Document & Handwriting Analysis
Questioned Documents:

Any documents whose source or authenticity is uncertain. This includes checks, letters, wills, contracts, records, tickets, and money. It also includes handwriting, paper and ink analysis.
Forensic Document Examination

analysis and comparison of questioned documents with known material in order to identify the author or origin of the questioned document, (whenever possible)
Document Examiners
Question ...

Is the signature genuine? Guided?
Is the document forged?
Is the same person the author of several documents?
Did the doctor come back later and alter the medical records?
What is written under the crossed out portion of the writing?
Are both documents typed on the same machine?
What type of printer, or what printing process was used to print the document?

Are there perforations, folds, staple holes, or other physical clues on the document?

Are there erasures on the document?

What was originally written before the alteration or under the obliteration?
Related Fields

Historical Dating – the verification of age and value of a document or object
Related Fields

Fraud Investigation – focuses on the money trail and criminal intent
Related Fields

Paper and Ink Specialists – date, type, source, and/or catalogue various types of paper, watermarks, ink, printing/copy/fax machines, computer cartridges
Related Fields

Forgery Specialists – analyze altered, obliterated, changed, or doctored documents and photos
Related Fields

Typewriting Analysts – determine origin, make, and models

Chart 2: Comparison of Dot Matrix Printing Characteristics

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The descender strokes of letters in the questioned documents exhibit a printer defect that is not found in sample documents from the same printer executed over the same period of time.

Note the difference in image quality between the page 3 TTI and those from pages 2 & 4.
Related Fields

Computer Crime Investigators – investigate cybercrime
Paper

Differences

- Raw material
- Weight
- Density
- Thickness
- Color
- Watermarks
- Age
- Fluorescence
1862: US Congress authorized the US Treasury to print "Greenbacks" (paper money not backed by gold or silver)

1865 US Secret Service was established to stop counterfeiting
Counterfeiting

In 1996 the government started adding new security features to our paper money due to the advanced copying technologies that have raised the incidences of counterfeiting.

Watermark: image that does not copy

Hold the note to light and look for a faint image of President Jackson in the blank space to the right of the portrait. The image is visible from both sides of the note.
Counterfeiting

Color shift inks: used in numbers in lower right corner change color when seen at different angles.

Tilt the note to see the numeral 20 in the lower right corner on the front of the note shift from copper to green.
Counterfeiting

- Lines behind the portrait

The clarity and detail of these lines are difficult for scanners and photocopiers to reproduce. These lines often cause a blur, or moiré, during the scanning process.
Counterfeiting

- Enlarged picture has more detail

Before 1996

1996 redesign
Counterfeiting

2003 redesign
(further enlarged picture)
Counterfeiting

- Low vision feature: large dark numbers in lower right corner

![Banknotes with large dark numbers](image)
Counterfeiting

Security thread

Hold the note to light to see an embedded thread running vertically to the left of the portrait. It is imprinted with the text USA TWENTY and a small flag in an alternating pattern, is visible from both sides of the note & glows green when illuminated by ultraviolet light.
Counterfeiting

Microprinting: fine printing that appears as a thin line to the eye

Look carefully (magnification may be necessary) to see the small text USA20 along the border of the first three letters of the blue TWENTY USA ribbon to the right of the portrait and THE UNITED STATES OF AMERICA 20 USA 20 in black in the border below the Treasurer’s signature.
$20 Note
Issued 2003 - Present

All U.S. currency remains legal tender, regardless of when it was issued.

Key Security Features

Security Thread
Hold the note to light to see an embedded thread running vertically to the left of the portrait. The thread is imprinted with the text USA TWENTY and a small flag in an alternating pattern and is visible from both sides of the note. The thread glows green when illuminated by ultraviolet light.

Watermark
Hold the note to light and look for a faint image of President Jackson in the blank space to the right of the portrait. The image is visible from both sides of the note.

Color-Shifting Ink
Tilt the note to see the numeral 20 in the lower right corner of the front of the note shift from copper to green.
Additional Design and Security Features

**Federal Reserve System Seal**
A black seal to the left of the portrait represents the entire Federal Reserve System. A letter and number beneath the left serial number identifies the distributing Federal Reserve Bank.

**Microprinting**
Look carefully (magnification may be necessary) to see the small printed text U/S 20 along the border of the first three letters of the blue TWENTY USA ribbon to the right of the portrait and THE UNITED STATES OF AMERICA 20 USA 20 in black in the border below the Treasurer’s signature.

**Raised Printing**
Move your finger along the note’s surface to feel the raised printing, which gives genuine Federal Reserve notes their distinctive texture.

**Paper**
Federal Reserve note paper is one-fourth linen and three-fourths cotton, and contains red and blue security fibers.

**Color**
The note includes background colors of green and peach. The words TWENTY USA have been printed in blue in the background to the right of the portrait.

**Portrait and Vignette**
The $20 note features a portrait of President Jackson on the front of the note and a vignette of the White House on the back of the note.

**Symbols of Freedom**
The large blue eagle in the background to the left of President Jackson’s portrait is representative of those drawn and sculpted during his time period. The smaller metallic green eagle to the lower right of the portrait is a more contemporary engraving.

**Green 20**
A large green numeral 20 in the lower right corner on the back of the note helps those with visual impairments distinguish the denomination.

**Treasury Seal**
A green seal to the right of the portrait represents the U.S. Department of the Treasury.

**Serial Numbers**
A unique combination of eleven numbers and letters appears twice on the front of the note.

**Series Year**

For more information about U.S. currency visit [www.uscurrency.gov](http://www.uscurrency.gov)
Handwriting analysis involves two phases:

- The hardware – ink, paper, pens, pencils, typewriter, printers
- Visual examination of the writing
Chromatography is a method of physically separating the components of inks.
All inks are not alike. The blue in Bic, Parker, Cross, Pilot and Paper Mate brand pens are all different when passed through chromatography.
12 Basic Characteristics of Handwriting

1. Line quality – flowing letters vs. laborious movements

1. Line quality:
   Smooth: Jack and Jill went up the hill.
   Shaky or nervous: Jack and Jill went up the hill.
   Juvenile or deliberate: Jack and Jill went up the hill.
12 Basic Characteristics of Handwriting

2. Spacing of Word & Letters – spacing in between words and the formation of letters

2. Spacing:

Left margin is even:

Our business in Switzerland is great. We are grossing over one million dollars a year. We know this will double by the next decade.

Left margin is jagged:

Our business in Switzerland is great. We are grossing over one million dollars a year. We know this will double by the next decade.
Angle on left margin:

Our business is growing over the

Angle on right margin:

One million is over the

The growth is doubling by the next decade.
Space between capital letters and small letters:

Jack and Jill went up the hill.

Space between capital letters:

J. P. Stevens

Space between word formations:

Jack and Jill went up the hill.

Size and proportion:
- Height of overall writing: 
  Jack and Jill went to the hill.
- Height of short to tall letters: 
  Jack and Jill went up the hill.

Evidence of diminishing strokes:
Jack and Jill went up the hill.

Evidence of increasing strokes:
Jack and Jill went up the hill.
12 Basic Characteristics of Handwriting

4. Pen lifts & Separations – How one stops writing when forming new letters or words

Removes pen entirely before starting new word:

Jack and Jill went up the hill.

Pen continues on paper close to next word:

Jack and Jill – went up the hill.
12 Basic Characteristics of Handwriting

5. Connecting Strokes – Connecting strokes within letters and words, etc. (Capital letters to lower case)

Do they begin as flourished or embellished?

Do they begin as inflexible and straight?

Do they end flourished?

Do they end abruptly?
6. Beginning & Ending Strokes – Beginning a letter formation or number and where the stroke ends as to location.

6. Does the letter begin at the top of the page? Does it continue to the end of the page? Does it stop or start in the middle?
12 Basic Characteristics of Handwriting

7. Unusual Letter Formations – Backwards letters, capital letters, etc.
8. Shading (Pen pressure) – Pressure and ink width is placed on upward and downward strokes.

8. Pen pressure:
Light:
Jack and Jill went up the hill.

Medium:
Jack and Jill went up the hill.

Heavy:
Jack and Jill went up the hill.
9. Slant – Writing slants to the right, left, straight up & down, combination. Degree of slant (angle can be measured).

Right slant to letters:

Jack and Jill went up the hill.

Left slant to letters:

Jack and Jill went up the hill.
12 Basic Characteristics of Handwriting

10. Baseline Habits – Write along a straight line? Or do lines slope upward, downward, or are bent in the middle?
12 Basic Characteristics of Handwriting

11. Embellishments – Curls, loops, etc.

Any unusual strokes?

My son...
12 Basic Characteristics of Handwriting

12. Placement of Diacritics – Crossing ‘t’, dotting ‘i’, other punctuation marks

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Handwriting Identification

Analysis of the questioned or unknown writing and determination of its characteristics
Handwriting Identification

Evaluation of the evidence, including the similarities and dissimilarities between the “questioned” and “known” writing.
The document examiner must have enough exemplars to make a determination of whether or not the two samples match.
Handwriting

Can change due to

- Age
- Illness
- Fatigue
- Stress
- Injury
- Intoxication
- Drugs
Methods of Forgery

Simulated forgery – one made by copying a genuine signature

EX:

Genuine Signature  Simulated Forgery
Methods of Forgery

Traced forgery – one made by tracing a genuine signature.
Methods of Forgery

- Blind forgery – made without a model of the signature (AKA simple forgery)

The forger signs in the absence of the facsimile of the genuine signature.

EX:

Genuine Signature

Simple Forgery
Types of Forgery

- Check Fraud
  - Forgery
  - Counterfeit
  - Alterations
- Paper Money
  - Counterfeit
- Identity
  - Social Security
  - Driver’s License
- Credit Cards
  - Theft of card / number
- Art – imitation with intent to deceive
  - Microscopic examination
  - Electromagnetic radiation
  - Chemical analysis
- Contracts – alterations of contracts, medical records
Class characteristics may include general types of pens, pencils or paper.
Evidence

Individual characteristics may include unique, individual handwriting characteristics; trash marks from copiers, or printer serial numbers.