





Mr. Vikram A. Dhere

Assistant Chemical Analyzer

DNA Division

RFSL, Nashik.

The diagram illustrates the interaction within the criminal justice system. At the top, a yellow box labeled 'CRIMINAL JUSTICE SYSTEM' has four red arrows pointing down to 'POLICE', 'FSL', 'FORENSIC MEDICINE', and 'JUDICIARY'. These four components are then grouped by a cyan box labeled 'INTERACTION'. Finally, a yellow box at the bottom states the outcome: 'INCREASE IN CONVICTION RATE, FAITH IN CRIMINAL JUSTICE SYSTEM'.

CRIMINAL JUSTICE SYSTEM

POLICE FSL FORENSIC MEDICINE JUDICIARY

INTERACTION

INCREASE IN CONVICTION RATE, FAITH IN CRIMINAL JUSTICE SYSTEM

Set-up in India

Ministry of Home Affairs

Directorate of Forensic Science

CBI Laboratory

Central Forensic
Science Laboratories

- CFSL Chandigarh
- CFSL Hyderabad
- CFSL Kolkata

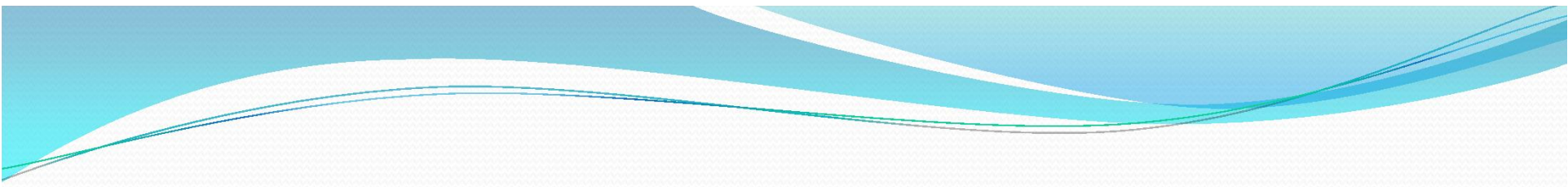
- Shimla
- Hyderabad
- Kolkata

State Forensic Science
Laboratories

26 State Forensic Science
Laboratories

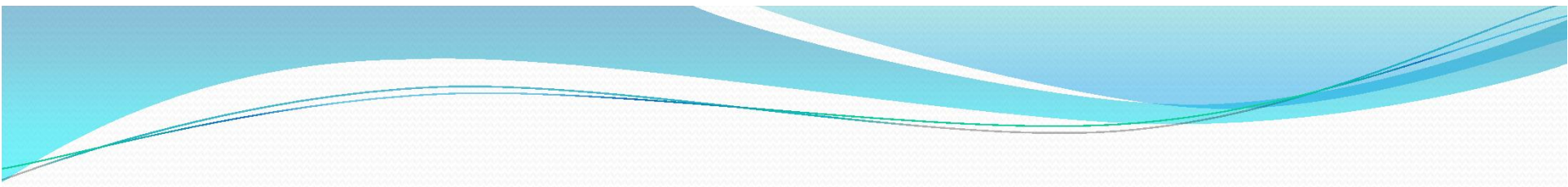
Set-up in India





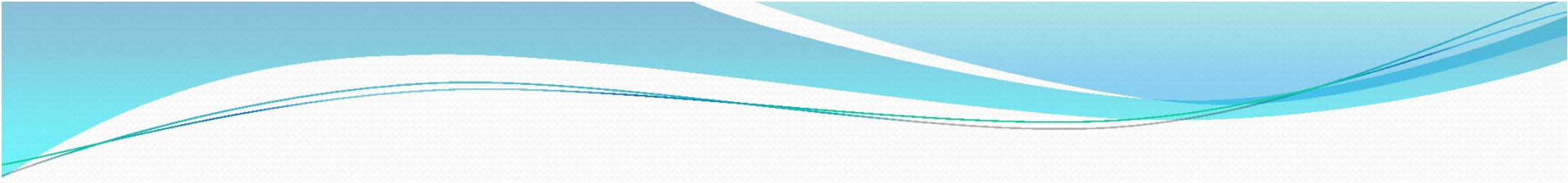
Forensic science laboratory

- Directorate of forensic science laboratory
- State of Maharashtra
- Kalina Mumbai



Regional Laboratories

- Amaravati
- Aurangabad
- Nagpur
- Nashik
- Pune
- Kolhapur
- Nanded



Mini laboratories

- Thane
- Solapur
- Dhule
- Chandrapur
- Ratnagiri

DIRECTORATE OF FORENSIC SCIENCE LABORATORIES, MUMBAI

- **GENERAL ANALYTICAL &
INSTRUMENTATION DIVISION**
- **BIOLOGY / SEROLOGY DIVISION**
- **BALLISTICS DIVISION**
- **TOXICOLOGY DIVISION**
- **PROHIBITION & EXCISE DIVISION**

- **DNA DIVISION**
- **PHYSICS DIVISION**
- **PSYCHOLOGY DIVISION**
- **CYBER FORENSICS**
- **TAPE AUTHENTICATION & SPEAKER
IDENTIFICATION DIVISION**



New Emerging Trends

- **Forensic Psychology**

- * Lie Detector

- * Brain Signature Profiling

- * Narco analysis

- **Forensic Acoustics**

- * Speaker Identification

- * Tape Authentication

- **Cyber Forensics**

WHAT IS FORENSIC SCIENCE?

- It is the science which embraces all the branches of science in criminal investigation which ultimately helps the law.
- It helps to establish the presence or absence of a link between the crime, the criminal, the victim, the place and the line of occurrence.

Locard's Principle of Exchange

“Whenever two objects come into contact, they always leave a trace on the other.”

Every criminal can be connected to his crime by contact traces carried from the scene of crime or left by him at the scene of crime .

Crime Scene

The scientific evidence of the vital clue material from the scene of crime can not be denied in the courts of law, hence is an authentic tool in the hands of law enforcement agencies. Thus forensic Sciences form a unique partnership with law enforcement and judiciary system.

Crime scene

- The physical examination of crime scene forms the basis of scientific crime scene investigation & may be used in the reconstruction of the crime and link to criminal.
- In murder & rape cases, bomb blast cases the proper collection & preservation of clue materials is most important.
- In blast cases, collecting physical evidence at the scene consists of the search for and recovery of items that may lead to information about the nature and type of explosives and the identity of the suspect.

Crime scene management-

The basic crime scene procedures are

- **Barricade the crime scene.**
- **Meticulous observations of scene of crime for any foreign material.**
- **Proper collection of Physical evidence, recognition, documentation.**
- **Packing of evidential clue material.**
- **Preservation of evidential clue material.**

Different Types of Crime scenes:

- **Blast scenes**- observation of craters, Blackening, search for remnants of missiles, collection of clue material from the place where the maximum damage has taken place.
- **House collapse scenes**- observe the place where the maximum damage has taken place, bending of steel rods, collect the representative sample about 1 to 2 kg.
- **Document Related scenes**- Search for any written material, even small paper chits may prove evidential clue material.

Different Types of Crime scenes:

- **Murder & Rape scenes**- In rape scenes collection of clothes of victim & accused, victim's vaginal swabs, pubic hair. Loose hair should be collected by combing. Hair should not be cut but should be plucked. Blood samples of both accused & victim should be collected.
- **Firing scenes**-Observe any bullet embedded, search for weapon, bullet & cartridge cases. Observe any burning, blackening, tattooing & smudge ring on target to estimate range of firing. In car firing search made for dents bullet holes.
- **Hit & run scenes**-Observe any colour transfer.

Crime Scene Management.

11/7 Serial Mumbai Local Train Blasts

➤ Explosive used-RDX, Petroleum hydrocarbon oil & Ammonium Nitrate.



Crime Scene Management.

Malegaon Blasts-2006

- Explosive used-RDX, Petroleum hydrocarbon oil & Ammonium Nitrate



General Analytical & Instrumentation Division

Following exhibits can be submitted to the

Narcotic Drugs like

Brown Sugar (Heroin), Charas, Ganja, Bhang,
Mandrax Tablets, Cocaine, LSD, Diazepam,
Lorazepam, Barbiturates.

- 5 to 10g of sample should be packed separately.
- In case of small vials or paper chits the representative no. should be forwarded.
- In case of tablets at least 10-12 tablets should be forwarded.

Petroleum Products like the following:

- **Petrol Diesel Kerosene**
- **Petroleum Hydrocarbon oil(Naphtha).**
- **Lubricating oil Furnace oil.**
- **Black oil Engine oil.**

**Can also be submitted to
the General analytical &
Instrumentation division**

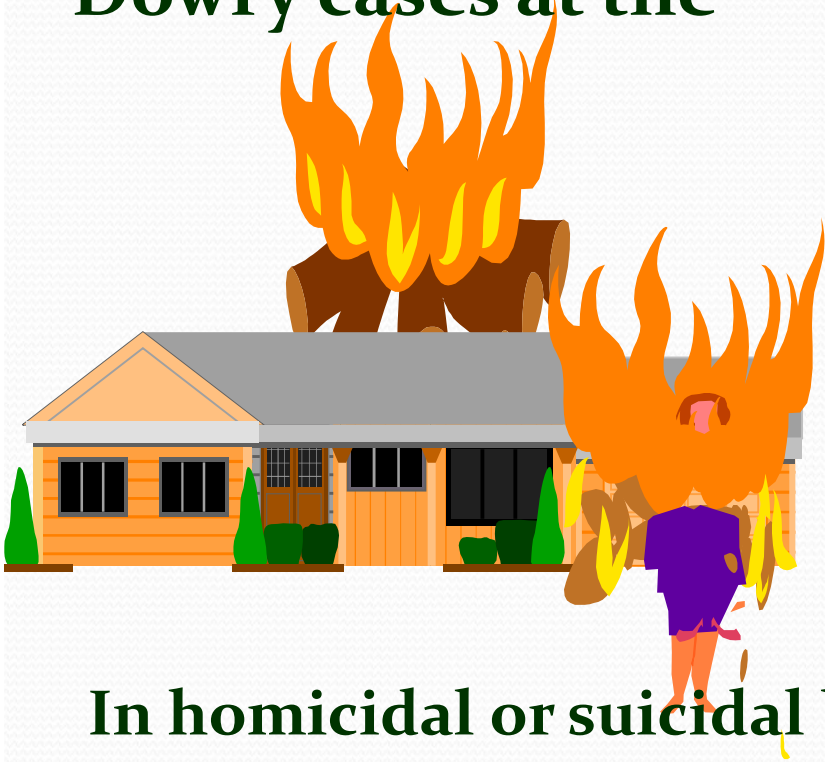


**About 750ml of Petrol, Diesel, Kerosene,
furnace oil, Naphtha, Lubricating oil etc.
should be sent in narrow mouthed glass
bottles.**

General Analytical & Instrumentation division

Deposit the exhibits collected in Bride Burning-
Dowry cases at the

- Kerosene Residues.
- Petrol Residues.



In homicidal or suicidal burning all material from
crime scene such as bedding , pillow, clothing of
offender if smelling of kerosene, as well as victim's
clothes should be collected & referred to lab .

General Analytical & Instrumentation Division

Please note that:

The forwarding letter should have,

- Outward no. & date.
- Full postal address of forwarding authority.
- Facts of the case in brief.
- Complete & proper description of the article forwarded with identification mark if any.
- Copy of label & impression of the seal.
- **Mode of dispatch.**

The article should be,

- packed & sealed properly.
- Police station name, C.R./AD/PCR No., section and act etc should be indicated on the label.



Biology/ Serology Division

- **Blood-grouping of blood/semen and body fluid stains in murder, assault, rape cases**
- **Species typing -COE**
- **Other biological evidences like hair, tissue etc.**
- **Snake bite cases**



Biology/ Serology Division

- Clothes of injured/ deceased/ victim/ accused
- Weapons used in crime
- Crime scene exhibits like blood mixed earth and control earth, blood stained grass etc.



GUIDELINES TO POLICE OFFICERS

- **Send completely dry clothes/
other articles (in shadow) stained
with blood or other body fluids.**

GUIDELINES TO POLICE OFFICERS

- **Send each article separately wrapped in paper or put in envelope etc. While folding the articles, precaution should be taken so that blood stained portion will not come in contact with unstained portion, In necessity said portion should be covered with papers and then fold it.**



GUIDELINES TO POLICE OFFICERS

- **Earth mixed with blood, blood stained grass and stones should be wrapped in paper after total drying along with nearby unstained control sample separately.**

GUIDELINES TO POLICE OFFICERS

- **Dry blood stains should be collected in the form of scrapings or chips from floor, wall, tiles, wooden furniture etc or cut portion of stained part, to be wrapped in paper or put in a small box and send along with a separate control sample.**

GUIDELINES TO POLICE OFFICERS

- **In case of liquid blood at the scene of crime, clean cloth piece should be soaked with blood, dried and sent along with wiped cloth piece from the near by unstained portion as a control.**

GUIDELINES TO POLICE OFFICERS

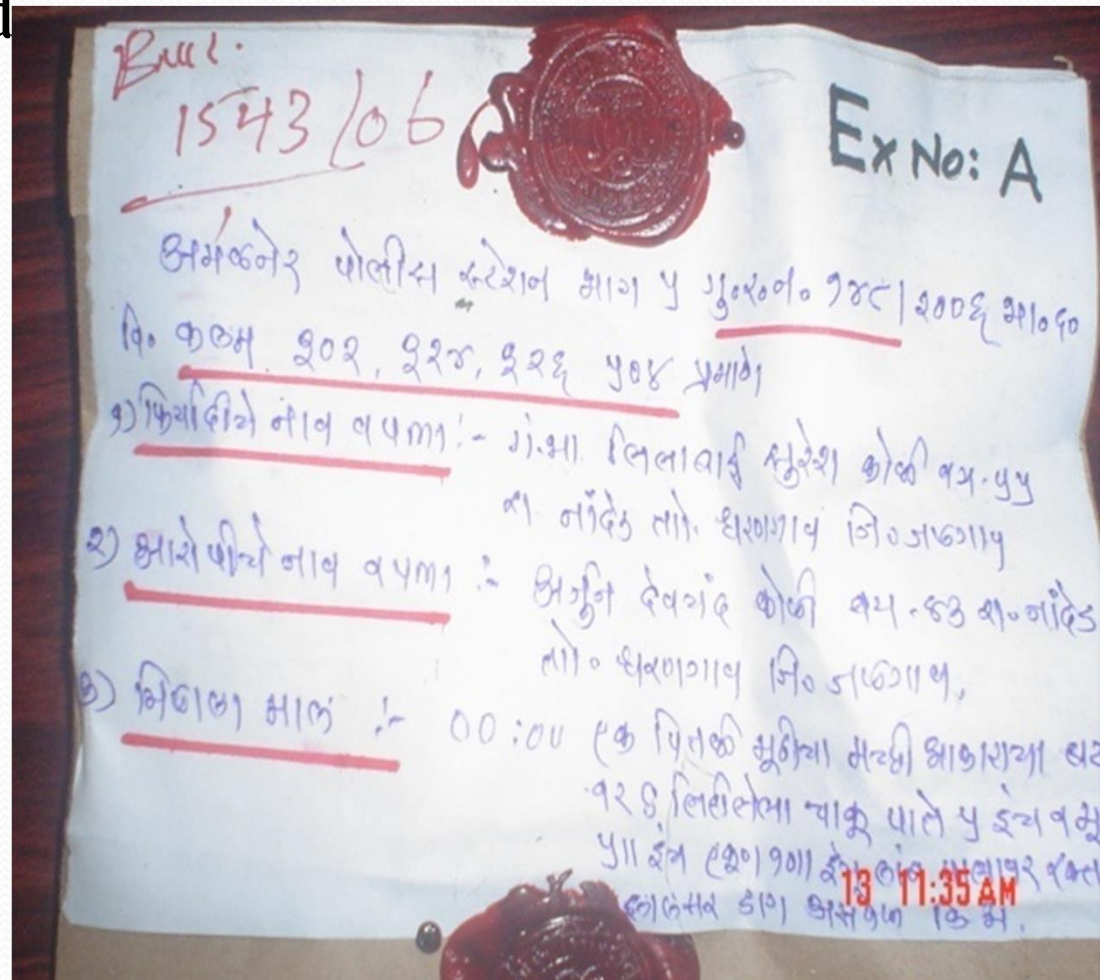
Articles to be sent to the laboratory should be covered with brown paper and sent under office seal. It should be labeled with Police Station name, C. R. No., IPC, the description of articles and number of articles according to forwarding letter. Parcels should be protected from tampering.

GUIDELINES TO POLICE OFFICERS

The letter forwarded by Police Station should be in a proper format and have an outward number, date, A.D.R./C.R No., IPC, name of the deceased/ injured/ accused, history in short, stamp and signature of forwarding authority and mainly copy of the seal.

Guidelines for sealing evidences

- Seal of the office used while sending the exhibits



Guidelines for forwarding evidences

Form of Report to be used when forwarding substances other than Victims to the Chemical Analyser

1483

mlc 584/06

23/9/06

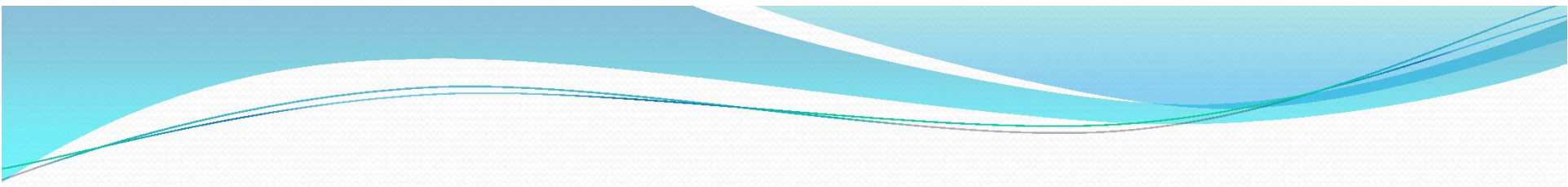
TO—THE CHEMICAL ANALYSER TO GOVERNMENT, MUMBAI

FORWARDING the articles mentioned below for examination for analysis & cross match with samples of mlc 583 in connection with case of rape

Description of Articles

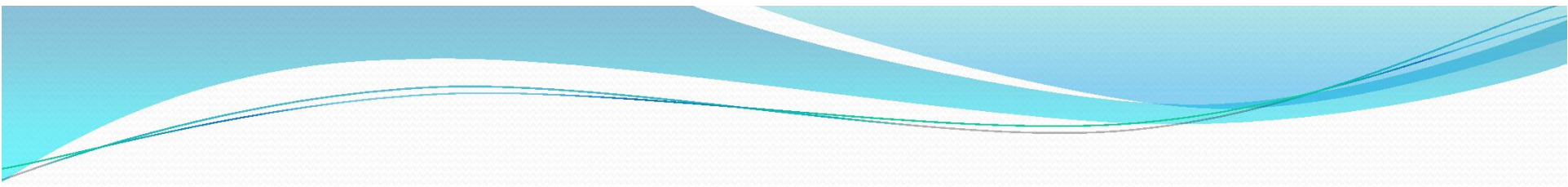
- 1 Blood
- 2 Nail clippings
- 3 pubic hairs
- 4 Blood on cotton cloth
- 5 semen

- Medical officers forwarding letter
- MLC /PM no.
- Name of person
- Seal
- Stamp
- Signature



BALLISTICS DIVISION

If examination of exhibits such as standard and country made guns/arms/ammunition is expected or examination of bullets/ cartridge residue of fired ammunition, distance of firing, effectiveness and physical aspects of wounding in cases of murder/assault involving use of fire arms and possession under Arms Act, is required .



TOXICOLOGY DIVISION

Exhibits such as viscera, stomach wash, vomit, blood & other related material submitted by the Medical and Police Officers in homicidal and suicidal poisoning cases for the detection of any poison should be forwarded. Materials in animal & bird criminal cases can also be deposited here for examination.

DIRECTORATE OF FORENSIC SCIENCE LABORATORIES

TOXICOLOGY DIVISION, MUMBAI

EXHIBITS RECEIVED FOR ANALYSIS IN TOXICOLOGY DIVISION

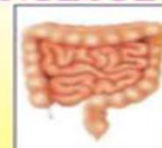
I) BIOLOGICAL EXHIBITS

VISCERA I :

STOMACH

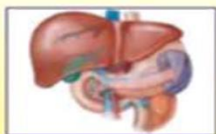


INTESTINE



VISCERA II :

LIVER



KIDNEY



BRAIN



LUNGS



SPLEEN



**BODY FLUIDS : STOMACH ASPIRATE/
STOMACH WASH/STOMACH CONTENTS**

BLOOD ➡



URINE ➡



II) NON-BIOLOGICAL EXHIBITS

INSECTICIDE CONTAINERS



MEDICINE BOTTLES



VOMIT STAINED CLOTHES



**SYRINGES WITH
BLOOD/INJECTION LIQUID**



TOXICOLOGY DIVISION

- If viscera is being submitted remember to attach Form no. **CM 23 m&e.**
- If vomit, blood, urine, stomach-wash or non-biological exhibits are being submitted attach Form no. **CM24 m&e.**
- The cases of scorpion bite or dog bite or rat bite should be submitted along-with sample of deceased brain, to the Haffkine Institute, Parel, Mumbai – 400 012.
- Blood and skin piece from the site of snake bite along with a control sample of the skin is being sent separately in snake-bite cases.



TOXICOLOGY DIVISION

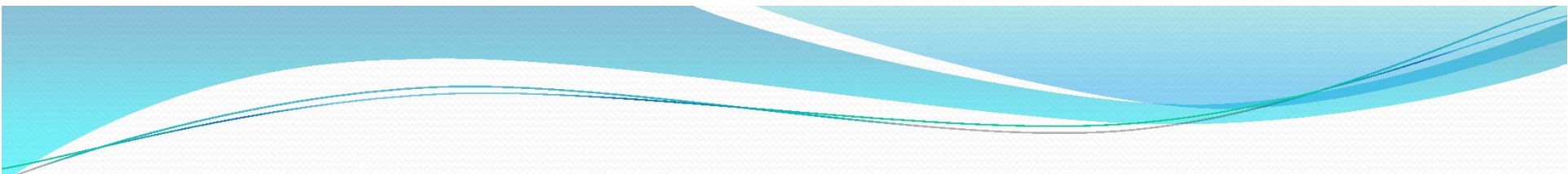
- Cases forwarded by private doctors are not accepted by FSL. Such cases are accepted by the Forensic Science Laboratories only after they are registered in Police Station and forwarded by the Police authority with proper seal and letter.
- Viscera is not needed in snake-bite cases.
- Exhibits in bacteriological Food poisoning cases are being submitted only if it is necessary after getting the examination report for the same from the Public Health Laboratory.

TOXICOLOGY DIVISION

- Drugs are being submitted for Chemical examination if only it is desired to identify the components of the drug as mentioned on its label or if it contains any other poison. Otherwise the drugs should be submitted to the **Food and Drugs Administration, Maharashtra State, Bandra-Kurla Complex, Mumbai – 51 .**
- The drugs should be submitted in its original container only. Do not transfer it in other container or wrapper.
- It is necessary to submit the poisoning case to the Forensic Science Laboratory **within three months** after the crime has taken place. If a time span of more than three months has elapsed before the submission of the case then the case shall be accepted only if it is submitted along-with a letter from senior authority giving proper justification for the time-elapse.

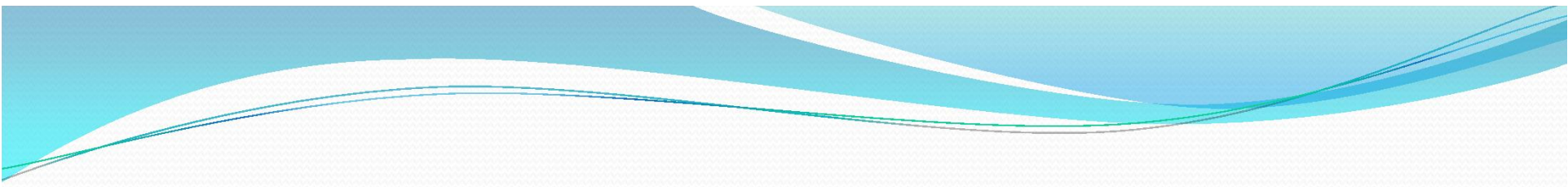
TOXICOLOGY DIVISION

- The bone samples should be first forwarded to the Professor of Anatomy for determination of sex, age, and for examination of whether it is human or not. If poison detection is necessary, a 10cm. long sample of the bone should be forwarded to the Forensic Science Laboratory for chemical examination. Do not send the whole skeleton.



TOXICOLOGY DIVISION

- The Police should submit viscera in Standard viscera boxes or bottles that are provided by the Laboratory to the Medical officers. Do not submit the viscera in plastic bags or uncapped open bottles.



DNA DIVISION

- Paternity
- Maternity
- Murder
- Sexual offences
- Decoity
- Identification



DNA DIVISION

Samples received

- Blood
- Bones- mainly femur, humerus, sternum
- Hair with root
- Teeth
- Tissue
- Blood and semen stained articles

Mode of parcel and proper preservatives for respective samples

Sample	Mode of parcel	Preservative	Remarks
Tissue, muscles, scalp skin etc	Put sample in clean, sterile, plastic or glass container add preservative , bring sample on ice	Normal saline or 4% EDTA , or keep below -20	Bring sample in ice
Blood	Clean sterile glass vial for PM blood For control blood use kit provided by FSL	4% EDTA	Bring sample in ice
Teeth	Air dry all the teeth, put them in dry, sterile container	No preservative	
Bone	Air dry and wrap in clean brown paper Do not macerate or treat with any chemical	No preservative	
Scalp hair	Air dry , put in dry sterile container	No preservative	
Blood stained cloth, scrapings etc	Dry cloths, pack separately in brown paper	No preservative	
Semen stained cloths	Dry cloths, pack separately in brown paper	No preservative	

PHYSICS DIVISION

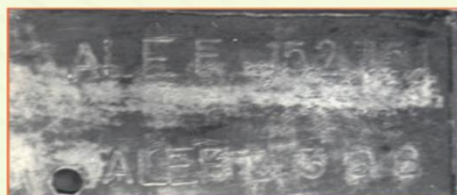
- trace evidence materials like soil, paint, glass, metal, fiber, restoration of erased marks, examination of tool marks etc. in murder, theft, vehicle accident and other cases.
- Examination of documents like currency notes, stamps, stamp papers, passports etc. is also carried out in this division.

DIRECTORATE OF FORENSIC SCIENCE LABORATORIES

PHYSICS & DOCUMENTS DIVISION, MUMBAI

CHASSIS NUMBER RESTORATION

The m/truck was stolen and it was used by accused after changing the chassis number. With the use of chemical reagents original number beneath present number was restored.



← Heavy Scratches and Dent mark

Erased filled in chassis number on stolen M/Truck.

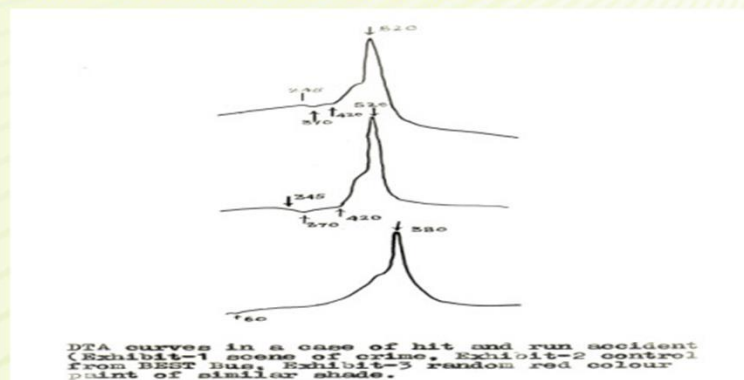


← Restored Numbers

After chemical restoration

DIFFERENTIAL THERMAL ANALYSIS (DTA)

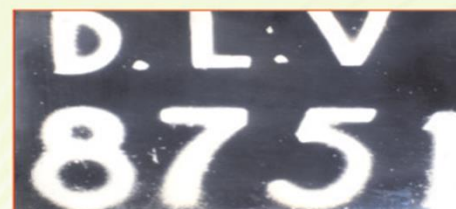
The BEST bus dashed a car in an attempt of hit and run accident. Transferred red color was collected from the car tallies with the control red color of the bus.



Characteristic DTA curves in case of hit and run accident
(Exhibit -1 scene of crime, Exhibit-2 control paint of BEST bus, Exhibit-3 random red color paint of similar shade)

RESTORATION OF VEHICAL REGISTRATION NUMBER

A car was stolen from west Bengal and was operated in new Delhi by changing the registration number. The original registration no. was obtained beneath altered number after restoration.



AS RECEIVED

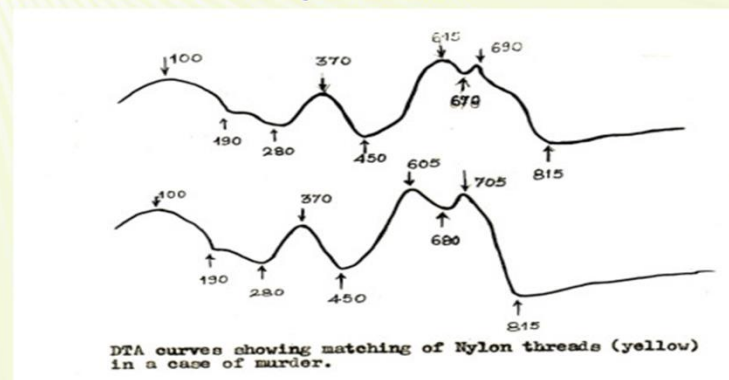


AFTER RESTORATION

(The original number was WBJ 4527)

DIFFERENTIAL THERMAL ANALYSIS (DTA)

The Nylon thread collected from the homicidal strangled victim 's neck at the time of autopsy tallies with nylon rope seized from the accuser's possession.



Characteristic DTA curves in case of Stagulation
DTA curves showing matching of nylon threads (yellow) in case of murder by strangulation.

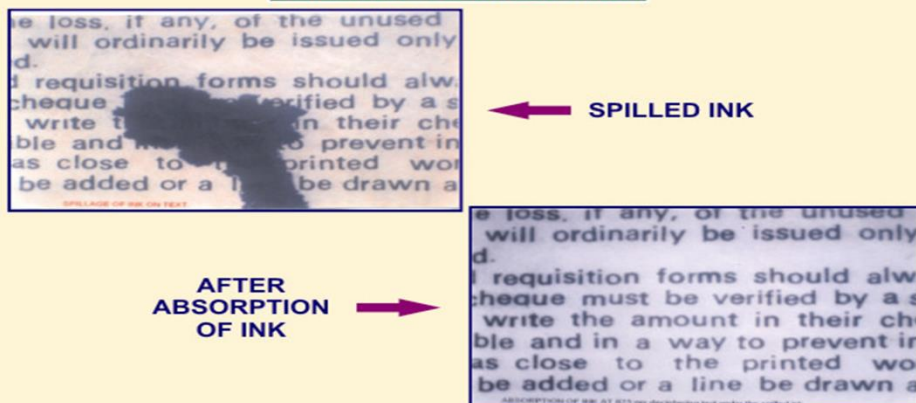
DIRECTORATE OF FORENSIC SCIENCE LABORATORIES

PHYSICS & DOCUMENTS DIVISION, MUMBAI

OBLITERATION

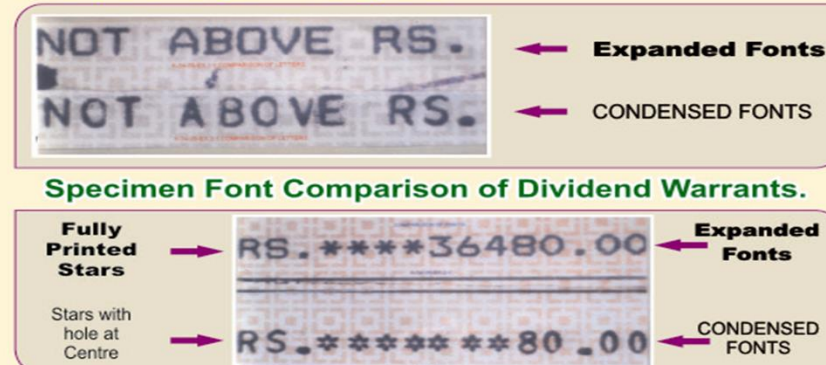
The attempt was made to spoil the text by spilling ink on the matter. The spilled ink was completely absorbed in infra red light at 823nm under VSC 5000.

SPILLAGE OF INK ON TEXT



COMPARISON OF DIVIDEND WARRANTS

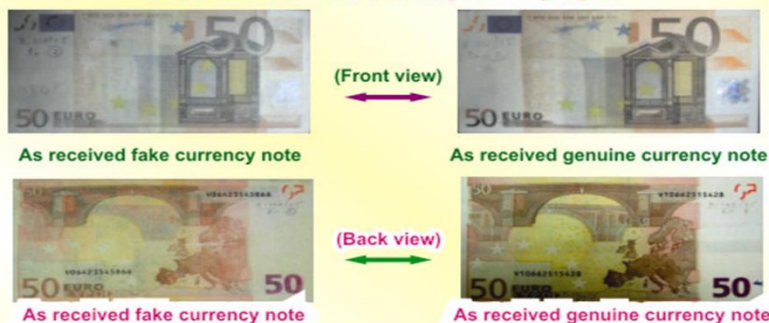
A Renowned Bank issued yearly Dividend Warrants of Rs. 80/- for their Shareholders. The accused used the same Blank Format for forging and prepared higher amount Dividend Warrants, thereby making loss to said Bank. The Letters and Digits were compared under Vsc5000, showed remarkable differences in Fonts of Letters and Digits of Forged with Originals.



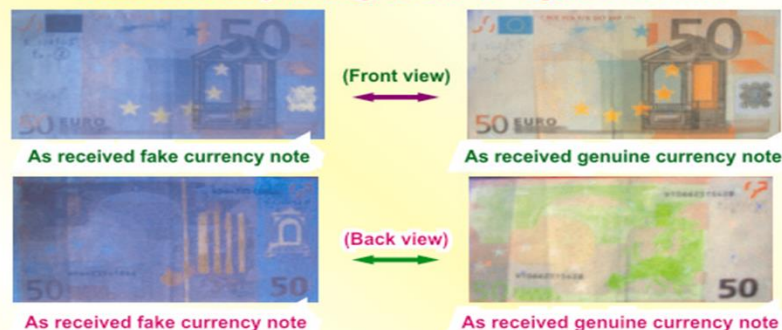
COMPARISON OF FOREIGN CURRENCY NOTES (EURO)

A Nigerian person was arrested while using fake Euro currency notes for shopping at shopping mall. When the currency notes were compared under VSC-5000 with genuine currency note it was found that they were counterfeited.

Difference in printing in daylight



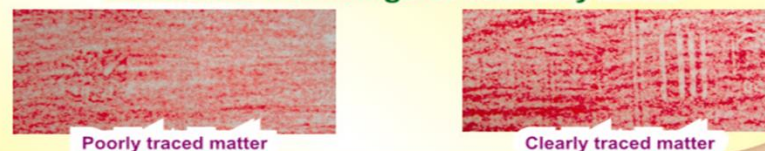
Difference in printing under uv light at 365nm



Difference in printing under transmitted light



Difference in tracings of currency notes





PROHIBITION & EXCISE DIVISION

Detailed reporting on sample of illicit liquor wash in possession offences and blood alcohol in consumption offences under Bombay Prohibition Act. Alcohol assay of Excise samples are done.

DIRECTORATE OF FORENSIC SCIENCE LABORATORIES

PROHIBITION AND EXCISE DIVISION, MUMBAI

Different types of samples containing Ethyl Alcohol and Methyl Alcohol are tested in this division



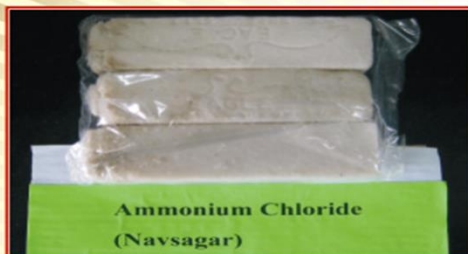
illicit Liquor



Whisky, Rum, Gin, Vodka (IMFL)



Black - Gur



Ammonium Chloride (Navsagar)



Blood Samples



Toilet Preparations



Toddy



Wash (Rasayan)



Country Liquor



Wine



Beer



French Polish



Medicinal Preparation

GUIDELINES TO THE POLICE OFFICER

Precaution to be taken while collection and sending liquor wash samples to this laboratory :

- Sample should be sent in dry and clean bottle.
- Minimum quantity to be sent: 180ml
- Panchas signature on Neck and label
- Accused Name
- Official seal, police station label, C. R. No. Section No.
- Police Officers Signature
- Name of sample
- Forwarding letter in duplicate describing all above points with copy of seal
- In Toddy and wash sample, preservative as copper sulphate should be added.
- Black Gur and Navsagar should be wrapped in polythene bag and then sealed in Brown paper.

New Emerging Trends

• Forensic Psychology

- * Lie Detector-
- * Brain Signature Profiling-
- * Narco analysis-



New Emerging Trends

Polygraph (Lie Detector)

Assesses Physiological Responses when the subject is asked to respond to a question related to a crime.

Measures Cardiogram, Blood Pressure, Respiration, Skin Electrical Conductance and subject's attempts to manipulate the test.



Narco analysis

- Not a scientific method, but helps in getting concealed information from an accused.
- Used in crimes of large social interest.
- Administration of Barbiturates like sodium pentothal in a strictly controlled environment in the presence of Medical Professionals.
- Aim is to reduce the person's attempt to inhibit his/her own speech, action & other behaviors.
- Combination of hypnosis with narcosis is a method of detection of deception.
- Memory recovering technique, an art of eliciting intimate details by stimulating the recall of suppressed memory through interview

Brain Signature Profiling

Assesses Electrical Responses (using EEG) from the brain when statements related to the crime are presented.

Tests for the presence or absence of a person's involvement in a crime (Experiential Knowledge).



GUIDELINES TO POLICE OFFICERS

- The referral needs to be from an officer of at least the rank of Deputy Commissioner (DCP) or Superintendent of Police(SP).
- All the important documents related to the case including FIR, panchanama, Medical Forensic reports, Statements of subjects & significant others, Photographs etc. should be submitted along with the referral.
- A case will be taken for evaluation only on the date on which there is an appointment for the same as communicated to the investigating officer.
- Only those subjects who are specified in the appointment letter should be brought for evaluation, need to be present on the day of appointment.

GUIDELINES TO POLICE OFFICERS

- A court permission addressed to the Director, DFSL, Kalina, Mumbai has to be obtained by the Investigating Officers for conducting any Psychological evaluation.
- A court permission for Narco-analysis will be treated only as permission and hence is not a binding upon the laboratory to conduct this test.
- A case of evaluation will be accepted only if the referral and the case fulfill all the procedural requirements of the laboratory.
- Only those subjects who are willing to give a written informed consent can be taken up for any kind of Psychological evaluation and also for each individual test.



Cyber Forensics

**‘Discovery , Analysis, Reconstruction of Evidence
extracted from any Computer System, Network, Media &
Peripherals’**

or

**‘Preservation, Identification, Extraction and
Documentation of Computer Evidence’**

or

‘Recovering Information the naked eye can no longer see’

**It is the application of Computer / Mobile SIM Card /
Credit Card investigation and analysis.**

DIRECTORATE OF FORENSIC SCIENCE LABORATORIES

CYBER FORENSICS DIVISION, MUMBAI

CYBER FORENSICS



Cyber Forensics Definition

The process of Acquiring, Analyzing and Documenting digital evidence to help Law Enforcement Agencies.

Cyber Forensics Steps

- Identification - identify the media to be seized.
- Seizure - use the right technique to seize media.
- Acquisition - making a forensic duplicate of media.
- Authentication - validation of forensic duplicate.
- Analysis - techniques to look for evidence.
- Presentation - putting together all the findings.
- Preservation - storage of the suspect media.

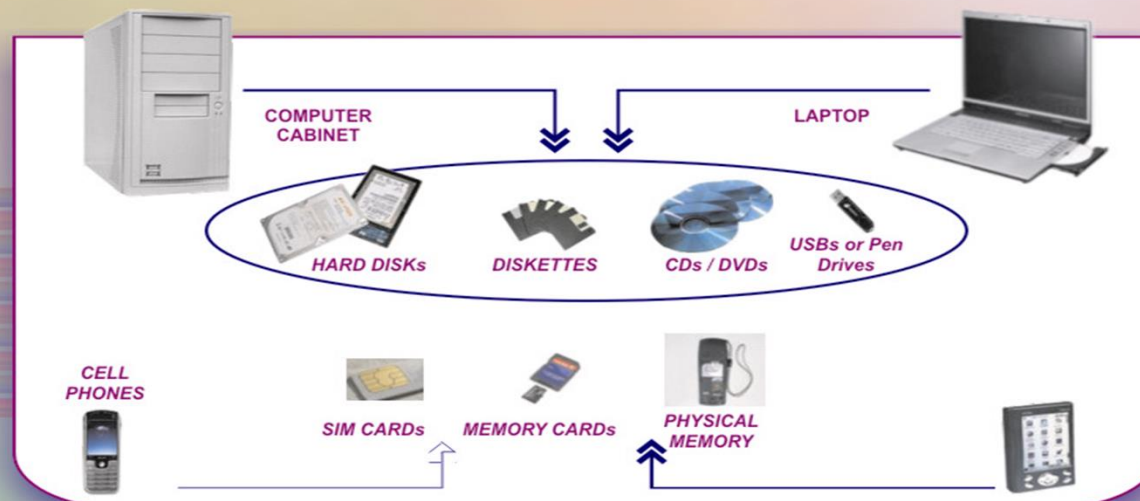


Common types of Cyber Crimes

- Financial Crimes
- Sale of illegal articles
- Intellectual Property Crimes
- Forgery
- Cyber Stalking
- Cyber Pornography
- Online Gambling
- Email Spoofing
- Cyber Defamation

Few Famous Cases

- Navy War Room Information Leakage - Espionage
- New Delhi Parliament Attack Case - Terrorism
- 9/11 World Trade Center attack - Terrorism
- Central Excise Case - Revenue Fraud
- ENRON - Financial Fraud Case



Cyber Forensics

Investigation of computer related crimes like hacking, sending threatening or obscene e-mails, stealing or deleting of important data, credit cards crimes, cheating, money laundering, morphing of photographs, using computers as a helping tool for committing bigger crimes.



Cyber Forensics

- After securing the scene document everything in and around:
 - Take Photographs
 - Draw Sketches if necessary
- Photograph every item before it is seized with time/date stamps
- Photograph documents/files on the monitor if PC is on



Occupant Interview

- Who owns / controls the items being seized
- Names (login) and passwords
- Encryption if present on certain files/folders
- Files of interest
- E-mail accounts their passwords
- Internet service provider(s)
- Storage out of the crime scene if present
- Hidden storage devices

What do we seize?

CPU cabinets

Pen Drives

Modems

External drives

Digital cameras

Back up tapes

PCMCIA cards

Hard disks

CDs

DVDs

Wireless network cards

Floppy disks

Memory sticks

Memory cards

Embedded CPU, Monitor

Mobile phones

Smart phone

Laptops

Tablet PCs Manuals

Other peripheral devices

While Seizing..

If machine is on try to:

- Get passwords
- Figure out the system configuration
- If networked, collect related data
- Determine the Boot sequence
- Collect volatile data
- If the monitor is on and the screen is blank, or in “sleep” mode, or a screen saver is visible:
 - Move cursor keys
 - Photograph the screen and information displayed

While Seizing..

If machine is ON

try to:

- Get passwords
- Figure out the system configuration
- If networked, collect related data
- If the monitor is on and the screen is blank, or in “sleep” mode, or a screen saver is visible:
 - Move cursor keys
 - Photograph the screen and information displayed

- 
- Then Pull the cord
 - Open the Cabinet and document the following:
 - **Components (processor, memory, cards)**
 - **Hard drives (the device model, serial- number, Size)**
 - If a laptop
 - **remove batteries**
 - **identify make, serial- number**
 - Document everything
 - If machine is off:
 - Document system configuration
 - Disconnect all drives – except Floppy/CD-Rom drive
 - Documenting / labeling connections
 - Ensure all drives are empty

Storage and transport of evidence.

Tag and number every evidence

Photograph evidences at original location and subsequently after tagging

Bubble wrap

Anti-static bubble wrap for magnetic devices

Place computer securely on the floor of the vehicle where the ride is smooth.

Avoid radio transmissions/Electromagnetic emissions in the vicinity of evidence.

Wave shield bags for mobile phones if found in on condition.



New Emerging Trends

- **Forensic Acoustics**

- * **Speaker Identification-**

- * **Tape Authentication-**

Tape and Video Authentication System



DIRECTORATE OF FORENSIC SCIENCE LABORATORIES

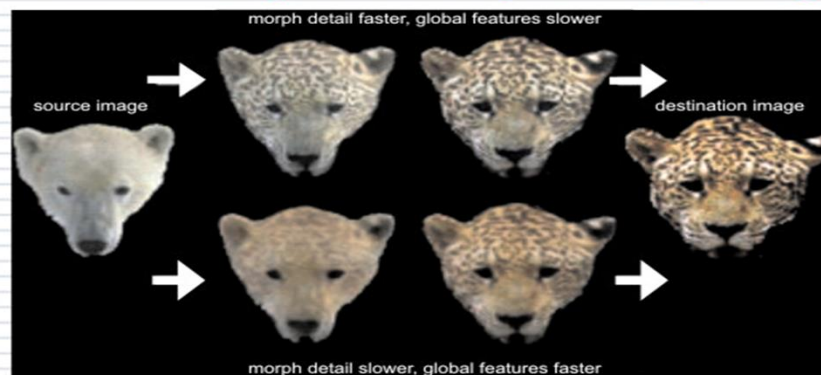
TAPE AUTHENTICATION DIVISION, MUMBAI

TAPE & VIDEO AUTHENTICATION

Video Authentication

- To determine whether or not a tape has been edited, tampered with, or altered in any way.
- Video authentication is a process that is used to ascertain the trustworthiness of a digital video, in other words, a video authentication system ensure the integrity of digital video, and verifies that the video taken into use has not been tampered.

Video Analysis Example - Morphing



Morphing is technique used for transforming one form of image to other form image.
e.g. In above figure image of "fox" is converted to image of "Leopord"

Speaker Identification

Voice of each individual is “unique”

- When we speak there are vibrations in our vocal cords.
- Because of such vibration a frequency is generated.
- The frequency generated is unique. Hence each individual possesses its own unique frequency when they speak.
- An individual is identified on the basis of various parameters.

The parameters are as follows.

Pitch.

Energy.

Spectrogram (A Spectrogram is three dimensional representation of “voice” i.e.time,frequency and intensity).

Frequency.

Speaker Identification

- For speaker identification there are two samples, one is suspect voice and another is control voice.
- First both the samples are listened carefully and then analyze both of the samples under Software called **“Computerized Speech Lab”(CSL)**.
- The parameters such as pitch, energy, spectrogram etc. under CSL are analyzed.
- Finally considering all an individual is identified on basis of his/her voice.



Guidelines for police

- An accurate transcript of the recorded conversation should be first made & made available to the laboratory along with the case paper.
- The recording of specimen sample should be performed in presence of two independent witnesses.
- Reasonably quiet environment should be maintained. The microphone should be placed about 30cms from the mouth of suspect.
- If the suspect is not cooperative it can be done by court order if necessary.
- The investigator should make all efforts to eliminate as much background noise as possible by not playing TV, radio, etc.
- The question and specimen sample should contain same text.



THANK YOU