chromatographic Identification and Immunological Identification.

Earlier Benzidene test was used. In a case in Harayana, Blood was detected on a knife even after three and a half year old ,in a well.

Identification of Menstrual blood can be done by microscopic examination, fibrin degradation product determination and LDH enzyme test. Identification of seminal stains is carried out by Physical examination, Presumptive tests such as Acid Phosphatase test etc. and confirmatory tests such as sperm detection, LDH isozyme etc. examination of hair and Fibre is carried out by determining the species, sex, race, site and genetic markers (source of comparison). Fibre examination is done by Microscopic examination, staining test, solubility test,

floatation tests, burning tests the garment is spread in a dark room, the UV light is used to mark the No. of statins fibre, is put on paper tested give violet colour on staining and then DNA test are done. In a case of 10 year girl who was murdered and found in fields in Haryana, had vaginal canal cut and there was a dried twig near her body, which may have been used. In another case in 1978, dead body of a 9 year old girl was found in field in Haryana, A foot print was also found which belonged to one of her cousins. Blood on the pubic region of the accused is important in identification. The IO along with Kushwaha Sir went to the village and studied 35 boys and boy no 19 and 22 were found to have blood on their pubic region and the case was held in session court for 6 months. The evidence was important because Dr.Kushwaha had gone through foreign literature and studied that the vaginal canal rupture is the reason for traces of blood. Examination of saliva is also important in Examination. Before the use of DNA techniques, saliva examination was done in hanging cases in sexual assault cases, salvia bite marks on body and swabs are useful for identification. According to FBI (1997), if the estimated probability of DNA profile found in crime sample is ben than 1 in 260 billion, and it is seen in a person, then that person is source of sample.

Hair and fibre also play important role in survivor or victim or accused .New Technologies for forensic DNA testing are Additional STR markers, Mini STRs, Mt. DNA, DNA phenotyping, SNP markers, DNA chip, CPG markers, RNA profiling. DNA is more discriminatory as one point on DNA can divide populations into 45 groups. Paternity cases can be solved by STR markers

also. One plucked hair has 300 ng of DNA whereas it is 10ng in a fallen hair.

DNA can also be extracted from fire victims exhibiting extreme charring. Touch or trace DNA, which is left behind from skin cells can be collected by swabbing, cutting, scrapping tape lift and panel held vacuum device. Long bone fragments burnt at 800c and thigh skeletal muscles at 900c have been typed for STRS.

Post coital persistence of seminal constituents is affected by several factors such as hostile environment/pH of female reproductive tract, immune tolerance of female reproductive tract, strength of sperms, frequency of coitus and lot of other factors. In the times of COVID PANDEMIC it is interesting to note that a person speaking upto 30 seconds from a distance standing between 69-115cm can deposit sufficient amount of DNA. Thus speakers can be identified by the objects in front of them.


COLLECTION OF DNA ON CARDS is the easiest and most efficient way for long term storage for future DNA testing, with leading DNA preservation tools in forensic applications today. Biological samples on B.C. cards are stored at room temperature so there is no need of freezers.

At the end, Dr.Kushwaha referred to the High Court judgement of the case Vikram Singh V.State of Haryana CRA-D-364. 1998 (2006) RD-P&H 3930) (10th July 2006). Here the importance of footprints left on a leather bag, though faint & partial belonged to the shoes of accused. Dr.Kushwaha also showed the Medico-legal Evidence collection Kits and the Protocols developed.

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NICFS prepared this protocol, this has been done by the results of a project and samples till three weeks of post coital stage are advised to be taken by doctors. The findings of this project being conducted in several states will throw more light on this aspect.

FORENSIC EVIDENCE IN SEXUAL ASSAULTS



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Dr.K.P.S. Kushwaha

The last lecture of afternoon session was delivered by **Dr. Deepak Raj Rao** on the topic **“Challenges in Digital Forensics- A need for New Approach”**

Nowadays use digital technology and increase in crime has increased. Every day, new devices and communication devices are coming but there is no standard tool, every year it changes. We have to say to the experts that lot is not available.

TECHNOLOGIES AND ANTI FORENSIC TECHNIQUES.

Challenges nowadays can be categorized into Technical, Recourse and legal challenges. Dr. Rao discussed the technical and resource challenges due to time constraint.

The challenges are non-availability of standard for digital forensic tools, Password Recovery, Cryptanalysis and steganalysis, data collection from online social media, anonymous and cloud technologies and anti - forensic techniques. There is non-availability of standard for Digital Forensic Tools. This is because of quick change in technology and development of new devices, trade secret maintained by the vendors and lack of knowledge sharing and coordination among the peer group. Open source tools though available, the trade secrets are maintained. The knowledge of evidence carrying device is not shared. Most difficult challenge is the password recovery. If a device is password protected it becomes difficult for the forensic expert to crack the evidence and if the device is protected by strong password, it is difficult to break open. Vendors provide the password to device. Strong password and encryption make things difficult.

Salt Pepper Technologies- By use of hash value, the criminal can go see hash value and see data. Password protect number is added called “salt”. By changing the number often is “pepper”. By changing the number often you cannot track the password even the criminal gets the hash value. Use of biometrics (not used in offices due to corona) cannot easily be cracked, Algorithm is strong. The vendor approached to protect the privacy of the data of customers. Vendor having a mind set to secure the data of customer.

CRYPTO ANALYSIS AND STEGANALYSIS- If May particular file is protected because of encryption, people in forensics cannot break it.

Cryptoanalysis is a major obstacle to most of cyber forensic investigation since they are very hard to break and also due to the fact that all encryption is the same. To crack the encrypted data, investigator need to find the text left behind by the application. Most of the time, the application erased the text. The texts are removed and you cannot break open file.

DATA COLLECTION FROM ONLINE SOCIAL MEDIA, ANONYMOUS AND CLOUD TECHNOLOGIES- Before, we had the access to make a tool to crawl in social media and gather information but after the Cambridge analytical, we have access to only the published information on social media and also the servers are located in difficult countries.

Nowadays anti-forensic techniques for destroying the data can be easily seen on google. In this comes-

TUNNELLING- Restricted sites can be accessed by proxy servers and tunnelling data i.e. what the young generation is watching, cannot be accessed by others.

CHANGING META DATA ON TIME STAMP

In forensics information about what kind of activity the person has done with system and the time, he had system in connection. There are 10 No. of tools to wash or delete this data. One is window washer by which you can wash the activity. The actions like.

WIPING A DRIVE the actions like, delete a file, shift the file and format a file can be recovered but wiping cannot recover.

TRIMMING OF SOLID STATE DEVICES are useful in forensics as they do not generate heat that much. Trimming is dangerous, as in garbage collection, data is lost.

DISABLED LOGGING The user knows how to disable log and sequence of activities cannot be found.

ONION ROUTING

Need for new Approach- involves standardization of tools and techniques, peer group knowledge sharing through different forums. Regular in-house and out- house training to update knowledge is required. There should be a centralized organization for password cracking. In most of the countries for example France, the experts send the data to centralized organized keys and high end methods. Encouragement of more research and development of new tools and techniques, in Digital forensics is needed and there is much scope in this domain.

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**Challenges in Digital Forensics –
A need for New Approach**

**Dr. Deepak Raj Rao G.
Asst. Prof. (Computer Forensics)
LNJN NICFS**



The webinar concluded with the closing remarks and votes of thanks by Dr. Avitoli G. Zhimo.

PHOTO GALLERY

Eminent academicians and Speakers Photos:



Prof. P.C. Joshi



Prof. P.K. Chattopadhyay



Dr. P.R. Mondal



**Prof. Arup Ratan
Bandyopadhyay**



Dr.K.N. Saraswathy



Dr. S.C. Mittal



Dr. Avitoli G. Zhimo



Dr. Suminder Kaur

“FORENSICS: AN IMPORTANT NEED OF THE SOCIETY”



Dr. P.R. Mondal



Dr. K.P.S. Kushwaha



Dr. Deepa Verma



Dr. Deepak Raj Rao



Dr. Kavita Goyal

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Moderator-cum-Reporteurs and Anchors Photos:



Dr. Astha Bansal



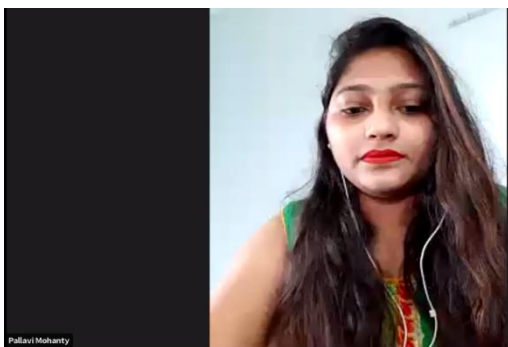
Mr. Rajeev



Dr. Sonali Walia



Dr. Suman Dua



Ms. Pallavi Mohanty



Ms. D. Adithya Krishna

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