What is secret writing???

• Secret writing is any writing which is not visible or readable by naked eyes.

• It can only be deciphered under an appropriate light source or equipment or by heating or on suitable treatment with a chemical.
Who use secret writing???

- Prisoners
- Criminals
- Terrorists
- International spies
- Intelligence department
- Drug dealers
Methods of secret transmission of data

• Using invisible ink
• Miniature writings
• Latent photographs
• Cryptography
• Steganography
Invisible inks

• Also called sympathetic inks, which are colorless in nature and that cannot be seen until it is treated with heat, vapor or chemicals.

• Such inks may include body secretions (saliva, urine, perspiration), lemon juice, orange juice, onion juice, milk, chemicals, soap solution, medicinal solutions etc.
**Miniature writings**

• The secret messages may be sent in form of a micro text.

• Even a photograph bearing small dots of inconspicuous size and shape may carry all the necessary information of secret messages.
Latent photograph

- A secret message may be conveyed in the form of a latent image on photographic bromide paper.

- The recipient develops and fixes it to read the message.

- Such documents should be carefully handled as there are great chances of their destruction as soon as it exposes to light.
Cryptography

• Cryptography is the science of creating and deciphering the codes.

• In cryptography, a cipher (an algorithm) is used for encrypting and decrypting any information.
• **Encryption**: process of transforming any information or data into codes or any unreadable form.

• **Decryption**: process of converting a secret code or encrypted data back into its original readable form.
10  30  40  50  60  70  80  90
20  30  40  50  60  70  80  90
40  50  60  70  80  90  80  90
60  70  80  90  80  90  80  90
80  90  80  90  80  90  80  90
100 200 300 400 500 600 700 800 900
200 300 400 500 600 700 800 900
400 500 600 700 800 900 800 900
600 700 800 900 800 900 800 900
800 900 800 900 800 900 800 900
1000 2000 3000 4000 5000 6000 7000 8000 9000
2000 3000 4000 5000 6000 7000 8000 9000
4000 5000 6000 7000 8000 9000 8000 9000
6000 7000 8000 9000 8000 9000 8000 9000
8000 9000 8000 9000 8000 9000 8000 9000

1993  4723  6859  7085  9433

3  10  1993
Meaning of 15 52 15 60 58 30???

15- S
52-U
15-R
60-B
58-H
30-I
• 38133014, 3813, 1845182934,

**MET ME AFTER**

390830, 152828596405

**THE SCHOOL**
Steganography

• It is an act of hiding the information or writing behind any text or picture.

• The word Steganography is derived from two Greek words “Stegnos” meaning covered or protected and “Graphein” means to write.

• The messages are hidden in such a way that no one apart from the sender and intended recipient can read that.
Preliminary examination of paper

- Condition of the paper.
- Color of the paper should be observed.
- The document should be examined under ordinary light, transmitted light or grazing light at various angles.
- The indentation marks are examined.
- The documents should be photographed before conducting the detailed examination.
Examination and decipherment of invisible ink

- Secret writings made using body fluids can be deciphered under UV light. The differential absorption and reflection of UV rays will help in reading the secret message.

- Some chemicals also give fluorescence under UV light.
Invisible inks
• Messages written with orange or lime or onion juice can be conveyed by heating the document. Certain salts or organic compounds can also be examined using the same technique.

• If the writing is made with secret ink bearing heavy metals, it can be read under IR light or x-rays.
• Geiger counter technique can be used to detect the text written with any radioactive material.

• Writings with silver nitrate solution becomes evident when exposed to strong light.

• The differential absorption of iodine fumes at the place of writings will reveal the secret text.
With lemon juice
With orange juice
With saliva

<table>
<thead>
<tr>
<th>Microbes</th>
<th>Raw Materials</th>
<th>Crude Protein % (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirulina maxima</td>
<td>CO₂, NaHCO₃, sunlight</td>
<td>60</td>
</tr>
<tr>
<td>Scenedesmus acutus</td>
<td>CO₂, sunlight</td>
<td>53</td>
</tr>
<tr>
<td>Rhodopseudomonas capulata</td>
<td>Industrial wastes, sunlight</td>
<td>60</td>
</tr>
<tr>
<td>Cellulomonas</td>
<td>Bagasse</td>
<td>85</td>
</tr>
<tr>
<td>Methylophilus methylotrophus</td>
<td>Methanol</td>
<td>70</td>
</tr>
<tr>
<td>Candida lipolytica</td>
<td>n-Alkanes</td>
<td>65</td>
</tr>
<tr>
<td>Cautilis</td>
<td>Ethanol, sulphite waste liquor</td>
<td>50</td>
</tr>
<tr>
<td>Kluyveromyces fragilis</td>
<td>Cheese whey</td>
<td>50</td>
</tr>
<tr>
<td>Saccharomyces cerevisiae</td>
<td>Molasses</td>
<td>30</td>
</tr>
<tr>
<td>Cephalosporium cichorians</td>
<td>Cassava starch</td>
<td>50</td>
</tr>
<tr>
<td>Chaetomium cellulolyticum</td>
<td>Agriculture and forestry wastes</td>
<td>45</td>
</tr>
<tr>
<td>Paezioniomyces variotii</td>
<td>Sulphite waste liquor</td>
<td>35</td>
</tr>
</tbody>
</table>

Candida species. In Britain, brewers' yeasts have made a contribution to the diet for many years, the excess microbes being sold as animal feed or produced to form...
Miniature writings

• Such type of writings are first examined using magnifying lens under normal lighting conditions to locate the traces of miniature writings, if any.

• The writings will be clearly evident under stereomicroscope which can further be enlarged using sophisticated instruments.
Latent photographs

• If an IO encounters any packet containing some material or paper wrapped in black or brown paper, it should be immediately sent to the laboratory for examination.

• Such packets should be opened under the dark conditions.

• If a piece of photographic paper or film is found, then should be first examined under the microscope.

• The paper should then be developed using appropriate developer and fixers to reveal the secret text or markings.
Codes and ciphers

- Any document bearing any text in unreadable format should first be photographed in its original form.

- There are different techniques, information, books available for coding and cipher. The expert should have sufficient knowledge about handling such difficulties.

- In case of some hidden text, attempts are being made for search and seizure of the computer from which that secret message has been originated.
પૂર્વ સર્વ સદા સર્વ લોકોની સાથે હોવાથી માર્ગ પણ સુધી થાય છે. ઈશારોની માનેલ અંત્યની સફળતા સુધી સારી હાલાતી રમાંડાડ કરી રહ્યું છે. એક પ્રતિભા દીકર્ણ સામાજિક અંગેસાન સ્વાભાવિક અંગેના વિકાસ અદ્ભુત થાય છે. સર્વ પ્રતિભા માનેલ અંત્યની સારી હાલાતી રમાંડાડ કરી રહ્યું છે. એક પ્રતિભા દીકર્ણ સામાજિક અંગેસાન સ્વાભાવિક અંગેના વિકાસ અદ્ભુત થાય છે.
Instrumental techniques

- Hand Magnifiers
- Stereomicroscope
- Vispec-5000
- Projectina
- UV lamp
- Video Spectral Comparator (VSC)
- Infra red filter camera
- ESDA
### Instruments vs. Secrete writing

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Secrete writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereo microscope</td>
<td>Disturbed surface, Miniature writing</td>
</tr>
<tr>
<td>U.V. lamp</td>
<td>If ink shows fluorescence under UV</td>
</tr>
<tr>
<td>I.R. photography or X-Ray</td>
<td>If heavy metal is used</td>
</tr>
<tr>
<td>Geiger counter</td>
<td>If radioactive substances are have been used</td>
</tr>
<tr>
<td>ESDA</td>
<td>Indentation mark of secret writing</td>
</tr>
<tr>
<td>AAS, FTIR, AES</td>
<td>Composition of secret ink</td>
</tr>
</tbody>
</table>
Charred Document?

- The document which is partially or completely burnt.
Contd...

• Sometimes the information present in the burnt document is of great importance for investigation.

• Charred documents are very fragile and are easily destroyed in the mailing process. So, such type of document requires special attention while collection and examination.
Effect of heat and temperature on paper

• Excessive heat leads to loss of moisture from the paper surface resulting in extreme dryness.

• Charred document becomes blackened and brittle from being exposed to high heat.
Furthermore, paper tends to curl because the different expansion of burnt fibers on both sides of paper.
Contd...

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Color/effect on paper</th>
<th>Writings</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 deg C</td>
<td>Brown</td>
<td>Legible</td>
</tr>
<tr>
<td>280 deg C</td>
<td>Black</td>
<td>Invisible</td>
</tr>
<tr>
<td>350 deg C</td>
<td>Dark Grey</td>
<td>Slightly Visible</td>
</tr>
<tr>
<td>400 deg C</td>
<td>Cream white</td>
<td>Visible</td>
</tr>
</tbody>
</table>
Handling, Collection and transportation of charred document

A. For documents found in open area

• Place a box or open end container (appropriately labeled) over the charred evidence to prevent it from being destroyed or blown away.

• The charred contents should be carefully lifted using thin cardboard sheet or metal plate and should be placed in cushioned cardboard box.
Contd...

- Light weight absorbent cotton or tissue paper should be used for providing proper cushioning to the charred evidences.

- It is usually not advisable to use tweezers for picking up the fragments.
B. More fragile documents

• Sometimes, the charred documents are so much fragile that they cannot be removed from the site safely. It is advisable to lightly spray a stabilizing mist of 2-3% of polyvinyl acetate on the surface of the document to impart sufficient tensile strength to permit later removal.
Contd...

• To straighten the curled edges, it should be kept in humidifying chamber for few days.
C. Fragments found in waste baskets or other open container

• These documents should be transported to the laboratory in the same container in which they were found. If necessary, use light packing of cotton wool around the chars.
Contd...

- The charred fragments present in file drawers should be transported by removing the drawers from the cabinet.

- No forceful attempt should be made as it can destroy the document.
D. Water soaked documents

• Such type of documents are encountered at the scene of fire. They may either be water soaked or both burnt and water soaked.

• Such documents should be lifted by inserting a fine wire screen beneath them for allowing water to run off from the top of the documents.
Contd...

- Thin metal plate is not recommended for lifting of these documents as they tend to slide on the surface of the plate.
Stabilization of charred documents

• The charred documents can be fixed either between two transparent sheets or on transparent glass sheet to carry out examination.

• 2-3% polyvinyl acetate in acetone (other organic solvent in case of ball point pen writings) should be sprayed on charred mass.
Contd...

• 1.2% boric acid with 0.4% sodium hydroxide is sprayed lightly on charred mass. This makes it flexible. After that 10% formalin solution is sprayed which helps in unfolding the charred documents.

• To prevent charred documents from adhering, the glass plate is treated first with 1% solution of silicone in petrol ether.

• The charred mass should be separated from one other by treating with sufficient quantity of acetone.
Methods for decipherment

A. Contact print photography

• Place the document between two unexposed photographic plates tightly and keep the arrangement in light proof box for 15 days. The plates were later developed to decipher the text.
B. By reflected light

- The document is examined under ordinary light at different angles. The writings are made visible as the reflecting power of the surface has been modified.

C. Using oblique light

- The indentation marks on the charred documents can be best examined under oblique lighting condition.
Contd...

D. UV & IR photography

- This depends upon the ink composition and extent of charring.

E. Treatment with chloral hydrate

- The charred text can be deciphered and photographed by spraying 20% chloral hydrate in ethyl alcohol.
F. Treatment with silver nitrate

- The document is kept in 5% silver nitrate solution in water. Absorption of silver nitrate makes the writings visible depending upon presence of reducing agents present in the ink.
H. Treating with alcohol glycerin emulsion

- The charred writings can be deciphered by placing the document in alcohol glycerin emulsion made by mixing 5 parts of alcohol in 3 parts of glycerin and 2 parts of distilled water.