Documents

- "Questioned Documents" are documents that are suspected to be forgeries.
- Scientific analysis can sometimes determine whether another person’s handwriting was impersonated, how long ago something was written, whether something was written on a specific typewriter or with a certain pen, or if some writing was altered or obliterated.

Introduction

- Any object with handwriting or print whose source or authenticity is in doubt may be referred to as a questioned document.
- Document examiners apply knowledge gathered through years of training and experience to recognize and compare the individual characteristics of questioned and known authentic writings.
- For this purpose, the gathering of documents of known authorship or origin is critical to the outcome of the examination.
- The uniqueness of handwriting makes this type of physical evidence one of the few definitive individual characteristics available.

Character of Handwriting

- Document experts continually testify to the fact that no two individuals write exactly alike.
- Many factors comprise the total character of a person’s writing.
- The early stages of learning handwriting are characterized by a conscious effort to copy standard letter forms.
- However, as writing skills improve, nerve and motor responses associated with the act of writing become subconscious.
- The unconscious handwriting of two different individuals can never be identical.

Handwriting

- Every person has unique handwriting, and everyone’s handwriting changes over time.
- A signature from ten years ago will be different from one today. This fact can be used to fix the date of a document or a forgery.
- If someone suspects that a document was forged, the date that it was signed may not correspond to the appearance of the signature at that particular time, especially if the forger took the sample from an earlier time.
Handwriting and signature samples are compared side-by-side using visual and often microscopic analysis of the individual characteristics present. The comparison can include factors such as:
- height ratios,
- slant,
- proportions,
- pressure,
- speed and
- line quality.

Only original documents are to be used, if possible, as photocopies and facsimiles often lose much of the important details present in the original. Sometimes individuals may try to disguise their handwriting by:
- writing very quickly or very slowly
- adding unnecessary embellishments to letters,
- heavy pen pressure, or any combination of these.

Generally to detect whether someone disguised their handwriting, they are made to write the suspicious signature many times, or to write a questioned paragraph as dictated onto a piece of paper without showing the original writing.

Handwriting Exemplars
- The collection of an adequate number of known writings (exemplars) is most critical for determining the outcome of a handwriting comparison.
- Known writing should contain some of the words and combination of letters present in the questioned document and be adequate in number to show the range of natural variations in a suspect's writing.
- The writing implement and paper should also be alike.
- The writing of dictation and several pages may serve to minimize attempts at deception.

Character of Handwriting
- No single handwriting characteristic can in itself be taken as the basis for a positive comparison.
- The final conclusion must be based on a sufficient number of common characteristics between the known and questioned writing samples.
- There are no hard and fast rules for a sufficient number of personal characteristics; it is a judgment call made by the expert examiner in the context of each case.

Indentations
- When a sheet of paper is written on, impressions are carried through underneath.
- There are two methods which are used by forensic document examiners:
  - Oblique lighting
  - ESDA (Electro-Static Detection Apparatus)
- They are often used as a source of identification in anonymous note cases and in detecting alterations.
• **Oblique Lighting**
  - method used to light the document from different angles. The indentations in the paper would cast shadows that could be recorded by photography.
  - A combination of multiple exposures and a moving light source would fill in most of the available indentations and reproduce the original writing.
  - Often effective, but oblique lighting techniques are unable to recover microscopic indentations—those which occur three or four sheets down.

• **ESDA**
  - writing can be revealed from three, four, or more pages beneath the original—sensitive
  - With ESDA, a suspect page is placed upon a porous bronze plate and covered with a cellophane material.
  - A vacuum is applied through the plate to pull the page and the cellophane into firm contact.
  - The document and cellophane are then subjected to a high voltage static charge by waving a wand over the surface.

  - A charge accumulates in the indentations of the document.
  - Black toner, similar to that used in photocopiers and laser printers is then cascaded over the cellophane.
  - The highly charged areas retain greater amounts of toner, resulting in a deposit of toner aligned with the indentations on the page.
  - The image of the document can be preserved by photography, or by placing an adhesive backed clear sheet over the cellophane while it is still being held in place.

**Typewriters and Printing Devices**

• The two requests most often made of the examiner in connection with the examination of typewriters and printing devices are:
  - Whether the make and model of the typewriter and printing devices used to prepare the questioned document can be identified
  - Whether a particular suspect typewriter or printing device can be identified as having prepared the questioned document.
• In order to do this, the individual type character’s style, shape, and size are compared to a complete reference collection of past and present typefaces.

• **Typewriters**
  - Typewriters have often been used to write anonymous notes, threatening letters, or alter contracts.
  - These days, however, computers and printers with changeable fonts are being used.
  - Typewriters, especially older ones, develop their own unique characteristics over time.
  - Some of the characteristics that are taken into account are letter wear, type alignment and spacing, ink density, and pressure.

**Characteristics From Use**

• As is true for any mechanical device, use of a printing device will result in wear and damage to the machine’s moving parts.
• These changes will occur in a fashion that is both random and irregular, thereby imparting individual characteristics to the printing device.
• The document examiner has to deal with problems involving business and personal computers, which often produce typed copies that have only subtle defects.
• Another area of investigation relates to the typewriter ribbon, which may contain type impressions.
• Typewriters and printer ribbons can be rewound to show the image of each letter.
• A standard document is produced by inserting a clean sheet of paper into a suspect machine and typing the material in question several times.
• The original documents are almost always needed for a detailed comparison, unless there are very obvious differences.

Digital Technology
• In the cases of photocopiers, fax machines, and computer printers an examiner may be called on to identify the make and model of a machine or to compare a questioned document with test samples from a suspect machine.
• A side-by-side comparison is made between the questioned document and the printed exemplars to compare markings produced by the machine.
• Examiners compare transitory defect marks, fax machine headers, toner, toner application methods, and mechanical and printing characteristics.

Photocopiers
• Sometimes photocopied documents can contain distinct marks that can identify the source of the original document, the model of the machine used, or the specific machine that was used.
• Photocopiers can leave "trash" marks on paper, which are caused by dirt and scratches on the glass, lenses, mirrors, and drum of the machine.
• Analysis of the type of paper and toner on the photocopied document can also be useful.

• In some cases, this information can also help to identify the make and model of the copier by searching through reference files.
• Because a drum of a photocopier can take up to three copies to complete one revolution, it is advisable to make about ten copies of plain paper to use as a control.
• The control and the suspect document can be compared side-by-side for any marks.
• If more than one photocopier or successive copies were involved, the results will be far less conclusive.

Alterations
• Document examiners must deal with evidence that has been changed in several ways, such as through alterations, erasures, and obliterations.
• Erasures by rubber erasers, sandpaper, razor blade, or knife to remove writing or typing disturb the fibers of the paper and are readily apparent when examined with a microscope.
• If an alteration is made to a document with ink differing from the original, it can sometimes be detected due to differences in the luminescence properties of the inks.

• Obliteration of writing by overwriting or crossing out to hide the original writing can be revealed by infrared radiation, which may pass through the upper layer of writing while being absorbed by the underlying area.
• Digital image processing is the method by which the visual quality of digital pictures is improved or enhanced.
• Digitizing is the process by which the image is stored into memory.
Alterations

- An image can be scanned by scanner or a digital camera and converting the image by computer into an array of digital intensity values called pixels.
- Once the image has been digitized, an image editing program can be used to make adjustments such as lightening, darkening, color, and contrast controls.
- Using a photo editor on a digitized image can reveal information that has been obscured.

Other Problems

- Infrared photography and reflecting light at different angles are sometimes successfully used to reveal the contents of a document that has been accidentally or purposely charred in a fire.
- In certain situations, indented writings (partially visible depressions underneath the visible writing) have proved to be valuable evidence.
- It may be possible to determine what was written by the impressions left on a paper pad.

Other Problems

- Applying an electrostatic charge to the surface of a polymer film placed in contact with a questioned document will visualize indented writings.
- A study of the chemical composition of the ink used on documents may verify whether or not known and questioned documents were prepared by the same pen, and the paper itself may be analyzed.

Other Problems

- Infrared examination may involve using special light filters and films for photographic imaging, or by using a machine designed for Video Spectral Comparison (VSC).
- Another method is to microscopically compare the characteristic marks left in the ink by ball-point pens.
- Thin Layer Chromatography (TLC) is also used to compare ink, and although a destructive process, it is a definitive one.

A special instrument for document examination is a UV/IR spectral comparator which makes use of electromagnetic wavelengths and various filters to differentiate inks and reveal hidden material on documents.

On the left is a 35mm camera coupled to the microscope. On the right is a Ken-A-Vision 7600 Flex Camera which captures a digital video image through a microscope eyepiece and connects to computer where the image is displayed, captured as a still image, examined, stored, and used in illustrated reports and demonstrative exhibits.