

Forensic Document Examination

FORENSIC DOCUMENT EXAMINATION

Principles and Practice

By

Katherine Mainolfi Koppenhaver, CDE

Board Certified Forensic Examiner

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Dedication

*This book is dedicated to two outstanding teachers,
Sr. Mary Frieda Chetelat and Dr. Clarence Terrill.*

Foreword

The field of forensic document examination is one of the oldest disciplines in forensic science. As reported by J. Newton Baker in his book, *The Law of Disputed and Forged Documents*, “forgery was practiced from the earliest times in every country where writing was the medium of communication” (1). Rules for identifying and comparing handwriting can be traced back to Roman law under the Code of Justinian in 539 AD. Thus, handwriting identification and forgery detection predates most of the other forms of forensic science by centuries.

The single leading court case that brought public and legal attention to the field of forensic document examination was perhaps the Lindbergh kidnapping trial in 1935. The testimony of the document examiner, Albert Osborn, demonstrated that Richard Hauptmann was the author of the ransom note. Osborn was the author of a leading treatise on document examination, *Questioned Documents*, published in 1929. The book is still considered to be the bible of document examination and set forth basic principles that document examiners continue to use to this day.

Although document examination has long been recognized as a forensic science discipline, the courts began to scrutinize the legitimacy of handwriting identification in the 1990s. In the 1995 case, *United States v. Starzeczyel* (SSOF. Supp. 1027, SDNY 1995), the court heard testimony criticizing the reliability and scientific foundation of handwriting examinations. The court ruled that the testimony of the document examiner was technical in nature and not scientific. This case, coupled with the Daubert case (*Daubert v. Merrell Dow Pharmaceuticals*, 509 US 579, 1993) setting strict guidelines on the acceptance of scientific forensic evidence, revealed that forensic document examination was a discipline lacking empirical support as a science. The result was a flood of empirical studies in the late 1990s and into the early 21st century supporting the assumptions that document examiners had held for decades. In two studies by Kam et al., it was shown that document examiners were using scientific methods to render opinions that lay persons were unable to render (2,3). One of the more convincing studies supporting the scientific nature of forensic document examination is the work on handwriting identification at the State University of New York’s Center of Excellence for Document Analysis and Recognition (CEDAR). Funded by the National Institute of Justice, the CEDAR computer software program is able to recognize certain features of handwriting and provide possible matches from a handwriting database. Similar to the Automated Fingerprint Identification System for latent fingerprint identification, CEDAR assists document examiners but does not replace them. The CEDAR program proved that there were unique identifiable features to handwriting that can be objectively demonstrated. The result of these empirical studies was the general acceptance of forensic document examination as a scientific discipline in most courts. Daubert challenges still arise but they are rarely successful in omitting the testimony of forensic document examiners.

Currently, practitioners in the field of forensic document examination are striving to create standards and protocols for the examination of documents and the education and training of document examiners through the American Society for Testing and Materials. Further, although guidelines and protocols for examining documents are based on the general principles that nearly every document examiner practices, the standards for education and training of examiners have been met with some controversy and resistance.

Traditionally, document examiners have been trained through apprenticeship with a senior document examiner in a crime laboratory. There are few law enforcement training academies that train forensic document examiners, and the ones that do exist are only of a few days duration. Privately trained examiners face a greater problem. They do not have access to government crime laboratories to become trained like their publicly employed counterparts. Those individuals in the private sector must independently secure access to training and apprenticeship resources unless they are employed as a government examiner. However, because of recent court rulings, standardization and accreditation of certifying boards, there has been an increase in the number of colleges and universities offering coursework in forensic document examination. Although not designed to replace apprenticeship training, college coursework provides a much better educational foundation for those seeking knowledge or a career in document examination than do self-taught learning or brief training courses. Moreover, with the increasing numbers of accredited online college courses, apprenticeship learning can be accomplished as well.

Because of the increase in the number of colleges offering courses in document examination, there is a need for relevant instructional materials and resources. Many excellent textbooks in the field of forensic document examination are available; however, most of these textbooks are not classroom friendly. Published primarily for reference and self-learning, such texts are not necessarily designed for structured academic learning. Academic textbooks are designed to allow material to be learned in one semester, guided by an instructor. *Forensic Document Examination: Principles and Practice* is designed for that purpose.

This volume brings together the foundations of document examination laid down by the recognized treatises on the subject. *Forensic Document Examination: Principles and Practice*, designed as a textbook for an introductory course in forensic document examination, provides for effective structured learning. It embraces the student with an easy-to-read style with chapter questions and case studies. It is succinct and concise, yet comprehensive in scope for an introductory course. It will help fill the need for more instructional resources in the field of forensic document examination.

Larry S. Miller, PhD

*Distinguished Professor and Chair,
Department of Criminal Justice and Criminology,
East Tennessee State University, Johnson City, TN*

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Preface

The field of document examination does not have a standard training program or recommended course of study. No college degree in the field of forensic document examination is available and very few college courses are being offered in the field.

Agencies that house forensic laboratories have their own training programs based on the questioned document cases that come into their laboratories. Trainees read suitable books on the subject and learn from senior examiners.

A few colleges occasionally offer basic classes in the examination of questioned documents. However, until now, there has never been a textbook written specifically for a college course. This book has been written to meet the need for a textbook for students who wish to study questioned document examination.

The first step in learning any subject is the study of the principles of that field. *Forensic Document Examination: Principles and Practice* introduces students to the basic principles of handwriting and the factors that affect handwriting. Once the student has mastered the study of the development of handwriting, he or she is ready to pursue the study of the identification of handwriting.

Students who use this text will gain an understanding of the development of skill in handwriting analysis in document examination and a basic concept of the characteristics of handwriting that are compared when making an identification or elimination of a writer. Students will also learn to recognize the signs of forgery and disguise and how to distinguish between simulation and disguise.

Students need to know what types of documents are suitable for comparison purposes to identify or eliminate a writer. They will learn how to collect and safeguard documents and maintain an evidentiary chain of custody.

Students will learn about modern office equipment, paper, ink, and writing instruments. They will receive an introduction to the court system and the litigation process.

Much additional information is needed before one can become a forensic document examiner. Students need an opportunity to work on questioned document cases. They need to learn how to distinguish between genuine, disguised, and simulated writing. This process requires intensive training that is beyond the scope of this text.

Forensic Document Examination: Principles and Practice will also be helpful for professionals in related fields who interact with document examiners. It is useful for police officers, private investigators, and attorneys to have a basic understanding of the field of document examination and what is required for a document examiner to complete an assignment.

Katherine Mainolfi Koppenhaver

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Contents

Dedication	v
Foreword	vii
Preface	ix
Acknowledgments	xi
<i>CHAPTER 1</i>	
Evolution of the Written Word	1
<i>CHAPTER 2</i>	
Principles of Handwriting	7
<i>CHAPTER 3</i>	
Factors That Cause Changes in Handwriting	27
<i>CHAPTER 4</i>	
Handprinting and Numerals	37
<i>CHAPTER 5</i>	
History of Document Examination	47
<i>CHAPTER 6</i>	
Forgery	55
<i>CHAPTER 7</i>	
Other Types of Fraud	61
<i>CHAPTER 8</i>	
Equipping a Laboratory	69
<i>CHAPTER 9</i>	
Care and Handling of Documents	75

CHAPTER 10

Standards of Comparison 83

CHAPTER 11

Systematic Examination of Handwriting 91

CHAPTER 12

Master Pattern 97

CHAPTER 13

Detecting Fraudulent Documents 113

CHAPTER 14

Weighing the Evidence 133

CHAPTER 15

Preparing Reports 139

CHAPTER 16

Alteration of Documents 143

CHAPTER 17

Disguised Writing 157

CHAPTER 18

Disguise Versus Simulation 167

CHAPTER 19

Check and Credit Card Fraud 173

CHAPTER 20

Paper 185

CHAPTER 21

Writing Instruments 195

CHAPTER 22

Seals, Stamps, and Paper 203

CHAPTER 23

Typewriters and Printers 207

CHAPTER 24

Duplicating Methods 221

CHAPTER 25

Desktop Publishing 229

CHAPTER 26

The Discovery Process 233

CHAPTER 27

The Litigation Process 239

CHAPTER 28

Demonstrative Evidence 245

CHAPTER 29

Court Cases 253

Appendices 257

Glossaries 279

Work Cited 289

Index 291

Chapter 1

The Evolution of the Written Word

THE HISTORY OF WRITING

Writing consists of messages to convey ideas to others in a permanent or semipermanent mode. This includes pictures and drawings as well as penmanship systems. Many signs and symbols, such as the barber's pole and the three balls over pawnshops, grew out of early stages of the development of writing.

Writing evolved because humans had a desire to communicate their thoughts with others. Writing developed independently through different cultures and various epochs of history. All primitive people had an oral language and an early stage of writing, or something resembling writing. People devised a means of communicating through visible signs that could be understood by others. Records have been chiseled into stone, notched in sticks, carved in wood, knotted on ropes, pressed into clay tablets, and marked on animal skins.

Writing grew out of pictures; cave drawings being the first recorded record of humans. These paintings, called petroglyphs or petrograms, are believed to have developed between 20,000 and 10,000 BC (Fig. 1.1). Gradually, pictures came to represent words. Word pictures known as ideographs were used by Sumerians, Chinese, Aztecs, Mayas, and Egyptians. Most notable are the Egyptian word pictures, hieroglyphics.

Pictures were modified into symbols, symbols represented syllables, and a symbol used to represent a sound or a syllable is known as a phonograph. This developed into simplified phonetic symbols called the phonetic alphabet. The Sumerians assigned a symbol to each sound and are generally credited with the development of the first alphabet. The Phoenicians spread this alphabet throughout the known world between 1700 and 1500 BC. The

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Fig. 1.1. Petroglyphs are ancient writing carved into rocks at Three Rivers, NM.

Phoenician alphabet consisted of 22 letters. They separated words with periods and sentences with slash marks. Their writing went from right to left.

The word *alphabet* stems from the first two letters of the Greek alphabet, alpha and beta. The Greeks changed the writing direction from left to right. They also added vowels. Their alphabet consisted of 24 letters.

The Romans borrowed the alphabet from the Greeks and gave our letters their abecedarian names. For several centuries their writing consisted of disconnected capital letters. Roman scribes invented the lowercase letters that were patterned from the capital letters. These letters simplified the forms and made it easier to copy manuscripts. Writers added ascenders and descenders to the letter forms, which ascended above the ordinary height of a letter and descended below the baseline.

We owe much of our present cursive handwriting to Ludovico Arrighi, a scribe in the Vatican chancellery who popularized an italic style of handwriting in 1522. The word *italic* comes from Italy and is used because of the origin of italic script in that country. Today italic means script that slants to the right. Italic writing was a precursor to modern cursive writing. Gradu-

ally, connecting strokes, also known as ligatures, were added to connect the letters within words. Many styles were used over the centuries, but the most prevalent is the garland-connecting stroke.

Today the influence of the early alphabets is seen throughout Europe and the Americas. The European explorers brought the alphabet to the new world. North and South American systems are based on the Germanic system, which is derived from the Roman. They include English in the United States and Canada, Spanish in Central and South America, Portuguese in Brazil, and French in the province of Quebec in Canada.

The Greek alphabet is still used in Greece, Cyprus, and Crete. The Cyrillic alphabet derived from the Greek is used in Russia and Eastern European countries. This alphabet was introduced by Sts. Cyril and Methodis who proselytized the Slavic tribes of East Europe in the ninth century.

The countries of the Middle East use the Armenian alphabet and Hebrew text. Arabic is used in this part of the world as well as in Northern Africa. Our American alphabets are taught in many of the African countries. The Ethiopians have their own alphabet. The Hebrew and the Arabian characters are written from right to left.

India, Mongolia, Tibet, and other countries in Asia have their own writing systems. India has two main alphabets, Hindu and Urdu, with many dialects. The Burmese alphabet is a combination of Indian Sanskrit and Pali script of the Buddhist scriptures.

The major alphabets of the Far East are Korean, Chinese, and Japanese. The Korean alphabet was designed rather than evolving like other alphabet systems and is considered the only perfect alphabet. Chinese writing is the most complex although efforts have been made to simplify it. The Japanese writing was adapted and simplified from the Chinese. They use syllabaries called kana. The most popular are hiragana and katakana. Japanese is normally written in kanamajiri.

Some nationalities have independent alphabets. The Celtic alphabet of Ireland is one example. In 1823, Sequoyah invented an alphabet of 86 characters for the Cherokee Indian nation. The Hawaiian alphabet has only 12 letters: *a, e, h, i, k, l, m, n, o, p, u, and w.*

PENMANSHIP SYSTEMS

Penmanship systems represent the class characteristics of handwriting. Knowledge of which penmanship system a writer was taught will assist you in distinguishing the class characteristics indicative of a penmanship system from the individual characteristics of a writer.

In 1507, Leonard Wagner began the first manuscript book containing 100 styles of handwriting. The first copybook was written by Sigismondo Fantis in Venice in 1514. It was titled *Theoretica et Practica*. Ludivico degli Arrighi published *La Operina* in 1522.

The first English copybook was published by John Debeau Chesne and John Baliden in 1570. This book contained samples of writing in every known alphabet of its day. It was titled *A Book of Divers Sorts of Hands*. In 1609, Daniel Crocker published a penmanship book in London.

Early American writing paralleled the English writing system because the earliest writing masters came from England. English Roundhand, which was based on the Italian hand, prevailed. In 1784, Benjamin Franklin and D. Hall published a compendium on various subjects including handwriting entitled *The American Instructor or Young Man's Best Companion*. The first true copybook published in the Americas was *The Writing Scholar's Assistant*. It was published in 1785 by Isaiah Thomas in Worcester, MA.

The first American-born author of a treatise on handwriting was John Jenkins. Published in 1791, it was called *The Art of Writing, Book I*. He was the first writing master to reduce writing to six principal strokes or lines. Instead of teaching whole letters, students learned the strokes of letters and combined them to form the letters. Henry Dean of Salem, MA, was the first American-born penman to publish a writing manual in 1804. In 1824, James Gordon Bennett founded the first commercial school in which penmanship played a major role. He later founded the *New York Herald*.

A modified Roundhand was the prevalent writing style between 1840 and 1865. This was subsequently influenced by Platt Roger Spencer, who created the Spencerian System in 1848. Spencer is known as the father of modern penmanship.

In 1851, J. W. Payson and Seldom Dunton produced the first modern system of teaching handwriting from "copy" books. Previous handwriting publications furnished handwriting plates in books that the students copied into their own separate copybooks. Spencer introduced his first copybook in 1851. The Spencerian System dominated from 1865 to 1890. Spencer simplified writing by omitting extra strokes and flourishes. His sons improved his writing style. The Vertical hand replaced the Spencerian and enjoyed brief popularity from 1900 to 1910.

The principal influence on 20th century scripts was the Spencerian System of Penmanship. Modern commercial hands were developed from the Spencerian near the turn of the century by several penmen, the most well known being the Palmer Method and the Zaner-Bloser System. This modification or adaptation of business writing developed in American commercial schools. All

American writing systems are based on this free arm movement, which falls under the general heading of American Business Systems. Since the early 1900s more than 62 different systems have been created.

Austin N. Palmer founded the muscular movement of penmanship, which he introduced through the publication of his *Palmer Guide to Muscular Movement Magazine* in 1888. Palmer began publishing a magazine on handwriting in 1884, which he called *The Western Penman*. This was renamed *The American Penman* in 1906. After the turn of the century, the Palmer Method of Muscular Movement was taught in every state and in Canada, replacing the Vertical Writing System.

Charles P. Zaner and Elmer W. Bloser introduced the running-hand style of business penmanship, which subsequently became the most popular penmanship system taught in modern times. The Zaner-Bloser System of Writing was first published in 1908 to meet the need for plain, legible writing in elementary schools. Many other systems were developed but most resembled the Palmer Method or the Zaner-Bloser Penmanship System.

Noble and Nobel introduced Better Handwriting for Everyone in 1928. Peterson Directed Handwriting has been taught in several school districts throughout the country. The D'Nealian System was developed in 1968 by Donald Thurber and has enjoyed wide popularity. It is popular because it is easily converted from manuscript to cursive. A list of 20th-century handwriting systems can be found in the appendix.

The advent of the typewriter in 1873 reduced the need for exquisite handwriting. Penmanship schools became extinct early in the 20th century as the typewriter replaced the penman in modern business offices. In the past 20 years, formal classes on penmanship have diminished. Children are encouraged to form their letters in a method that is comfortable for them as long as the letters are legible.

CASE STUDY: INSURANCE FRAUD

Background

A life insurance agent was “selling” insurance policies to people without their knowledge and consent. The people were elderly immigrants from Eastern Europe. The agent falsified the medical information and changed the age of the insured. He was caught because the handwriting did not match the insured’s normal writing.

Question

What alphabet would immigrants of Eastern Europe use?

Answer

The Cyrillic alphabet.

Outcome

The document examiner determined that the handwriting of the immigrants was based on the Cyrillic alphabet, whereas the signatures in question were not. The insurance company sued the agent and recouped its losses.

Questions

1. What is the origin of the word “alphabet”?
2. What are ligatures?
3. What alphabet is used in Russia and Eastern European countries?
4. Name some alphabets that are written from right to left.
5. Name the major Far East alphabets.
6. Who published the first true copybook in America? When?
7. What writing style was prevalent in America between 1840 and 1865?
8. Who is known as the father of modern penmanship and why?
9. When was the Vertical hand used?
10. Name the leading alphabet systems of the 20th century.

Chapter 2

Principles of Handwriting

BASIC PRINCIPLES OF HANDWRITING

No two people write exactly alike. The principles of handwriting identification are based on basic scientific truths about handwriting. The first and foremost of these scientific truths is that no two people write exactly alike in an extended handwriting sample. The use of a signature in legal and financial transactions is possible because unique characteristics in an individual's handwriting distinguish it from every other handwriting. This principle enables document examiners to differentiate genuine and non-genuine writing and to identify the author of a sample of handwriting.

The second basic scientific truth about handwriting is all writing contains natural variation so that no two writing samples by the same writer will be exactly the same. There are slight deviations in all handwriting characteristics. The document examiner must learn to distinguish between natural variation and a different writer.

Writing is a complex act and a highly developed skill. Many influences affect the development of each person's writing ability, resulting in the unique style of each individual writer. These influences continue to occur throughout the life of the writer.

PHYSICAL FACTORS

Physical factors, including hand-eye coordination, flexibility of wrist movement, and the grip of the writing instrument, play a part in the development of handwriting skills. Other factors include attitude and discipline. If handwriting is important to the writer, he or she will expend more effort in

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learning to write. Taking care to adhere more closely to the written model, the writer will continue practicing until reaching a skill level that is comfortable.

The process of learning to write begins in young children long before formal schooling. The first step involves the visual observation of one's surroundings. Children see many forms that they will eventually identify and duplicate. They develop a concept of what writing looks like. Gradually they learn to recognize the letters of the alphabet and numbers. Each person sees the shapes of letters a little differently. This is the beginning of the individuality that develops in everyone's handwriting.

Writing is affected by what we see and what we remember. We are surrounded by stimuli that influence our understanding of letters and words. Billboards, posters, magazines, and television all contribute to our learning the identity of letter forms.

At the same time children are learning to recognize letters, they begin to develop hand-eye coordination. Children's play is preparation for adult activities. They like to imitate their elders in their play. For example, children pretend to write by scribbling on any available surface from writing paper to walls. Young children actually begin learning to write when they start scribbling with a pencil or a crayon. Coloring is a precursor to writing and helps children develop coordination.

Writing begins formally when children are given paper and pencil and taught to create a form following a model. They trace the letter design with their pencil several times and then attempt to duplicate that letter design. They struggle to control their movements until they can copy a form.

At first the children are given large, fat pencils and are taught to form ball and stick letters. As their skills increase, they are taught to write smaller with finer writing instruments. Children learn handprinting in the primary grades. Cursive writing is generally introduced by the end of the second grade or the beginning of the third grade.

Students deviate from the standard penmanship forms from the time they begin to write. In fact, copybook style writing is so rare that anyone who writes perfect Palmer could easily be identified because the writing would be unique.

Several major factors control the success of mastering handwriting. The powers of observation and the ability to remember the forms observed are two principal considerations. Another major factor in the development of handwriting is the writer's attempt to reproduce the forms observed. Some children have more control over their muscles at an earlier age than others. Some are more patient and will spend more time developing their writing skill. Others will spend more time experimenting with different letter forms (Fig. 2.1).

The image shows the handwritten phrase "From Amanda" in a cursive script. The word "From" is written in a larger, more decorative style, while "Amanda" is written in a smaller, simpler cursive. The letters are connected, and there are some loops and flourishes, particularly in the 'F' and 'A'.

Fig. 2.1. The handwriting of a young child.

An important factor influencing the development of writing is the ability to overcome the mechanical and physical impediments to writing; that is, placing the paper at the proper angle, holding the paper in place with one hand to steady it while writing with the other, and learning to control the pen or pencil and direct the movements.

Each writer has innate powers of observation, capacity for graphic expression, and technical execution. It takes many years of practice to develop skill and proficiency at writing. Graphic maturity is reached when the motor skills of the writer are fully developed, and the writer no longer has to focus attention on the act of writing. At this point, the writer concentrates on content and lets his or her subconscious handle the execution of the writing act. The writing has become a habit. The method of construction of various letter combinations and words is set.

Some people never reach graphic maturity. Their writing remains at a low form level. The writer may not have mastered writing for many reasons. A person who does not find a need to write will not develop skill in writing. Lack of formal schooling also results in poorly developed handwriting.

Each person attains a level of skill that he or she finds acceptable. The more an individual practices writing, the better the skill, unless the writer has an impediment to learning. Before the advent of modern office equipment, penmanship practice continued into adulthood. Emphasis is no longer placed on handwriting skill. Even the methods of teaching handwriting are more relaxed in modern times. Children are not drilled in proper procedures for handwriting like our forefathers. Little attention is paid to posture, positioning of the paper, and the proper grip of the writing instrument.

PHYSIOLOGY OF WRITING

Just how does the act of writing occur? Skilled writing uses arm, wrist, and finger movement. The arm moves across the paper as writing is produced so that the pen is presented at the proper location for writing. The arm may be in continual movement, or it may rest on the writing surface and move in segments as necessary.

The wrist is flexed to assist in the movement of the writing instrument. The wrist will bend to assist the writer in reaching the writing area. When the wrist can no longer reach, the arm slides forward toward the right margin to extend the writing line. The arm is pulled back to the left margin to start the next line of writing. The paper may be adjusted as well to assist the writer in reaching the available writing surface. The fingers work together to produce the forms of writing. When one finger pushes the writing instrument another offers resistance, which controls the motion. The contraction and release flow together to push the pen away and pull it back again. The strokes turning leftward and downward require contraction of the muscles, and the upward and rightward strokes involve the release of the muscles. Thus, downward writing is better controlled.

Right-handed writers use their thumb to exert pressure on the writing instrument to push it horizontally in a rightward and upward direction. The middle finger pushes the writing instrument leftward both diagonally and horizontally while the thumb and index finger pull the instrument down toward the baseline, which is the imaginary line to which the writing returns.

Because writer movement is from left to right, the right-handed writer has the advantage of being able to see the writing as it is being executed. The left-handed writer must adjust his or her hand to compensate for the fact that the hand is covering the line of writing as it is being executed. Many left-handed writers hook their hand over the writing so they can see what they are writing.

Skilled writers use a combination of finger, wrist, and arm movements to accomplish the act of writing. Poor writers use only their fingers and have to constantly lift and move their hand to reach across the page. Some writers use only arm movement, which is more difficult.

Writing becomes automatic to the point where the operation not only requires almost no conscious direction but is frequently beyond the control of the mind or the hand. This is evident when someone tries unsuccessfully to disguise his or her handwriting. The habits are so ingrained that the writer cannot eliminate all the characteristics comprising his or her writing style.

PEN SCOPE

Pen scope is the distance the pen covers before the writer moves his or her hand to continue the writing act. It is possible to identify the pen scope by the breaks between letters, syllables, or words. This is one of the factors that can assist in the identification of a particular writer because pen scope is an individual characteristic.

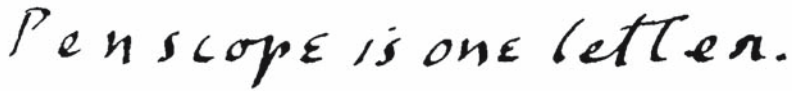
The image shows the sentence "Pen scope is one letter." written in a cursive script. Each letter is formed independently, with visible pen lifts and adjustments between individual characters, illustrating the limitation of finger movement.

Fig. 2.2. Writing created using only finger movement, requiring the writer to adjust the writing instrument for each individual letter.

The image shows the sentence "Pen scope is one syllable." written in a cursive script. The letters within each word are more connected than in Fig. 2.2, but there are still distinct pen lifts and adjustments between words, illustrating the limitation of wrist movement.

Fig. 2.3. Writing created using wrist movement, enabling the writer to complete one syllable before adjusting the writing instrument.

The image shows the sentence "Pen scope is one phrase." written in a cursive script. The entire sentence is written in a single, continuous, fluid motion without any pen lifts or adjustments, illustrating the advantage of whole arm movement.

Fig. 2.4. Writing created using the whole arm, enabling the writer to write a complete sentence before readjusting the writing instrument.

How can one distinguish between finger movement and wrist movement? The writer using finger movement must constantly readjust his or her hand when writing across the page. This constant adjustment can be seen in abrupt turns and breaks in the letters. It is primarily used by unskilled writers and indicates unfamiliarity with the writing process. The writing will show frequent stops and pauses to relocate the pen because there is little lateral movement during the formation of letters using finger motion only (Fig. 2.2).

Wrist motion results in longer continuous motion before adjusting the pen position. Often, the baseline forms an arc in the writing because the hand swings from left to right. Phrases and words are completed in a single movement of the writing instrument (Fig. 2.3).

Modern writers have not been taught to use whole arm movement when writing. Although arm movement was used by the writing masters in the 19th century, in modern times this method is employed primarily on large writing surfaces such as blackboards. Writers using whole arm movement generally write larger. The movement can be extended across the page without having to readjust the pen position (Fig. 2.4).

FACTORS THAT INFLUENCE HANDWRITING

An individual's handwriting changes over his or her lifetime. The most obvious change takes place from childhood through adolescence. Graphic maturity is generally reached toward the end of adolescence. Gradual changes will continue to occur. Many factors will affect the act of writing, although few factors will alter the handwriting so that it cannot be identified.

The penmanship system taught in schools influences handwriting. The primary systems currently being taught are Palmer, Zaner-Bloser, and D'Nealian. Although these systems are similar, some differences in letter forms and methods of construction exist. The characteristics learned from a penmanship system are called class characteristics because they are writing habits that are shared by many people.

Although students learn the same system of writing, each develops unique characteristics that distinguish his or her writing from all other writers. These are called individual characteristics, and they are either consciously created or subconsciously executed. A writer will copy an admired style or letter form. He or she will experiment with different designs to add unique and individual letter forms to his or her writing. More mature writers create more individual letter forms.

Some writing habits are so subtle that the writer is not aware of them. Like breathing, they occur without conscious effort. The writer does not plan them. Pressure patterns are examples of these subconscious habits. The writer is not aware of the variations of pressure when executing writing. Hooks and ticks are another example of writing habits that fit into this category. The writer is unaware of the slight flick of the wrist that creates these hooks. These characteristics are found at the beginning and ending of words. They may be found in any stand-alone letter form. Hooks or ticks may appear at the beginning of specific letter forms or may be found in all beginning or terminal strokes of words.

Some habits are developed by the writer when learning to write. These are consciously executed characteristics. Diacritics, or i-dots, may be consciously executed characteristics, particularly circle i-dots or the placement of i-dots or t-bars in a location that is pleasing to the writer. Some writers use printed capital letters in place of cursive or add a flourish to a letter or delete extra strokes. The writer chooses a particular letter form. These are consciously created handwriting characteristics.

Penmanship systems teach i-dots as static; that is, the writing instrument touches the paper and is immediately removed, leaving a dot on the page. Many writers execute the i-dot quickly, resulting in a dash instead of a dot. This dash may also have a specific direction. It can be horizontal, diagonal, or vertical. It may change direction, resembling a hook or a v-formation.



Fig. 2.5. The first signature is a genuine signature written by Carol L. Mainolfi. The second signature is her mother (this author) imitating her daughter’s signature.

Table 2.1
Principles That Assist in the Identification of Handwriting

-
- No two people write exactly alike.
 - Individual characteristics that are unique to a particular writer exist in every person’s handwriting, distinguishing it from every other handwriting.
 - The act of writing is a skill learned through repetition until it becomes a habit.
 - A person’s normal form of writing is based on mental images of learned letter designs.
 - People stylize their writing from the method they were taught.
 - People adopt writing styles by copying those they like.
 - Many writing habits are subconscious and therefore cannot be changed by the writer.
 - A person’s handwriting changes over the course of his or her lifetime.
-

FAMILIAL CHARACTERISTICS

Family members frequently share some handwriting characteristics. These are called familial characteristics. Children copy the writing style of their parents or siblings. They generally have plenty of opportunity to observe their parents’ handwriting. Many children practice their parents’ signatures until they become proficient at imitating them (Fig. 2.5).

Some groups of people who share a common bond develop handwriting characteristics that are unique to that group. Accountants, engineers, and draftsman fall into this category. People from foreign countries also share some common characteristics resulting from the system of writing they were taught. Unless the document examiner is aware of these influences, he or she could mistake national or group characteristics for individual characteristics of writing.

FEATURES OF HANDWRITING

Handwriting features called characteristics are used to identify handwriting. Characteristics that are shared by many writers are called class characteristics. Individual characteristics are those that are unique to writer. It is a

combination of class and individual characteristics that are used to identify an individual's handwriting (*see* Table 2.1).

CHARACTERISTICS OF HANDWRITING

The characteristics of writing that occur in handwriting include the appearance of the writing and the method of construction. They cover the range of writing of the writer. Class characteristics are those features shared by a large number of people. In handwriting, they are usually identified by the penmanship system a writer has learned. Although all writers deviate from the penmanship system they learned, many of the characteristics are retained. Class characteristics assist in identifying a writer but are not sufficient identifiers to limit the writing as belonging to one individual writer. Some deviations of penmanship standards are so common they fall into the category of class characteristics although they are not part of any penmanship system. An example would be the Greek letter, epsilon.

Individual characteristics are those deviations from the norm that writers make when they do not follow the rules of penmanship. Individual peculiarities creep into everyone's handwriting as they modify and stylize their writing. These modifications provide the strongest identification. No other writer duplicates exactly all the peculiarities that show up in a writer's handwriting. Although many writers may have similar individual characteristics in their writing, it is the unique combination of characteristics that identify a writer. No two writers share all the same characteristics. Each writer's characteristics are unique to that writer.

What are the characteristics or features that make up writing? The features of handwriting are classified for identification purposes. When the writer puts pen to paper, he or she uses movement, spatial relationships, and form.

MOVEMENT

Movement includes direction, slant, rhythm, pressure patterns, line quality, and speed. The direction of writing is dictated by rules of penmanship, but not everyone adheres to the rules. It is necessary to know the normal progress of writing across the page to determine deviations from that norm. Slant is part of the direction of writing but is measured separately. Speed and rhythm are affected by the direction of writing. Pressure is also related to movement.

Direction

Rules of penmanship dictate that writing progresses from left to right on a horizontal plane. Each line is placed below the preceding one from the top

to the bottom of the page. Letters return to an imaginary baseline in a rhythmic motion. Most alphabets begin their letter formations at the baseline and move upward and to the right. Some letters begin in the mid-zone and move left, such as *a*, *c*, *d*, *g*, and *o*.

Writing requires a movement through space. Writers start at the imaginary baseline and move up or down to form their letters. They adhere to rules that govern the location of each letter, either above or below the baseline. They are taught to divide their writing into three zones: upper, middle, and lower. Writers are taught the proper proportions among the zones of writing. They learn the rules for size, slant, and spacing between letters and words of writing.

Slant

Slant refers to the direction in which the writing leans. It may lean to the right or the left, or it may be vertical. Slant may also be variable. Slant is sometimes called slope. When a writer tries to disguise his or her handwriting, that individual will usually change the slant because that will change the pictorial effect of the writing.

Rhythm

Rhythm refers to the writer's consistency of the slant combined with the even return to the baseline. Skilled writers produce more rhythmic writing than unskilled writers. Writing rhythm can have a consistent or variable slant and an even or erratic return to the baseline. It mostly falls somewhere in between. Rhythm is usually disrupted when a writer attempts to copy another's handwriting and may be one of the most significant factors in the identification of a forgery.

Rhythm is also an indicator of skill level. The writer who has a well-developed rhythm consistent with an even return to the baseline is a more highly skilled writer than one whose rhythm is poorly developed (Figs. 2.6 and 2.7).

Pressure

There are two types of pressure in handwriting: grip pressure, which refers to the hand's grasp on the writing instrument, and the amount of pressure used to push the pen across the paper. It varies for different writers from light to heavy. The writing instrument will not function properly if the pressure is too heavy or too light. Most writers apply lighter pressure on upstrokes when they are pushing the pen away and heavier pressure on downstrokes when they bring the pen toward them. These pressure patterns are individual-

Mary Helen Bean

Fig. 2.6. Good rhythm showing consistent slant, even spacing, and an even return to the baseline, revealing a highly skilled writer.

Ashley Brozyk

Fig. 2.7. Poor rhythm showing variable slant and a moderate skill level.



Fig. 2.8. Pressure patterns of a normal writer showing less pressure on the upstrokes and heavier pressure on the downstrokes.

ized and subconscious, therefore becoming strong identifying factors in handwriting (Figs. 2.8 and 2.9).

When the pen comes in contact with the paper, it indents the paper. The writing surface affects the depth of the indentations in a paper. A hard surface reduces the indentations, and a soft surface allows deeper embossing of the paper.

Line Quality

The smoothness of the line of writing represents the line quality or line value. The skill of the writer determines whether the line quality represents



Fig. 2.9. Writing lines showing even pressure that is a result of drawing a set of initials in an attempt to simulate another writer's habits.

high or low quality. Speed is generally the important determinant when measuring line quality. Slow writing is tremulous and lacks good line quality. Slow writing is the result of lack of skill or of copying another's style. It can be an important consideration in identification of a writer. Fast writing is smoother and more fluid. There are numerous indicators of speed in writing of which line quality is the principle one. The intricacies of the letter form as well as embellishments are part of line quality (Figs. 2.10 and 2.11).

Speed

Speed of writing differs for various reasons. Some writers think fast and try to write as fast as they think. Some are impatient and always in a hurry. Slow writers may be deliberate and meticulous or less familiar with the writing process. Writers trade speed for legibility. The faster the writing, the more difficult it is to read. Speed reduces legibility. Fast writers simplify the letter forms and slur the endings on words. Letters widen and height is shortened. I-dots seem to be jabbed and carelessly placed. T-bars are sweeping or tapered and may be joined to the following word. Connecting strokes widen. Word endings become blurred and decrease in size. Endings are abbreviated and impossible to read.

As the fast writers progress down the page, their left margins increase while right margins become uneven or diminished. Slant leans toward the right and strokes are steady and firm. Rhythm is smooth and natural with good line quality. Pressure patterns are usually obvious with strong downward strokes and lighter upward strokes.



Fig. 2.10. An illegible signature rapidly written, showing smooth lines that represent good line quality.



Fig. 2.11. Slow writing, resulting in tremor in the writing line as the result of illness.

The general pattern for slow writing is stiff and labored. Slow writers will make carefully executed letter forms that are generally consistent and exact. Many strokes of writing are retraced and cramped. T-bars are carefully placed and balanced, often with blunt endings. I-dots are more rounded and close to the stem. Beginning strokes and word endings are generally blunt to the point that bulbs may be observed without the aid of magnification.

Slow writers generally do not slant their writing as far right as the faster writers do. The margins are generally more even. Pressure is often monotonous. The writing may appear to be drawn instead of written. Poor line quality may result if the writer is not a proficient penman.

SPATIAL RELATIONSHIPS

Spatial relationships include size; proportions; spacing between letters, words, and lines of writing; and utilization of space. Utilization of space includes arrangement and alignment of the writing. Arrangement is based on the space available, and alignment refers to the baseline, real or imaginary.

Size

Penmanship systems dictate normal size of writing. Young children are taught to write using larger strokes with lower case letters 0.25-in. in height. By the time they master the basic letter forms, the students are expected to reduce the writing size to half the original size. Size of writing will vary under different circumstances.

Proportions

Proportions usually are consistent in writing regardless of the size of the writing. When writers change the size of their writing, their letters remain proportional. Horizontal expansion also plays a part in establishing the identity of the writer and is considered part of spacing.

Penmanship systems dictate the proper proportions. Upper looped letters are twice as high as middle zone letters, and capitals can run as high as three times the middle zone letters.

Middle zone letters include *a, c, e, i, m, n, o, r, s, u, v, w,* and *x*. Letters with a middle zone area include *b, d, g, h, k, p, q, y,* and *z*. Upper and lower loop letters without a distinct middle zone area include *f, j, l,* and *t*.

The letter *f* is the only letter to fully extend into all three zones in cursive writing. Writers may vary the size of one of the zones in forming their letter *f*, just as they may emphasize a zone in other letter forms.

Most handwriting systems mandate the upper extenders of *d, p,* and *t* to be shorter than the other extended letters. The *d, p,* and *t* extenders are three-fourths the height of *b, f, h, k,* and *l*. The Palmer Method extends the *d* to the same height as the other letters. Palmer is the only system that puts a loop in the letter *d*.

Spacing

Writers are taught to space their letters uniformly with connecting strokes that are the same size between each letter. Writers are taught to space their letters evenly on a horizontal plane. The rules of writing dictate two letter spaces between words. Sufficient space must be left between lines to prevent intermingling of upper and lower loops. Some writers crowd their writing with cramped letters, and others spread their writing across the page.

Utilization of Space

When writers are given unlimited space they will proceed to write in a size that is comfortable for them. Writing may be small or large. It may also be variable.

A writer's utilization of space is affected by the parameters of the writing environment. The writer must adjust the size of his or her writing to fit into a specific area. Some writers plan accurately and space their work evenly in the space available, whereas others miscalculate and must compress some of their writing to fit it in a tight space. How the writer adjusts the size to accommodate the available space is an identifying factor.

Arrangement

Writers are instructed to arrange their writing on a page by leaving margins all around the writing area. Depending on the type of paper, writers are trained to leave a 1-in. margin at the top and bottom of their papers and a smaller margin along the sides. Deviations from these norms help to reveal a writer through the personal pattern of arranging margins.

Alignment

The baseline is the imaginary line on which writing sits. Writing goes above and below the baseline but always returns to this imaginary line. An even return to the baseline is a significant feature because few writers bring all of their letters exactly to the baseline. Writers usually are consistent in their baselines. People copying another's writing rarely give consideration to the baseline.

FORM

Form is not limited to the shape of the letters but includes the method of constructing and connecting the letters, including the initial and terminal strokes.

Letter Designs

The writing strokes consist of lines and curves in various directions, forming individual letter shapes. Lines can be vertical, horizontal, or diagonal. Curves are loops, circles, or parts of circles (Fig. 2.12).

Letter designs are the most easily identifiable feature of handwriting. Forgers copy letter designs while disregarding other characteristics of the writing. Each letter has a distinguishing element that makes it unique. For



Fig. 2.12. Strokes of writing and letters of the alphabet.

example, the *t* has a crossbar, the *i* and *j* have a dot, and the *f* is the only lower case cursive letter that spans all three zones of writing because it has both an upper loop and a lower loop. The letter *p* can occupy both zones if the upstroke is added.

Many writers use more than one design for an individual letter. It is not unusual to see two or three different letter designs in one's handwriting as well as slight variations in the form of each letter. Natural variation is present in every writer's handwriting. Everyone has a mental image of learned letter designs. Many of these designs deviate from standard penmanship forms. A person may copy someone else's letter design that he or she admires. A writer may experiment with variations of letter designs until finding one that is desirable or may simply make a design that represents the letter form being created. Most people do not recognize the uniqueness of their individualized forms.

Method of Construction

Forgers will imitate letter forms, but they fail to follow the same method of construction of letters and words when they do so. Writers develop consistent habits regarding the construction of letter forms. They start their letters in approximately the same place whether on the baseline, above or below it. They move the writing instrument in the same direction and join strokes at a similar location each time. They terminate their letters in a similar manner. A document examiner should carefully follow the direction of the writing line to determine the method of construction.

Initial Strokes

Significant aspects of letter forms are the lead-in and terminal strokes that people devise to begin and end their letters. These are highly personalized strokes that have a high value in identifying a writer.

Lead-in strokes are found at the beginning of letters and words. They may be straight, curved or hooked, long or short. The initial placement of the pen to begin each letter form is also a strong factor in identification because of the highly individualized nature of this placement. Forgers rarely copy the

beginning point of a letter, and writers rarely deviate from these habits, especially in their signatures.

Terminal Strokes

Terminal strokes are ending strokes on letters and words. They also may be straight, curved, or hooked, long or short and are consistent with writers. These are also overlooked by forgers unless the terminal stroke is very distinctive.

Medial Strokes

Medial strokes are found between the initial and terminal strokes. They include the letter forms and the strokes used to connect the letters in a word in cursive writing.

Connecting Strokes

Connecting strokes join the letters in words. They are also called ligatures. Letters in a word may be connected or disconnected. Connectors can consist of arches, garlands, angles, or thready connections.

Embellishments

Embellishments were once considered an important part of letter forms, but modern penmanship systems do not use embellishments. Calligraphers will embellish their letters with flourishes but the average writer does not. Therefore, flourishes that appear in handwriting assist in the identification process. Flourishes are extra strokes added to letters to improve their appearance. These flourishes are curved and wavy lines added to the beginning or ending of letters.

Hooks are little strokes made with an immediate change of direction, executed subconsciously by a writer. Hooks may be found at the beginning or ending of words, although some will appear in the middle. Ticks are similar to hooks but make an abrupt change of direction. Hooks generally have some curvature, and ticks are more angular.

INDIVIDUAL CHARACTERISTICS

Individual characteristics are deviations from the system of writing taught and consequently are strong identifying characteristics when comparing handwriting samples. Their value is weighed by the number of people who make an individual characteristic. Some individual characteristics are copied by many people, others are rarely seen in handwriting. The more

handwriting samples a document examiner studies, the more accurate the assessment of the value of an individual characteristic because the examiner knows how likely it is that a characteristic will show up in other handwriting samples.

Individual characteristics can be categorized as consciously acquired habits or as subconscious acquisitions. Consciously acquired habits are those the writer cultivates in his or her writing. The subconscious habits creep into handwriting without conscious awareness. Because the writer is not aware of these subconscious characteristics, they cannot be changed or deleted from his or her handwriting. Consciously developed habits are easier to modify, although a writer may forget to do so when attempting to disguise his or her handwriting. The most obvious consciously developed deviations are unusual letter designs, slant, speed of writing, and skill level achieved by the writer. Writers will practice penmanship until satisfied with their development.

Writers often make adjustments without thinking about them. Utilization of space is such an example. A writer must adjust his or her writing to fit into an available space. He or she may not think about this while doing it, although the writer is aware of adjusting the size of the writing. Subconscious developments are more subtle. Most writers are not aware that these elements exist in their writing. Hooks and ticks may creep into their letter forms. Pressure patterns develop without awareness. Deviations in other handwriting characteristics may go unnoticed. The more subconscious the habit, the stronger the identifying factor because of the writer's difficulty in changing these subconscious characteristics.

ADDITIONAL CONSIDERATIONS

Once the document examiner has compared all of the basic handwriting characteristics of writing, additional determinations about the writer can be made based on the examiners observations.

Evaluation of Skill Level

A person develops a skill level that suits his or her needs. The writer cannot exceed this skill level. The line quality and the rhythm of the writing reveal skill level.

Grammar

Spelling and punctuation are important elements in handwriting identification, along with the rules of grammar. Spelling and punctuation cannot be used exclusively to identify handwriting, but they can aid in identification.

Range of Writing

All characteristics that make up an individual's handwriting represent the range of the writer. This includes class characteristics as well as individual characteristics. All deviations from the method taught and all idiosyncrasies of the writer are part of the range of writing. This is the master pattern of the writer.

Elimination

Any fundamental unexplainable handwriting characteristic that is not part of the master pattern indicates a different writer. Differences must be fundamental. Explanations for differences include accidentals or deliberate disguise. Outside factors such as health problems and aging also affect handwriting and can be the reason for significant differences between writing samples.

Fundamental Differences

A fundamental difference is an irreconcilable difference. Fundamental differences in handwriting that are significant include: differences in line quality, pressure patterns, method of construction of letters and words, or subtle subconscious handwriting characteristics. Differences in letter forms are also significant but not necessarily fundamental differences.

A forger must choose between maintaining good line quality and adhering to the letter forms of a model. If the forger concentrates on the line quality, the writing will not adhere to the model. If the forger adheres to the model, the line quality will suffer. Therefore, lack of adherence to the model or poor line quality indicates a different writer. Poor line quality looks drawn or tremulous and frequently is drawn and not written. Drawn writing will have a different pressure pattern than natural writing.

Because writing is a habit, a difference in the method of construction of letters and words is a fundamental difference. Conscious attention to the act of writing usually represents a writer trying to imitate someone else's writing.

Subtle characteristics are small inconspicuous habits of the writer that go unnoticed by most people. Examples of inconspicuous habits are hooks or ticks in the writing or unusual connecting strokes.

CASE STUDY: BASELINE VARIATION

Background

While a manager was out of town on business, another employee forged and cashed his paycheck. The document examiner hired to identify the culprit was given access to the personnel files. There was no comparable handwriting.

Question

Can handwriting be identified when there are no similar letters for comparisons?

Answer

There are many characteristics of handwriting aside from letter forms, such as size, proportions, spacing, connecting strokes, and pressure patterns.

Outcome

The document examiner noticed the fraudulent endorsement of the manager had an unusual baseline variation that was evident in one of the employee's handwriting. The company obtained additional request writing from the suspect. The culprit was identified and returned the money he had taken.

Questions

1. What is the foremost principle of handwriting identification?
2. When does the process of writing begin?
3. What is graphic maturity?
4. What is pen scope?
5. What are class characteristics?
6. What are individual characteristics?
7. What is slant?
8. How can a document examiner determine the speed of writing?
9. What is rhythm?
10. What is grip pressure?
11. What is meant by method of construction?
12. What are the various types of ligatures?
13. What is line quality?
14. Name some of the characteristics of handwriting.

Chapter 3

Factors That Cause Changes in Handwriting

FACTORS THAT AFFECT HANDWRITING

Once a writer has reached the permanent condition of automatic writing, he or she has reached graphic maturity, which continues until some physical or mental disturbance interferes with the ability to write.

Robert Saudek¹ states that a person is capable of writing fluently, easily, and automatically only under the following conditions:

1. The writer is familiar with the letters so that mention of a letter conjures a graphic image of that letter in his or her mind.
2. The writer has control of the writing instrument and the mechanical factors of the paper, pen, and writing surface do not interfere with the writing.
3. The writer is free of any physical impediment that would hinder writing.
4. The writer knows how to spell the words and does not have to concentrate on the spelling.
5. The writer is writing in his or her native language.

Obviously there are other factors that can affect writing, such as mental illness, emotional states, and even moods. The type of document being written may cause a person to write more formally and neatly. Many factors combine to affect handwriting.

What are the basic factors that influence writing? The level of education attained will affect the development of writing. An illiterate writer makes clumsy, halting strokes. As writing skill increases, the writing flows smoothly

¹ Saudek R. *Experiments with Handwriting Books for Professionals*, Sacramento, CA, 1978, p.40.

and becomes well executed. If a child continues in school until reaching graphic maturity, his or her writing will be more highly developed than a student who drops out of school before mastering penmanship. Likewise, an adult who writes frequently, such as a white-collar worker, will exhibit more skill than a blue-collar worker who does little or no writing in his or her job.

Mechanical factors affect handwriting. These include the writing instrument, the quality of the paper and the writing surface, and the position of the writer when writing. It makes a difference whether the writer is standing, sitting, or trying to write under adverse conditions. Poor lighting can also affect writing. Cold or heat is another factor to consider. Poor conditions may adversely affect legibility.

Physical well-being will cause changes in writing ability. Illness and injuries can alter a person's handwriting temporarily or permanently. Medication and substance abuse also interfere with handwriting. Physical handicaps play a part as well. This includes loss of use of the accustomed writing hand, blindness, and aging.

The emotional state of the writer alters the appearance of his or her writing. When one is excited or angry, his or her writing is more expansive and hurried. Writing becomes compact when the writer is pensive and introspective. When one is tired the writing line and word endings tend to droop.

The psychological factor, that is, the writer's physical makeup and personality, influences the writing act. According to J. F. McCarthy (1976), "Handwriting most certainly reflects some aspect of the writer's personality. ...Handwriting is in essence nothing more than a form of visual behavior, graphically recorded and relatively permanent. It is the result of the writer's physiological, psychological and environmental life."²

Lack of familiarity with the material being written impedes the flow of writing. Difficult words, foreign words, and complex concepts may interfere with normal script.

MECHANICAL FACTORS

Mechanical factors may play a part in changes in handwriting. A simple thing such as a change of body position may have an effect on the appearance of the handwriting. The writing deteriorates when a writer attempts to write

² McCarthy, JF. Some aspects of normal behavior: their use in understanding problems encountered by document examiners. *Journal of Forensic Science* 1976;21:201-207.

from an awkward position. If the writer is lying down, his or her orientation will be affected, and the ink in the pen may not flow properly. Leaning across a bed distorts the appearance of the writing.

What is the writer's normal writing position? What was the position when executing the document in question? Was the writer seated at a desk? Standing? Riding in a car? Was the paper on a flat surface, a ledge, the steering wheel of a car, a lap? Document examiners should try to determine this information to weigh the effect on the handwriting.

Lighting may affect the handwriting. Dim light may make it difficult for the writer to follow a line. Bright light may temporarily blind the writer so that his or her writing is distorted.

The type of pen and paper can affect the writing. It is obvious that a broad pen point creates a different effect than a fine point. Ballpoint pens create a different writing line than fiber-tip or fountain pens.

Ink may not flow evenly, particularly with ballpoint pens that "goop" on curves. Some papers are more porous, thus the ink will spread into the paper. Others have finishes that repel the ink. Some finishes on paper make writing easier. Poor quality paper can snag a pen, causing glitches in the writing. If the writer is having difficulty with pen or paper, he or she may have to change the pressure and speed of writing. A microscopic examination may reveal coarse paper or a poor ink flow. Document examiners try to duplicate the writing environment. They experiment with different writing instruments on different kinds of paper.

As stated in Chapter 2, the writing surface affects the indentations in the paper. A rough writing surface can also create grooves and patterns on the paper. If writing is done on a soft surface, the pressure appears to be heavier because the indentations into the paper are deeper. A hard writing surface under the paper reduces the depth of the indentations in the paper. Without adequate support, the writer loses uniformity, and pressure patterns are affected.

People attempt to create conditions conducive to comfortable writing. Occasionally, this is not possible, so the writer has to adapt his or her writing to the conditions present. Writing may be done on various surfaces, such as a writing tablet, a wooden table or desk, a glass or metal surface, even a body part. Do not confuse writing pressure with environmental factors.

Of course, there are many nontraditional writing tools that have been used and must be examined by document examiners. For example, spray paint on walls and furniture, lipstick on mirrors, writing scratched into metal with a stylus, and chalk on a chalkboard.

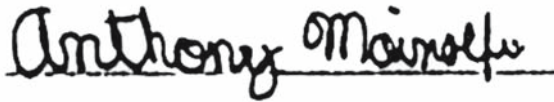

 A handwritten signature of "Anthony Mainolfi" written in a child's hand. The letters are formed with clear, distinct strokes and are well-spaced, indicating a high level of attention and skill for a child. The signature is written on a horizontal line.

Fig. 3.1. The signature of Anthony Mainolfi as a child, showing careful attention to the act of writing as seen by the carefully formed letters.


 A handwritten signature of "Anthony Mainolfi" written in an adult's hand. The signature is more fluid and cursive than the child's version, with more connected letters and a more complex, sweeping structure. It is also written on a horizontal line.

Fig. 3.2. The signature of Anthony Mainolfi as an adult, showing a higher skill level.

TIME SPAN

Handwriting changes over the course of one's life. It changes most strikingly from childhood to adolescence and may change again when one reaches adulthood. It will develop until one reaches graphic maturity, at which time subtle changes may continue to take place. It will decline as the aging process reduces one's skill level.

Penmanship was once a major subject in classrooms around the country, but modern schools do not devote much time to teaching proper penmanship. With less emphasis on conforming to traditional writing systems, children are developing their own individual style of writing at an early age. As children grow into adolescents, their handwriting develops and often shows drastic changes in many handwriting characteristics. Teenagers will experiment with different styles of writing, changing letter forms until they find a style they like. By the end of the teen years, a young adult's writing has stabilized into an adult style that may change gradually over the years (Figs. 3.1 and 3.2).

Graphic maturity is reached when movement is made from the habituated neuromuscular patterns. This usually occurs when a person reaches adulthood, around the age of 21. A basic style has been adopted that generally continues throughout life, although various factors will alter and modify the writing.

Most of the changes in mature handwriting occur gradually, however, a dramatic event in one's life can cause sudden changes in handwriting. Presi-

dent Nixon's writing changed drastically following Watergate. The writing of a man whose wife died of cancer changed so dramatically over the course of her illness that he had to sign new bankcards to match his new signature.

Many changes take place as one grows older. Ordway Hilton lists some of these changes in his book *Scientific Examination of Questioned Documents*. Handwriting skill declines in elderly writers. Legibility and design are affected. Coordination is impaired and other writing characteristics deteriorate. Writing lacks uniformity. Elderly writing develops tremor due to loss of muscle control. The quality of the writing suffers. Internal consistency is evident although the letter forms are deteriorating.

Forgers sometimes copy handwriting from the wrong period of time when perpetrating a fraud. The examiner must be careful to compare writing from the proper time period, because material written under different circumstances can affect the accuracy of the results of the examination.

HEALTH

A person's mental and physical condition affects the ability to write. Therefore, the mental and physical condition of the writer needs to be taken into consideration when comparing handwriting so that writing is taken from a similar set of conditions.

Did the writer suffer from any illnesses either chronic or transitory? Could an injury or an accident have altered the handwriting either temporarily or permanently? It is important to compare handwriting from a similar point in time and under similar circumstances to compensate for these and other changes.

A writer who is under severe stress from an accident or in excruciating pain will not write in his or her normal manner. The handwriting will deviate sometimes to the point of not being recognizable or identifiable.

A long-term debilitating illness, such as cancer, will cause handwriting to slowly deteriorate. It is not necessarily a steady decline. There may be some temporary improvement in the writing, although the writer never regains optimum skill level.

Writers who lose their ability to write with their dominant hand learn to write with other parts of their body, such as the opposite hand, a foot, or in the case of quadriplegics, with the pen held between their teeth (Fig. 3.3). When a person becomes fluid in writing using an alternate method such as other-hand writing or foot writing, many similar characteristics to his or her previous writing will be found. Mouth writing, although more awkward than handwriting, shows remarkable similarities to previous writing styles.

The image shows a sample of cursive handwriting. The text is written in three lines: "All things work", "together for", and "good". The script is fluid but shows some irregularities in line height and spacing, characteristic of mouth writing.

Fig. 3.3. The mouth writing of a quadriplegic. Writing is done with a pen held by the teeth.

Once a handicapped writer has mastered writing with an alternate body part, the examiner may not be able to distinguish it from previous dominant-hand writing. The mouth writing of quadriplegic Joni Erickson is similar in many ways to her writing before her accident, with a slight loss of fluidity.

BLINDNESS

Poor eyesight can interfere with one's handwriting ability. Although a person can write without looking at his or her writing, it is more difficult to execute fluid writing when the writer cannot check his or her progress.

A sighted writer who becomes blind must rely on previous knowledge of graphic movement to continue writing without the ability to visually check the progress. There is a tendency for the blind writer to write continuously so as not to lose his or her place. Blind writers tend to rise in the middle of the page and then to drop as the writing hand is extended across the page.

People born blind have a more difficult time learning to write. They use a stylus to gauge spacing. Each letter is placed inside of a box using the sides of the box to control the size and form of the letters. This gives the writing a stilted appearance.

MENTAL HEALTH

A person's mental state can affect the appearance of writing. Mentally ill people often have difficulty expressing themselves in writing. Depending on the severity of the illness, the writing may deteriorate into illegibility.

Table 3.1
Drug Effects

1. Tiredness	5. Confusion	9. Tingling
2. Dizziness	6. Tremor	10. Pain
3. Nervousness	7. Restlessness	11. Paralysis
4. Spasms	8. Parkinsonianism	12. Muscle relaxation

Severe disturbances may cause writing to become a series of lines, in some cases short vertical strokes or horizontal wavy lines in others. None of these can be deciphered. In most cases, mental illness does not diminish or destroy the habitual writing patterns.

Suicide notes and letters usually show some deterioration of the quality of writing, although they exhibit characteristics of the normal writing of the person. Mental depression affects the handwriting but does not diminish or destroy the habitual characteristics.

DRUGS AND MEDICATION

Every drug has an effect on the person taking it. Many of these effects are undesirable side effects. Some of these drugs will cause changes in a person’s writing style and even in the ability to write.

There are two areas the document examiner must take into consideration: medication prescribed to a patient for purposes of health restoration and drug abuse.

Patricia Wellingham-Jones tells us that almost every drug has many effects, but one cannot state that a particular drug causes a particular result. Undesirable side effects can distort handwriting. Some of these adverse reactions are described in Table 3.1.

Confusion and dizziness may disturb the overall writing of an individual causing overlapping of lines and a disturbed baseline. Euphoria causes increases in the size of the writing and writing that drifts uphill. Nervousness and restlessness result in erratic pressure, tremor, or other irregularities in the writing. Spasms are sudden involuntary muscle contractions that create jerks and glitches in handwriting. Tremor is an involuntary uniform oscillation altering the direction of the writing temporarily and repeatedly. Tremor caused by caffeine is vibratory.

Changes in the psychiatric state of the writer may affect the writing differently. Disturbed rhythm will probably be the most obvious. Depression usually causes writing to droop and to slant downward. Writers will also write downhill when they are tired.

Some drugs will cause Parkinsonian symptoms resulting in micrographia (small writing) that trails off. Muscle relaxants can cause writing to trail off as well. Light, erratic, or fading pressures can also be a result of muscle relaxants.

ALCOHOL AND DRUG ABUSE

In addition to the side effects of medication, drug abuse will cause other adverse affects on handwriting. Alcohol reduces inhibitions causing larger, more rapid handwriting. As the level of intoxication increases, the writing becomes more slurred. Extremes of size and spacing will occur as well.

Alcoholics will have general deterioration in their handwriting over time. As the disease worsens, the handwriting may actually improve when the alcoholic is intoxicated and deteriorate when sober. Alcoholism causes uncontrolled muscular movement, jerking, and tremor. Breaks in pen lines, irregular strokes, and overwritten parts produce an erratic action without the semblance of order.

Drug abuse can alter handwriting. Different types of drugs produce different side effects. Abuse over a period of time causes continual deterioration of the handwriting as well. A question of authenticity of the signature of a drug addict requires comparison of signatures from the same time period and, as much as possible, under similar circumstances.

ACCIDENTALS

Accidental strokes are aberrations that occur as the result of a transitory incident, such as someone bumping the writer's arm or a crumb on the table under the writing paper. These strokes are deviations from the intended path of the writer, who automatically jerks the writing instrument back to its intended trajectory. These strokes are rare. According to Ordway Hilton in *Scientific Examination of Questioned Handwriting*, they occur once in about 200 signatures. Some examiners who are trying to demonstrate that a signature is genuine will state that the divergences are due to accidentals. In most cases, they are not.

GUIDED HAND

A guided-hand signature is one in which the writer gets support from another person when attempting to write. The writer is usually infirm. The result of guided hand is frequently a signature that does not resemble either writer. Guided-hand writing is rare. It is also used as a theory to support authenticity when the characteristics of writing differ from the exemplars.

TREMOR IN HANDWRITING

Tremor is indicated by an involuntary, rhythmic, and recurrent movement of the pen from side to side. These tremulous strokes are instant changes from the desired direction of the pen lines and are attributed to nervous impulses affecting the muscles indicating loss of control of the pen.

There are many different reasons that tremor occurs in handwriting. Some of these have already been discussed, including aging, illness, and drug abuse. Other causes are writer's cramps and pathological or psychiatric disorders. Pathological tremors resulting in a convulsive manner of writing are independent of the will and therefore beyond the control of the writer. These tremors are often rhythmic to-and-fro movements that are practically impossible to imitate with the same writing speed and pen pressure. Wavering and broken strokes forming the letters of a writer's signature will deviate from the normal style, but they retain sufficient individual characteristics to identify the writer (Fig. 3.4).

The tremor of illiterate and uneducated individuals is more varied because of the unfamiliarity of the writing process. Although there is a lack of control, the writing is strong. The strong lines of the illiterate writer can be distinguished from the lines of the experienced writer in poor health, which are usually lighter, more tremulous, weaker, and finer.

The tremor of fraud or criminal tremor results when one is attempting to copy another's writing. The act of slowly drawing lines, instead of writing them, causes corrugation of the writing line. The corrugation is a very fine side-to-side movement and can be seen most clearly under a microscope.

Tremor is difficult to imitate. An error can easily be made by overlooking the line quality. Forgers trying to imitate tremor usually fail to capture the style of the writer. They make even to and fro movements instead of the erratic deviations of tremor. They make smooth curves and misplace tremor.

CASE STUDY: DRUNK DRIVING CASE

Background

A man was arrested for drunk driving when he failed the field sobriety test. He was issued three tickets for driving under the influence, driving while intoxicated, and crossing the centerline. He signed the tickets and was taken to the police station. He refused to take the Breathalyzer test and was released. Subsequently he received a signed release in the mail from the police indicating that he had refused the Breathalyzer. He had not signed the release. He hired a document examiner to determine the origin of the questioned signature.

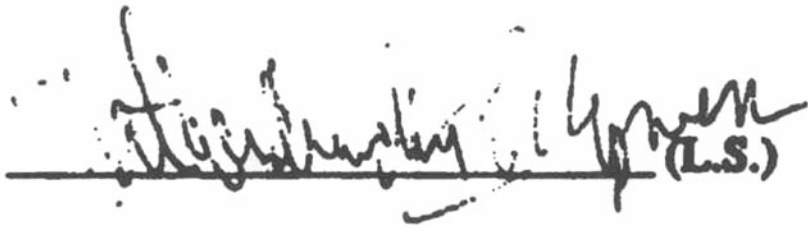


Fig. 3.4. Poor line quality and illegible letter forms as a result of an elderly infirm writer. Tremor is a result of a writer losing his ability to control the writing instrument.

Question

The document examiner relied exclusively on the three signatures signed 20 minutes prior to the time on the questioned document. Why?

Answer

The document examiner wanted compatible handwriting because the man had been drinking (but was not) intoxicated. These were the only signatures that duplicated the conditions under which the questioned document would have been signed.

Outcome

As a result of the document examiners testimony, the signature was proven to be bogus. In addition, the man was found not guilty because he had a medical condition that had caused him to fail the field sobriety test.

Questions

1. What conditions must be present in order for a writer to be able to write fluently and automatically?
2. What are some of the basic factors that affect handwriting?
3. Give examples of mechanical factors that affect handwriting.
4. How does the writing surface affect handwriting?
5. What are the stages of handwriting that occur over a person's lifetime?
6. What affect does health have on handwriting?
7. What are some of the effects of drugs on handwriting?
8. What is tremor?
9. What causes tremor?
10. What is corrugation in writing and what causes it?

Chapter 4

Handprinting and Numerals

HANDPRINTING

Handprinting has been called lettering, hand lettering, pen and pencil printing, print script, print writing, printing script, and script writing. The school system refers to it as manuscript writing. Lettering is generally recognized as handprinting, which is a precise style of writing used by architects, draftsman, engineers, and commercial artists.

Children are first taught to print in kindergarten and first grade. Once they are introduced to cursive writing in second or third grade, printing is discarded. But many people prefer to print and incorporate printed letter forms within their writing, or use handprinting instead of handwriting because printing tends to be more legible. Many forms require handprinting so that most adults have occasion to handprint. Handprinting may be more individualized than handwriting, and it is this individuality and diversity that enable a document examiner to identify the writer. In addition, lack of familiarity with printing contributes to more variation in letter styles (Fig. 4.1).

Adults who print do not adhere to the letter forms they were taught as children. Most mix uppercase and lowercase letters. Some combine printed and cursive letters (Fig. 4.2).

The examination of handprinting includes the same methods used to compare cursive writing. In addition to their letter forms, writers transfer many of their writing habits from handwriting to handprinting. Size, proportion, letter shapes, margins, spacing and spatial arrangement, pressure patterns, and line quality are carried over between printing and writing (Fig. 4.2).

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

Fig. 4.1. Handprinting by several writers, showing the significant differences that occur among different writers.

Fig. 4.2. Handprinting of various writers.

Capital Letters

In cursive, a writer may use two or three different designs for each letter depending on the location of the letter in a word. There is usually not as much variety of the individual letter forms in handprinting because letters are individually made, so that their location within a word does not affect their appearance. The writer sticks to one letter design for each letter. Most handprinted letters are plain letters made without serifs or embellishment.

There is a tendency in handprinting to vary the size of each letter within a word. Many writers will make the letters *o* and *i* smaller than the other letters. The letter *r* is frequently made larger than the other letters.

Another common tendency among writers who use all uppercase letters is to make the first letter of a sentence taller than the rest. Capital letters in proper names are also indicated by making these letters taller (Figs. 4.3 and 4.4).

Capital letters can be divided into three groups according to their construction. Letters made with straight lines that are horizontal and vertical include *E*, *F*, *H*, *I*, *L*, and *T*. Letters containing angles consisting of straight lines that are horizontal, vertical, and diagonal include *A*, *K*, *M*, *N*, *V*, *W*, *X*, *Y*, and *Z*. The remaining group of letters is curved: *B*, *C*, *D*, *G*, *J*, *O*, *P*, *Q*, *R*, *S*, and *U*.

Similar letter forms can be grouped and compared in handprinting and cursive writing. The letters *B* and *D* are similar, as well as *P* and *R*, *E* and *F*, and *O* and *Q*. In the lowercase letters, humped letters *h*, *n*, and *m* can be compared. The humps may be rounded or pointed. Lowercase *b* and *d* share a similar construction as well (Fig. 4.5).

The number of individual strokes used in letter construction is another identifying factor. Some people make letters in one continuous stroke and others raise their pen whenever they change direction. *E*, *M*, and *W* can be



Fig. 4.3. Uppercase printed letters, also called capital letters.



Fig. 4.4. Taller capital letters at the beginning of a sentence.



Fig. 4.5. Letters that can be grouped together because of their similarities.

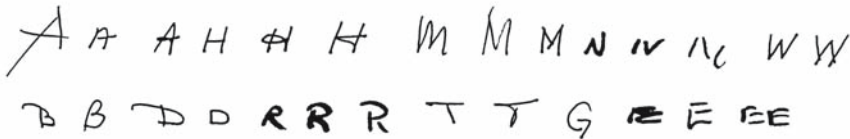


Fig. 4.6. Examples of various methods of construction used by different writers when creating printed letter forms.

made in as few as one stroke or as many as four separate strokes. *A* and *H* may have one to three strokes in their construction. *K* and *R* can also have one to three strokes. A microscopic examination will reveal the method used (Fig. 4.6).

The letter *I* lends itself to various designs. Some writers make a single stroke, whereas others add serifs at top and bottom similar to a Roman numeral. A few dot their capital *I*.

Another highly stylized capital letter is *E*. The placement of the bars across the letter will differ with various writers. Some writers make a continuous stroke when forming the bars or arms. The center stroke of the *E* may be higher or lower than normal. Others will use the Greek *E* form.

The letter *K* has several possible methods of construction. *K* is traditionally made with straight lines, but some writers curve the second stroke of *K*, or they attach a *C* formation to the initial stem of the *K*. Others change the direction of the lower curve so that it resembles an *h*. A few writers add a third stroke to the *K* that makes it unique (Fig. 4.7).

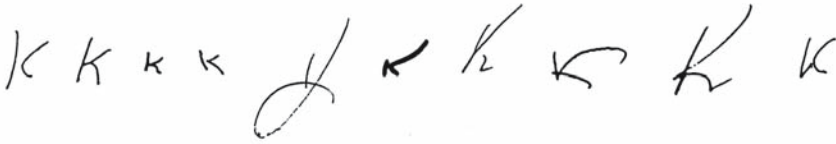


Fig. 4.7. Various styles and methods of construction of the letter K.

The letter *N* is frequently rounded to resemble a cursive lowercase *v*. Sometimes it looks like a *u* attached to a stem. Like the Greek *E*, these variations show up so often they have become class characteristics.

Retraced strokes will be found on some capital letters, especially *A*, *B*, *D*, *M*, *N*, *P*, and *R*. Note that all of the letters, except the letter *A*, begin with an initial vertical stem. These letters generally start with a downstroke that is retraced to form the letter in one continuous movement.

Some capital letters have extra lead-in strokes that can be straight or curved. Ticks may be attached to the stem at an angle. Curved strokes can be wavy or hooked. Look for these strokes on *B*, *H*, *K*, *M*, *N*, *P*, and *R*.

Some capital letters start with a small loop or eyelet. These are most common in *C*, *E*, and *G*. The letters *H*, *K*, *M*, *N*, *U*, *V*, and *W* sometimes begin with an eyelet. Some writers extend the curved parts of letters beyond the stem. This shows up in *B*, *D*, *P*, and *R*. Hooks can be large or small and come in a variety of styles. They are most commonly found at the beginning of a letter but can also be located inside the letter or at the end of the letter.

Stylized letters can be found in handprinted capitals. They are often employed at the beginning of signatures. The initial letter will be a printed capital even though the rest of the writing is cursive. Occasionally, a printed capital will be inserted into a word that is written in cursive.

Lowercase Letters

Lowercase letters can also be grouped according to their method of construction. The letters *a*, *d*, *g*, and *o* are referred to as the circle letters. Curved letters include *c*, *e*, *s*, and *u*, although some writers curve the *w* as well. The letters *h*, *m*, *n*, and *r* are sometimes called the humped letters.

Letters also are grouped according to the zones occupied by each letter. Middle zone letters include all the letters that have no extenders: *a*, *c*, *e*, *i*, *m*, *n*, *o*, *r*, *s*, *u*, *v*, *w*, and *x*. The rest of the letters are divided into upper zone letters: *b*, *d*, *h*, *k*, *l*, and *t* and lower zone letters: *g*, *p*, *q*, and *y*.

Lowercase letters come in more varieties than handprinted capital letters. Writers will mix uppercase and cursive forms with lowercase letters.



Fig. 4.8. Various styles and methods of construction of the letter *y*.



Fig. 4.9. Example of both printed and cursive letters containing circles (*a*, *d*, *g*, and *o*).

Some writers consistently replace a specific lowercase letter with its capital. The cursive *a* is frequently substituted for the lowercase printed *a* just as a cursive *e* replaces the printed form. These patterns assist in identifying a specific writer.

The method of construction of the lowercase letters can be a clue to their author. Follow the direction of the stroke to determine if it is made in the traditional way or if the writer has reversed the normal direction. The number of individual strokes also plays a part in identifying the writer. The starting and ending point of various letters can lead to identity because writing is habitual.

The letter *y* can be made several different ways. The upper portion of the *y* may be rounded or pointed at the base. The tail may be joined at the center or to the side of the upper portion. The tail could contain a hook or a loop, although the normal construction calls for a straight line that ends below the baseline (Fig. 4.8).

Circle letters *a*, *d*, *g*, and *o*, share characteristics, notably in the joining of the circle. Writers are consistent in their starting and ending points when constructing circle letters. Some writers make circles within circles. Others leave a gap in their circle letters. The circles are often similar in shape as well (Fig. 4.9).

The placement of t-bars tends to be habitual in handprinting as well as handwriting. Some writers never deviate in the location of the t-bar on the stem of the *t*. Others cross at a variety of levels. Some cross at the top of the *t*, and others miss the t-bar altogether (Fig. 4.10).

Placement of i-dots is routine. Some writers dot their the letter *i* close to the stem of the letter, whereas other i-dots float high above the *i* to the right or



Fig. 4.10. Examples of various styles and methods of construction of the letter *t*.



Fig. 4.11. Various types of i-dots.

to the left of the i-stem. The shape of the i-dot varies among writers. A few writers make a round static i-dot. Many writers make dashes that are vertical, horizontal, or diagonal. Other writers make hooks of various sizes and designs. Some writers make circles for i-dots, and a few writers make heart-shaped i-dots (Fig. 4.11).

Notice the variety of printing styles used by different writers. Continual observation of handwriting is the key to identification. Only when one becomes thoroughly familiar with handwriting, handprinting, and all their characteristics will a writer be able to give accurate opinions regarding questioned handwriting cases.

NUMBERS

History of Numbers

People have been looking for various techniques to count and describe amounts since early civilization. Notches in a tree, sticks or stones, and knots tied into ropes are among the early methods used to indicate amounts. Early civilization began marking days using the phases of the moons as delineators. Gradually a calendar began to take form.

Egyptians and Mesopotamians used strokes and marks to represent numbers more than 5000 years ago. The Chinese used simple strokes for the first 3 numbers, but different marks for the rest of the numbers up to 10. Roman numerals still consist of strokes for the first three numbers (I, II, III).

The Mayas of Central America devised a number system using dots, strokes, and ovals. With dots and strokes they built numbers from 1 to 19, and each time they added an oval the number was multiplied by 20.

During the era of pyramid building in Egypt, the Egyptians measured distance by means of an early geometry system. Egyptian measurements were based on body measurements. A pace was the length of a man's foot, a span the width of his hand. Horses are still measured by hands. Because people are different sizes, one person's measurements had to be used to define paces and spans. It is likely the Egyptians used their pharaoh's measurements as the standard for measuring.

Many current measurements are based on this ancient system of body measurements. A cubit is the length of a man's arm from his elbow to the end of his middle finger with his hand outstretched. A foot has replaced the pace.

The Greeks were the first to use letters of the alphabet to represent numbers. Roman numerals still use letters to represent numbers.

As writing evolved, symbols were developed to represent numbers. The first nine symbols were used for the first nine numbers. Another set of symbols represented numbers from 10 to 90, and the last set represented numbers from 100 to 900. Any number could be made to represent thousands by adding a stroke.

Merchants of Mesopotamia calculated with a crude but effective method. Using a base of 10, they drew grooves in the sand and placed pebbles in the grooves to represent units, tens and hundreds. The Chinese improved on this method by placing beads on a wire in groups of tens. This device is called an abacus. Modern civilization still uses units, tens and hundreds in mathematics.

Modern numbers are based on the Arabic numerals, although modern Arabic numerals vary in some of their designs. The Arabic numerals were adapted from Islam. These numerals were obtained from the Crusades in the 12th and 13th centuries. Further adaptations resulted in the modern numbers used today. Although the numerals of the 16th century are modern numerals, placement on the baseline is different for various numerals.

The proper formation of numbers is part of penmanship training. The numbers in various penmanship systems are very similar. Architects, engineers, and draftsmen use specially designed numbers in their work.

Identification of Numbers

Many document cases involve numbers not written in the same hand as the other material on a document. They include alterations of numbers on checks or other negotiable instruments, changes in dates, embezzlement of funds, as well as genuine numbers that act as identifying factors.

Most people do not alter their numbers when disguising their handwriting. Many cases of identification have been made through the comparison of numbers. Sometimes the relationship of one number to the next is significant.

For example, some people make zeros smaller than other numbers. Some people connect the numbers one and five to a zero.

In addition to studying the numbers, look at the related signs associated with numbers: the dollar sign (\$), the ampersand (&), the comma that separates thousands (,), the cent sign (¢), and the decimal point (.). Search for peculiarities there. These signs will vary from writer to writer but remain internally consistent for a writer.

Problems Involving Numbers

One of the most common problems involving numbers entails raising the amount of a negotiable instrument. One can be made into four, seven, or nine; two can be turned into three or five; zeros can be added to increase amounts by tens or hundreds. Digits can be placed before other numbers to raise amounts to hundreds or thousands of dollars.

Document examiners need to be able to identify individuals who fraudulently alter numbers in forged check cases or doctor the books in embezzlement cases.

Occasionally a date is changed on a document or a false date is given. Although this may necessitate dating the paper or ink, the date itself may give clues to its spurious nature. The check number may fit into the sequence of checks that had been written during an earlier time period.

Document examiners are frequently asked to solve problems involving forged or counterfeit checks. People are creatures of habit who tend to repeat the same method of filling out a check. A forger does not always copy the proper form for date, payee, or amount. Although a different signature is used, forged checks can be identified by the method employed to complete the check. Ralph Bradford, a document examiner in California, devised the Bradford Classification System for check identification based on the method of construction of the check.

When examining any kind of document, scrutinize every part of it carefully, especially any numbers that appear on the document. Examine any envelopes in which documents are sent. Examination of numbers can yield considerable information about their author.

What does the document examiner compare when studying numbers? In addition to the characteristics of handwriting, there are further questions a document examiner needs to ask about numbers.

Dates

People are usually consistent in writing dates. Their dating habits provide clues to their identity. Writers use dashes or slashes between the month,

day, and year. Some writers follow the European style of placing the day first and then the month and year.

Disguise

Writers who disguise their writing rarely disguise their numbers. When they do attempt to disguise their numbers, they are not usually successful in doing so.

Individual Characteristics to Look For

1. Are the numbers aligned with the baseline as taught by some of the handwriting systems with the numbers three, four five, seven, and nine sitting below the baseline, the six and eight above the baseline, and the one, two, and zero being on the baseline?
2. Are there similarities between the numbers two and three?
3. Are there eyelets in the numbers two and three?
4. What is the relationship of the downstroke of the number four with the cross-stroke?
5. What is the shape of the four? Is it open or closed?
6. How many strokes were used to form the number five, one or two strokes?
7. Is the five well formed or does it resemble the letter S?
8. What is the shape of the loop in the number six? Is it round, oval, an eyelet, open, or closed? Where does it attach to the stem?
9. Does the seven have a short initial stroke? Does it have a cross bar common to European sevens?
10. In what direction is the number eight formed? Does it start on the right or the left? Is it made in one continuous stroke or two small circles?
11. Is the circle of the number nine round or flattened on the side connected to the stem? Where is it attached to the stem?
12. Where does the zero start and end? Is there a gap in the circle? What shape is the circle?
13. Are there any tails in addition to ticks or hooks in the numbers?
14. Are any of the numbers smaller? Zeros are sometimes made smaller than other numbers.
15. Are any of the numbers joined? For example, are double zeros joined?
16. Do any of the strokes show signs of being altered? For example, is the number one changed into four, seven, or nine?
17. Are there any unusual number combinations?

CASE STUDY: ALTERED NUMBER CASE

Background

A man's ex-wife cashed a check against his account. He suspected forgery and contacted a document examiner. An examination of the check

revealed that the check had been written and signed by the client. However, the check had been altered. The client remembered making out a check to his wife several years earlier when he was putting her through school. She lost the original check so he had issued her a new check.

Question

What should a document examiner look for on a check to determine alteration?

ANSWER

Change of date, payee, or amount. Look for signs of erasure or rewriting.

Outcome

The document examiner discovered that no bank would cash a check that was more than a year old. The date on the check had been changed from 1992 to 1993. The perpetrator was indicted for forgery.

Questions

1. Which is easier to identify, handprinting or handwriting?
2. What are some of the groups that handprinted letters can be put into?
3. Which letters contain humps?
4. Which letters are more varied, lowercase or uppercase?
5. What type of i-dots can writers make?
6. What civilizations used letters of the alphabet to represent numbers?
7. What is the origin of modern numerals?
8. Name types of cases that involve numbers.
9. How does one change a number to make a higher number?
10. What does the document examiner compare when studying numbers?

Chapter 5

History of Forgery

INTRODUCTION

The art of forgery is as old as the alphabet. The crime of forgery has been practiced since ancient times in every country where writing existed and paper was used for financial transactions. Laws against forgery can be traced to 80 BC when the Romans prohibited the falsification of documents that transferred land to heirs. Forgery was prevalent in Europe in the Middle Ages. Gradually laws were passed to prohibit forgeries in every developed country, but it was difficult to identify some of the highly skilled forgeries.

In 1562, a statute was passed in England prohibiting forgery of publicly recorded, officially sealed documents. These documents pertained to titles for land. In 1726, an expansion of the forgery laws made a false endorsement on an unsealed private document a capital crime punishable by death. Pillory, fines, and imprisonment were the penalties in cases not subject to capital punishment.

In 1819 in England, an issue of one pound notes consisting of simple pen and ink inscriptions on ordinary white paper proved irresistible to a great mass of people. Over the next 7 years, 94,000 people were arrested and 7700 were sentenced to death.¹

In the United States, the principal federal forgery statute prohibiting false making, forgery, or the alteration of any writing for the purpose of obtaining financial gain was enacted in 1823. The American Law Institute's Model Penal Code of 1962 simplified and defined the elements of forgery and became the standard for defining the crime of forgery.

¹ O'Hara C. *Fundamentals of Criminal Investigation*, 5th ed. Charles C. Thomas, Springfield, IL, 1980, p. 474.

EXPERT WITNESSES

The comparison of handwriting by an expert was permitted under the Justinian Code of 529 AD under Roman law. Judges were entitled to appoint experts to give testimony in court as to the genuineness of a writing based on a comparison with other admitted genuine writings. Although the English followed the Justinian Code, under English common law the only witnesses allowed to testify regarding the authenticity of signatures were people who had knowledge of or had seen the disputed signature written.

Experts were allowed to make comparisons in special circumstances in non-jury trials. However, handwriting samples that were not part of the case were excluded and could not be used for the comparison of handwriting by the witnesses. The inability to introduce standards of comparison into court cases hampered identification. The English Parliament changed this practice in 1854, allowing the introduction of genuine writing for comparison purposes that was not part of the court case.

The United States based their laws on the English common law. Massachusetts, Connecticut, and Maine have always permitted properly proven comparisons in court cases. In *Homer v. Wallis*, 11 Mass. 309, the court said, "Comparison of a disputed writing proved to the satisfaction of the court to be genuine shall be permitted to be made by witnesses, and such writings and the evidence of witnesses respecting the same may be submitted to the court and jury, or the court, as the case may be, as evidence of the genuineness or otherwise of the writing in dispute." This occurred in 1814, but most states did not accept comparisons until 1914, 100 years later, after Congress enacted the Statute of 1913, which reads:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that in any proceedings before a court or judicial officer of the United States where the genuineness of the handwriting of any person may be involved, any admitted or proved handwriting of such person shall be competent evidence as a basis for comparison by witnesses, or by the jury, court or officer conducting such proceeding, to prove or disprove such genuineness. (H.R. 20, 102)

PIONEERS OF DOCUMENT EXAMINATION

The earliest record of expert comparison testimony in America was in *Sauve v. Dawson*, 2 Mart. (La.) 202 (1812), where a signature on a promissory note was proved genuine.² However, handwriting identification did not become popular until much later in the 19th century.

² Baker, J. Newton, *Law of Disputed and Forged Documents* The Mitchie Co., Charlottesville, NC, 1955, p. 11.

One of the first forensic document examiners in this country was Albert Southworth (1811–1894), a handwriting teacher and penman. He used photo-micrographs to illustrate handwriting written after a paper had been folded.

The first significant forgery case in this country was tried in Massachusetts in 1867. It involved the traced signatures of Sylvia Ann Howland of New Bedford.³ The most significant testimony came from Dr. Benjamin Piece, a mathematician from Harvard. He testified that the mathematical probability of identical strokes being made in two different signatures is equal to the probabilities of all the events to the continued product of the probabilities of all the separate events. The likelihood of 30 strokes occurring in two separate signatures could occur only once in 931,000,000,000,000,000,000.³ Bankers, tellers, professors of penmanship, photographers, and engravers were the only experts allowed to testify. Dr. Piece's methodology was subsequently proven to be inaccurate.

Around this time, handwriting experts began to testify in court as expert witnesses. Most of these experts were calligraphers. Daniel Ames and William Kinsley had a private practice from 1861 to 1909. In 1900, Ames wrote *Ames on Forgery*, which was one of the first books on document examination.

John Tyrrell, born in 1861, was a pioneer in document photography. He worked as a document examiner for Northwestern Mutual Life Insurance Company for 45 years and had a private practice from 1896 to 1955.

In 1904, John H. Wigmore wrote *The Law of Evidence*, which revolutionized the legal profession regarding expert testimony.⁴

Albert Osborn is recognized as the father of document examination. He wrote the first comprehensive book on the subject, *Questioned Documents*. It is considered the "bible" of document examination and required reading for everyone in the field. The principles of handwriting identification that he described are still the basis for the comparison of handwriting today.

The case of Roland B. Molineux involved at least 17 handwriting experts, 6 of them being tellers and bank clerks. Molineux sent poisoned Bromo Seltzer through the mail. It was ingested by an innocent victim who died. Among the experts who testified in the case was Albert S. Osborn. The trial lasted 3 months, and Molineux was found guilty and sent to Sing Sing prison.

In 1903, the Rice Will Case required handwriting testimony to prove that Albert T. Patrick forged Rice's name on several checks and a will after he had murdered Rice. Albert S. Osborn testified in this case to the fact that the checks and will were traced forgeries. He was allowed to use photographs on transparent paper to show that the four questioned signatures were identical.

³ Osborn A. *Questioned Documents*, 2nd ed. Nelson-Hall, Chicago, IL, 1929, p. 348.

⁴ Bradford R.R. and Bradford R.B. Introduction to Handwriting, Examination, and Identification. Nelson-Hall, Chicago, IL, 1992, p. 9.

In the early years, professional handwriting examiners came strictly from the private sector. The first two government examiners were Dr. William Souder of the National Bureau of Standards, Department of Commerce and Bert C. Farrar of the Treasury Department. The first scientific police laboratory was established in 1930. The Federal Bureau of Investigation (FBI) opened their laboratory in 1932 with one document examiner. The Post Office followed with their laboratory in 1940.

The Lindbergh kidnapping case is considered by many to be the most significant case in the history of document examination. Eight document examiners testified for the state, including Albert S. Osborn and his son, Albert D. Osborn. Bruno Richard Hauptman was accused of writing the ransom notes and was convicted and executed for the kidnapping and murder of the Lindbergh baby.

In 1948, Alger Hiss was tried for treason based on a comparison of documents typed on his typewriter. Alger Hiss was accused of being a member of the Communist Party by Whittaker Chambers, an admitted Communist functionary. Whittaker Chambers claimed that Alger Hiss copied documents for Soviet agents and had his wife type them on their Woodstock typewriter. Alger Hiss denied the charges. Chambers turned over documents to the government that he said had been given to him by Alger Hiss. Documents that had been typed on the Hiss typewriter were turned over to the FBI for comparison with Chambers' documents. All of the documents were found to have been typed on the same typewriter, and Alger Hiss was found guilty of perjury.

He insisted that he was a victim of forgery by typewriter; that is, that a typewriter was adjusted to match the idiosyncrasies of the Hiss' typewriter. Martin Tytell was commissioned to manufacture a typewriter that would duplicate the idiosyncrasies of the Hiss' typewriter. He was able to manufacture a typewriter that exactly duplicated the idiosyncrasies of the Hiss' typewriter. Document examiners were unable to distinguish the two typewriters.

FORGERS

Forgers are proud of their ability to dupe people into accepting their forgeries as genuine documents. Consequently, they are inclined to admit their deception when their hoax is revealed. From Anthony in ancient Rome to Mark Hoffman of Utah, forgers have plied their trade and bragged about their accomplishments.

All documents are subject to forgery, from Shakespeare's plays to Howard Hughes' autobiography. Autograph collectors deal with fake Bibles of Stonewall Jackson, fraudulent orders from George Washington, and fabri-

cated letters from Abraham Lincoln. Some forgeries are difficult to detect but most show obvious signs of spuriousness. Some forgers have succeeded because greed prevented the victims from having documents properly authenticated.

William Henry Ireland specialized in Shakespeare forgeries that were accepted as genuine until he tried to create a new Shakespearian play entitled *Vortigern and Rowena*. Joseph Cosey specialized in Lincoln's handwriting, and Robert Spring was adept at imitating George Washington's handwriting. Cosey and Spring were prolific forgers who mastered many handwritings and made their living forging documents.

Many other forgers proffered fictitious manuscripts. Most were eventually caught and brought to justice, making headlines for their bold attempts to dupe others. Charles Hamilton and Kenneth Rendell have written books about these various forgers. In addition to the blatant forgeries, there are authorized signatures of famous people that were signed by wives and secretaries or a robot signature using a writing machine called an autopen. Document examiners who specialize in famous forgeries need additional training to learn to differentiate authentic signatures from authorized and autopen signatures.

FAMOUS FORGERY CASES OF THE 20TH CENTURY

In 1971, Clifford Irving convinced the publishers of McGraw-Hill that he had been authorized by Howard Hughes to write his autobiography. McGraw-Hill agreed to pay \$750,000 for the autobiography. Irving forged letters from Hughes requesting Irving's assistance in writing his autobiography. Irving even fabricated a contract between himself and Hughes to divide the money from the book. *Life* magazine purchased the rights to run excerpts of Howard Hughes' autobiography. To verify the authenticity of the letters from Howard Hughes, they hired the firm of Osborn, Osborn and Osborn who compared samples of Hughes' known writing with the Irving forgeries. Paul and Russell Osborn opined that the letters written by Irving were penned by Howard Hughes. Clifford Irving was exposed when Howard Hughes came out of exile to announce he had not authorized anyone to write his autobiography. An affidavit was filed by Hughes stating he had never met Clifford Irving and never cashed any checks from McGraw-Hill. Clifford Irving pleaded guilty of forgery, and he and his wife served prison terms. Robert A. Cabanne testified before the Federal Grand Jury of the Southern District of New York that Hughes had not penned the questioned documents.

After Howard Hughes' death numerous wills were submitted for probate. The best-known will, the Mormon Will, was presented for probate in Las Vegas. The jury declared that the will was not genuine after several document examiners testified to its non-authenticity.

In 1983, the world was stunned with the “discovery” of the Hitler diaries. Document examiners and historians were asked to determine if the diaries were authentic. Reports were mixed until laboratory testing revealed elements in the paper that were not manufactured until 1956. The Hitler diaries were the most ambitious hoax of the century.

The Hitler diaries were crude forgeries. How were they accepted as genuine? In an effort to scoop the world, the editors of *Stern*, the magazine that “uncovered” the diaries, did not want any information about the diaries leaked before publication. They bypassed the important step of presenting the diaries to document examiners for authentication. When they finally contacted the German police laboratory, the police were busy, and it took a month before they examined the material. A thorough examination revealed the fraudulent nature of the diaries.

The forger, Konrad Kujau, a dealer in military memorabilia, had forged Hitler’s handwriting for many years before attempting the diaries. In fact, some of the Hitler exemplars used for comparison were forged by Kujau so that the experts declared the diaries to be genuine based on forged exemplars. Kujau spent 4.5 years in jail and continues to sell his forged Hitler handwriting samples.

Mark Hofmann was an autograph dealer who seemed to have a knack for finding rare documents at the request of his clients. His principal interest was Mormon documents. He spent considerable time researching the Mormon religion at Utah State University. He based his forgeries on much of this research. He stole pages from old books so that he had paper from the proper time period. He duplicated an ancient ink formula to replicate the proper substance. His years of research enabled him to fool the experts, including the FBI, for 5 years. Like so many other forgers, however, he made mistakes and was caught. Investigators began looking into the documents he supplied after two people were blown up by bombs linked to Hofmann. Hofmann was injured by another bomb he had made that exploded prematurely.

Because Hofmann used paper with an ink formula from an earlier period, he escaped detection for several years. He chemically aged the documents he forged. Document examiners William Flynn and George Thockmorton replicated the unusual appearance of Hofmann’s forgeries to prove the spuriousness of his material. Several tests revealed the fraudulent nature of the Hofmann forgeries.

In 1992, Michael Barrett of Liverpool, England approached a publishing agent with a diary allegedly written by James Maybrick, who identified himself as Jack the Ripper. The 63-page diary was published with a narrative

by Shirley Harrison. Robert Smith published the book as authentic although numerous document examiners had stated the diary was not genuine. Kenneth Rendell's report was published in the book with an opposing viewpoint by Robert Smith. Michael Barrett admitted the fraud but has since retracted his statements.

On September 8, 2004, Dan Rather announced on national television that CBS had obtained documents relating to George W. Bush's service record in the Texas Air National Guard, showing that George Bush had not completed his training. Documentation consisted of photocopies of several memos and a letter claiming to support this position. Dan Rather stated that document examiners had reviewed the documentation and declared the documents authentic. In fact, Marcel Matley had opined that a signature on one of the documents was authentic but had not given an opinion about the authenticity of the documents. Two other examiners, Emily Will and Linda James, had been consulted and had not authenticated the documents.

Document examiners around the country made statements to the media that the documents were not authentic. ABC started an investigation immediately contacting and interviewing Emily Will and Linda James. They were the first network to challenge the authenticity of the documents. Two weeks later Dan Rather stated that the documents could not be authenticated.

MODERN DOCUMENT EXAMINERS

Document examiners are employed by the government on all levels. The federal government has document examination departments in the Secret Service; Department of Immigration; Bureau of Alcohol, Tobacco and Firearms; the Drug Enforcement Administration; FBI; and United States Post Office. State police usually have a document examiner in each state who handles work from many county police departments. Large cities generally have a full-time document examiner on staff for their police force.

The majority of document examiners are found in the private sector. Most work part-time and come from related fields, such as criminal justice or another forensic science. Many are retired from the federal government. Others are private investigators and ink chemists.

There are few courses available for aspiring document examiners, although this is beginning to change. There are now several correspondence courses on the market as well as some college courses scattered around the country. There is no degree offered in the field. Students are encouraged to seek a degree in forensic science or criminal justice in order to pursue a career in document examination.

The government trains its document examiners. A 2- to 3-year apprenticeship is considered appropriate for new document examiners. Those in private practice obtain their credentials independently through reading, observing, studying, comparing, and experimenting. They generally apprentice to other document examiners on an informal basis and join associations that offer continuous training in the field, such as the National Association of Document Examiners, the Association of Forensic Document Examiners, and the Independent Association of Questioned Document Examiners.

CASE STUDY: FAMOUS SIGNATURES

Background

What is required to authenticate handwriting of famous or historical figures?

Answer

Known signatures are required to authenticate handwriting of famous or historical figures, just as in any document examiner's case. The problems with famous or historic figures are twofold. First, expert forgers create fraudulent signatures of well-known figures. These forgeries are not easily detected. Second, the invention of the autopen makes it difficult to determine if a signature was actually penned by the well-known figure unless the document examiner has sufficient samples of the writer's signature.

Outcome

Most document examiners decline these cases because they recognize that it is outside their area of expertise. If one has a variety of exemplars of the famous person including any autopen signatures, he or she may be able to differentiate a genuine signature from a spurious one.

Questions

1. When did the crime of forgery first occur?
2. When did the first expert testify in a handwriting case in the United States?
3. Who was one of the first forensic document examiners?
4. Who is considered the father of document examination?
5. What book is considered the bible of document examination?
6. Who forged the autobiography of Howard Hughes?
7. Who is Kajau?
8. What did Mark Hofmann forge?
9. Who employs document examiners?

Chapter 6

Forgery

INTRODUCTION

What is forgery? A person who makes, utters, or alters a writing in such a way as to convey a false impression concerning its authenticity imposing a legal liability with the purpose of deceiving or injuring another is guilty of forgery in its contemporary sense.

To support a charge of forgery, the elements of proof must be established. The elements of a crime are the specific conditions that must occur for an act to be classified as a specific type of crime. These elements are defined by each jurisdiction, thus there may be some differences from state to state. The elements of forgery are falsemaking, legal liability, identity of the forger, and the intent to defraud.

FALSEMAKING

Falsemaking involves the creation of fraudulent writing on a document or the alteration of an existing document. The whole document may be fabricated or just the signature. The signature could be an imitation of a genuine signature on a legitimate account or a fictitious name in a non-existing account. An example of an altered document would be a raised amount on a check.

Falsemaking refers only to the authenticity of the document and not to the content of any statements in the document. Even if false statements are used to deceive, these statements are not forgery.

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

LEGAL LIABILITY

The fraudulent writing must impose a legal liability on another if the document had been genuine. A person is guilty of forgery when he or she issues a false document even if no money is collected on the document. The attempt signified by the issuing of the false document is sufficient proof of forgery.

FORGER'S IDENTITY

The identity of the forger must be established. It is necessary to prove the accused made or altered a false document or uttered, issued, or offered the fraudulent document knowing its spurious nature.

INTENT TO DEFRAUD

The forger must know the document is fraudulent. He or she must intend to swindle the victim. The act of making or altering a fictitious document is sufficient evidence to show the perpetrator intended to defraud another.

Altering a document is considered false-making. Changing the name of the payee on a check or raising the amount is an example of false-making.

Although forged checks are the most common type of forgery, other instruments are also forged. Wills and contracts constitute a large number of forgery cases. Any document is vulnerable to forgery from college diplomas to stocks and bonds.

Only the court can determine if a forgery has been committed; that is, if the suspect who attempted to pass a fraudulent document intended to defraud. Document examiners can only identify the document as being spurious but cannot state the document is a forgery.

METHODS OF FORGING

Two types of forgeries exist, simple and simulated. A simple forgery is one in which no attempt has been made to imitate a genuine signature. It may be the signature of a particular person, or it could be a fictitious name. A simple forgery is the easiest type of forgery to identify because it does not resemble a known signature.

A simulated signature is one in which the forger has attempted to copy a known signature. The known signature can be copied freehand or it may be traced. If the forger is an experienced and skilled penman, he or she may



Fig. 6.1. An attempt to imitate the tremor of an elderly writer.

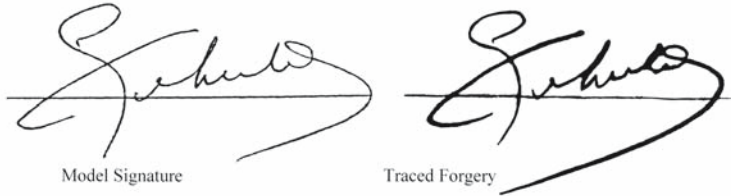


Fig. 6.2. An example of a traced signature and the model from which it has been traced. The traced signature contains less detail than the known signature.

simulate a signature from a model. Simulated forgery is the most difficult of all methods to create and the most difficult to detect (Fig. 6.1).

Only a small percentage of forgers are skilled penman capable of creating a skilled forgery. Most forgeries are created by amateurs or opportunists, and their attempts to forge are very obvious. Traced forgeries contain tremor and deviate slightly from the model signature (Fig. 6.2).

Various methods are used to trace signatures. Carbon paper is sometimes placed under the model signature to trace the outline of the signature onto another paper. The outline is then followed with a broad-point pen. Carbon residue will be seen wherever the ink line failed to cover the carbon.

Sometimes the forger will use a stylus to go over the signature, leaving indentations of the model signature. The forger goes over these lines with a pen. This type of traced forgery can be identified by the indented lines because the forger usually misses some of the indentations when writing over them.

Signatures are sometimes traced using a light source such as a light box or window. The signature is copied onto a paper on top of the model signature. This will leave an indentation on the model signature.

Some modern forgers are using scribes and pantographs. These are instruments used by artists and draftsman to change the size of the drawing. The forgers change the size of the signature when duplicating it.

CLASSIFICATION OF FORGERIES

Forgeries can be classified according to the various types of forged instruments. The first consideration is the extent of the forgery. Entire documents can be fabricated, or parts of a document may be altered. An entirely fabricated document is known as a holistic forgery. Fabricated documents may be handwritten, typed, or printed. Counterfeit forms may be involved, or genuine forms may be altered. Signatures may be simulated forgeries or simple forgeries.

Some forgers attempt to imitate the handwriting or signature of another person, whereas others only disguise their writing so it cannot be identified. Disguised writing will be discussed in Chapter 17. Others make no attempt to disguise their writing, making their writing easier to identify. Some forgers alter documents by changing dates or raising amounts of money.

There are forgers who only forge signatures, whereas others attempt to handwrite whole documents. An entire document is much more difficult to forge than a signature. It requires tremendous concentration to forge a holistic document. The forger must keep in mind all the habits of the original writer while simultaneously eliminating his or her own habits. The more writing a person does, the more difficult it is to maintain another's style. As the forger's attention wanes, he or she reverts to his or her own writing habits.

TECHNIQUES OF THE FORGER

Forgery became a more complicated procedure as negotiable instruments became more complex and more difficult to copy. The early 20th-century forger needed considerable knowledge and skill to ply the trade. He or she also needed a variety of mechanical devices. Typewriters, checkwriters, check protectors, rubber stamps, date stamps, and professional printing equipment were basic tools of the trade used to create fraudulent documents. Knowledge of chemicals, papers, and inks was essential. Skills in printing, engraving, lithography, as well as penmanship were indispensable. Forging required a considerable amount of time as well as the investment of expensive equipment.

Forgers acquire forms by stealing or printing them. The modern-day forger uses modern equipment to duplicate checks, gift certificates, and other negotiable instruments primarily through desktop publishing.

DESKTOP PUBLISHING

The proliferation of computer equipment in recent years simplified the technique of creating fraudulent documents. Desktop publishing made it easy

to forge documents from letters of credit to spurious checks. Documents that had required expensive printing equipment can now be done on a personal computer with a scanner and a laser printer in a short period of time. Ninety-five percent of modern counterfeit checks are produced on desktop computers.

CUT-AND-PASTE DOCUMENTS

Some forgeries are committed by cutting a valid signature from a document and pasting it to a fraudulent document. Then the new document is photocopied and the original destroyed. The perpetrator will present the photocopy as best evidence and try to collect on the fraudulent creation.

Cut-and-paste documents can be identified by the misalignment that generally occurs when a document is altered in this manner. The perpetrator fails to align the document exactly. A grid placed over the fraudulent document will generally reveal its true nature.

When the document in question consists of several photocopied pages, the trash marks can be compared to assist in identifying a cut and paste. Trash marks are those marks left by a photocopier. They are caused by dirt on the glass or a nick in the drum. When the trash marks on the top and bottom of the page do not match, the document may be a cut and paste.

ELECTRONIC SIGNATURES

With the advent of computer-generated signatures, it is becoming more difficult to identify forgeries because electronic signatures can legally be used in business (Fig. 6.3).

CASE STUDY

Is your signature valid if

1. You sign the name John Smith to a lease, Tom Jones on a contract, and Bill White to a deed?
2. You are tired of signing your name, Enrico Hernandez Juan Valdez, so you sign with an X?
3. You sign a contract at age 17?
4. You cannot sign your will because your hand shakes so you ask a friend to guide your hand?
5. Your signature on a contract is barely legible because of an inkblot?
6. You make a four-page will, and sign your name only on the first page?
7. You ask a friend to sign your name to a purchase agreement?
8. Somebody writes out a check forging your name to it?



Fig. 6.3. A genuine signature that has been scanned into the computer and printed.

9. You use a rubber stamp with your signature on it to sign a document?
10. Your spouse endorses your name to a check with your consent?

Answers

1. Yes, you may sign any name you choose on a legal document provided you are not doing it for a criminal purpose.
2. Yes, you can use any mark you choose as your signature, but if you use an X you should have witnesses.
3. No, you must be at least 18 to sign a contract.
4. Yes, a guided-hand signature is acceptable.
5. Yes, if the signature is legible it is valid.
6. No, you must sign the will at the bottom of the last page in front of witnesses.
7. Yes, you can give someone a power of attorney to sign your signature.
8. No, a forged signature is not valid.
9. Yes, a rubber stamp is acceptable.
10. Yes, you can authorize your spouse to sign your name.

Questions

1. What is forgery?
2. What are the elements of proof that support a charge of forgery?
3. What is falsmaking?
4. What types of forgeries are there?
5. What is a simple forgery?
6. How does one create a simulated forgery?
7. What is a holistic forgery?
8. Why is it difficult to create a holistic forgery?
9. What is desktop publishing?
10. To what does cut and paste refer?

Chapter 7

Other Types of Fraud

WHITE-COLLAR CRIME

The term *white-collar crime* was coined by Edwin Sutherland in 1949. He describes white-collar crime as a crime committed by a person of respectability and high social status in the course of his or her occupation. The definition has broadened to include an illegal act or series of acts committed by nonphysical means and by concealment or guile, to obtain money or property, avoid the payment or loss of money or property, or obtain a business or personal advantage. Much of this type of fraud involves fabricating or altering documents.

The amount of white-collar crime being perpetrated has escalated in the past few years. Many white-collar criminals are never caught and few are prosecuted. White-collar criminals are businesspeople, con-artists, and opportunists. White-collar schemes range from simple swindles to complex conspiracies. Three elements come together to create fraud: motive, opportunity, and rationalization.

From predication to litigation, fraud is the most costly of all criminal activities. The annual cost of fraud in the United States is more than \$135 billion (Table 7.1).

Insurance fraud accounts for the largest percentage of fraud, with much of it directed toward health care. Embezzlement, medical malpractice, and industrial espionage are examples of other types of white-collar fraud that a document examiner will encounter. In some cases, he or she is looking for alterations or material that has been added to a document. In many of these cases, the document examiner will be looking for the person who created the questioned documents.

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

Table 7.1
Annual Cost of Fraud

Telecommunications fraud	\$15 billion
Credit card fraud	\$3 billion
Mail fraud	\$15–40 billion
Computer hackers	\$2.2 billion
Insurance fraud	\$100 billion

INSURANCE FRAUD

Many people defraud insurance companies. Doctors falsify invoices for services never rendered. Records of medical examinations are falsified so unhealthy clients can buy life insurance policies. People stage phony automobile accidents, arsonists destroy property for insurance money, and agents falsify information on policies to collect commissions.

EMBEZZLEMENT

Embezzlement is the fraudulent misappropriation of funds entrusted to an individual. Embezzlement usually involves a person who has been given a position of trust. In some cases, document examiners work with accountants to decipher the system used to pilfer funds. The document examiner may be expected to match numbers to determine the identity of the embezzler, or he or she may simply have to identify the writing on specific documents.

MEDICAL MALPRACTICE

Medical malpractice usually entails alterations or additions to medical records. Records are doctored to reflect proper procedures on the part of medical personnel for the purpose of avoiding lawsuits or loss of their licenses.

INDUSTRIAL ESPIONAGE

Industrial espionage is the theft of valuable information from a company or place of business. It may involve disgruntled employees or undercover agents sent to steal formulas, specifications, blueprints, or other proprietary secrets.

IDENTITY THEFT

Identity theft is the newest white-collar crime that is rapidly becoming the leading white-collar crime. Although thieves have used other people's identity for years, this crime has only recently been identified and made a

criminal act. It is a federal crime and often involves people not geographically linked.

Thieves are stealing identities to obtain credit cards or other forms of financing, leaving the victim with a ruined credit record. In addition to stealing identification to commit financial fraud, criminals use false identification when charged with a crime.

The modern age of communication makes identity theft easy to commit. All the person needs is the victim's name and social security number. With little effort, gangs obtain not only the social security number, but also the date of birth, address, and other personal information about the people they victimize.

There is no way an individual can be completely protected from identity theft. Victims spend much time and effort correcting their credit history and clearing their names of crimes they did not commit, often with the assistance of a document examiner.

DOCUMENTS USED IN CRIMINAL ACTS

Ransom notes, extortion and blackmail letters, and crank mail (both vicious and sexually oriented) constitute some of the types of cases document examiners may be asked to solve. They may be asked to identify the author of a hold-up note or a death threat. They may be able to uncover a bigamist. They may be asked to determine who put the wrong dimensions on an architectural drawing. Did the suspect write the murder confession or is he or she being framed? These are just a few of the scenarios encountered in the field of document examination (Fig. 7.1).

GRAFFITI OR ANONYMOUS POISON PEN LETTERS

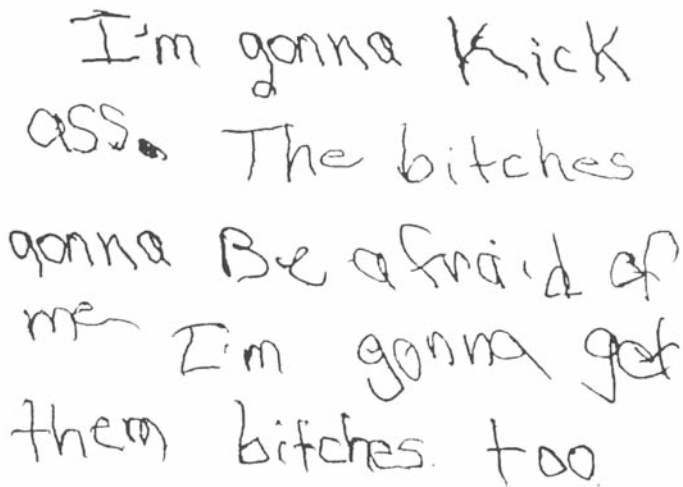
Graffiti or anonymous poison pen letters in a business environment cause a decline in morale in employees. Culprits are often surprised when they are terminated from the company for these unethical practices. Occasionally, a disgruntled employee will write a poison pen and/or threatening letter to a previous place of employment or a sexually explicit letter will be sent anonymously to a fellow employee (Fig. 7.2).

Graffiti often involves writing on media other than paper, such as walls, locker doors, or mirrors. It may be spray-painted, scratched with a sharp instrument, or written with lipstick or chalk. Whenever possible, the document examiner should arrange to study the original, although a good, clear photograph may suffice.



THIS IS A HOLD UP
BE APOC

Fig. 7.1. A handprinted hold-up note written naturally. There was no attempt to disguise the handprinting on the note.



I'm gonna kick
ass. The bitches
gonna Be afraid of
me I'm gonna get
them bitches too.

Fig. 7.2. A handprinted anonymous threatening letter. There has been some attempt to disguise the writing as seen in the tremor of some of the letters.

INTERDELINATION OF LINES

Problems sometimes arise involving co-mingled writing. It may be necessary to determine which writing was placed on the document first. Lines that intersect can be studied to ascertain the sequence of writing.

INDENTED WRITING

Document examiners are confronted occasionally with cases involving indented writing. Indented writing is created when sheets of paper sitting under the original receive the impression from the pressure of the writing instrument. Indentations may affect three or four subsequent pages of writing.

The impression of writing on a page may need to be deciphered. It may be possible to decipher the impression by side lighting the document and photographing it or by placing it on an Electro-Static Detection Apparatus machine.

COUNTERFEIT DOCUMENTS

Counterfeiting involves the fabrication of false representations. Counterfeiters may make a copy without authority or a right to such a copy for the purpose of perpetrating a fraud. The most likely documents to be counterfeited involve money or securities but can include other items such as counterfeit credentials.

SIGNS OF FRAUD

Document examiners are called on to solve many different types of problems that arise concerning documents. A document examiner may be asked to determine if the document has been altered in any way.

- Has information been erased from a document?
- What has been obliterated?
- What was written on documents under blackout or whiteout?
- Has additional information been added to a document?
- In what order has information been written or printed on the document?
- When was the alteration done?
- What is the age of a document and/or entries on the document?

To determine the age of a document or entries on a document, a handwriting expert may have to determine the age of the paper and/or the ink used on the paper.

- When was the watermark manufactured?
- Has the paper been artificially aged by heat or by chemicals or by staining and wrinkling?
- Can the age of the ink be discovered from the chemical tracings?
- What type of pen was used to create the document?
- Was that type of pen in existence when the document was purportedly executed?

Identifying the typewriter or printer used to create a document may be vital when determining age or authorship of a document.

- What kind of typewriter was used? Manual, electric, or electronic?
- Was a specific typewriter used?
- Was the document created by a printer with the aid of a computer?
- What type of printer? Daisy wheel, dot matrix, ink jet, or a laser printer?

Substitutions

- Have pages been substituted in a contract or will?
- Has a genuine signature been photocopied onto a document?
- Has material been substituted on a page after it was signed?
- Have numbers been changed?

How much information can be discovered about documents? Some information is easily obtained. For example, a watermark can indicate the date the paper was first manufactured. This information can be procured from the dandy roll factory that manufactures the watermarks or *Lockwood's Post Directory of the Pulp, Paper and Allied Trades* published by Miller Freeman Publications. A new edition is published each year.

An important part of a document examiner's work consists of knowing what can be determined and where to get the needed information. The examiner may need to consult an ink or paper expert for his or her clients. Document examiners keep a list of resources available and update it with new information whenever necessary.

CASE STUDY: INTERSECTING LINES

Background

A woman discovered a will giving all of her possessions to her niece. The woman had not written the will, and she reported the fraud to the police. The police took exemplars of the woman's handwriting and her niece's writing. The forensic laboratory could not make a determination as to who authored the questioned will, so the woman hired a private document examiner. The examiner photographed the signature and found that the intersecting lines crossed in the wrong direction.

Question

What is the significance of intersecting lines crossing in the wrong direction?

Answer

The signature had to be written backwards in order to have the lines cross in the wrong direction.

Outcome

The examiner proved that the signature on the will was fraudulent because it had been written backwards.

Questions

1. What is white-collar crime?
2. What type of fraud is most prevalent?
3. What is embezzlement?
4. Name some types of fraud associated with documents.
5. What is indented writing?
6. What are counterfeit documents?
7. How can a document be altered?
8. What assists a document examiner in determining the age of a document?
9. What does a dandy roll company manufacture?
10. What is *Lockwood's Post Directory of the Pulp, Paper and Allied Trades*?

Chapter 8

Equipping a Laboratory

INTRODUCTION

The field of document examination involves evidence that can be seen, tested, and measured. A document examiner needs instruments to assist in examining documents and determining facts that may not be visible without the aid of scientific equipment.

OPTICAL AIDS

The most important piece of equipment in the document examination laboratory is a stereoscopic microscope between 10 and 50 power that includes both incident and transmitted illumination. Most stereoscopic microscopes offer a combination of two different powers like 10 and 30 power or 15 and 45 power. A more expensive version of a stereoscopic microscope offers variable magnification of any power between 10 and 50 power. This is known as a zoom stereoscopic microscope. Power refers to the amount of magnification the microscope provides (2 power = 200% enlargement). A stereoscopic microscope gives the viewer a magnified three-dimensional view. This depth assists in the study of pressure patterns, crossed lines, erasures, indentations, writing over folds, and similar problems.

Microscopes used for document examination should be mounted on a long arm that allows adequate room for large documents to be examined without folding or bending the documents.

A transportable microscope and a good carrying case are needed because some documents cannot be released for examination and must be examined at their location. The modern document examiner must be portable.

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Comparison microscopes display two images side by side. Although side-by-side comparisons are necessary in document work, the field of the microscope is small and only a few letters can be compared at a time. Enlargements placed side by side are generally more valuable, so the comparison microscope has limited use for document examiners.

Assorted magnifiers are another mainstay of the document examiner. Good-quality, non-distorting magnifiers, along with a powerful light source, are necessary instruments to assist the document examiner in seeing fine detail. Various strength magnifiers in the 2 to 8 power range complement a microscope by filling in the gap between what can be seen with the unaided eye and what is visible with the low-power setting of the microscope. Optivisors and strong reading glasses also assist the document examiner.

An Optivisor is a lightweight binocular magnifier that fits comfortably around the head on an adjustable band. It can be worn over eyeglasses. This instrument allows the document examiner to view documents while leaving both hands free.

MEASURING DEVICES

Accurate measuring devices, including rulers, gauges, and grids, are necessities for obtaining precise measurements. A 12-inch, steel machinist's ruler with both inch and metric scales is desirable. Use the metal ruler as a standard to check other rulers or templates. Clear plastic rulers and templates may shrink over time. Plastic grids and transparent evidence rulers are lightweight and non-breakable but may not be accurate. Glass grids are more accurate but are fragile. Small paper rulers, as illustrated in Fig. 8.1, are used when photographing a document to identify size.

Document examiners use typewriter grids for pica and elite type, that is, 10 characters per inch (cpi) is called pica and 12 cpi are known as elite. These gauges need to be accurate because even a very badly aligned typewritten document will seldom vary more than 1/25 of an inch. Modern fonts may require additional size grids because they come in many different sizes.

A comparator is a magnifying glass containing a measuring device called a reticle combined into one unit. It is especially handy for measuring small distances or angles through the use of interchangeable reticles. A reticle is a flat circular piece of plastic or glass with a scale or pattern printed on the bottom that can be seen when imposed on the object being viewed, which assists in measuring fine details.

A protractor measures angles. A micrometer measures the thickness of paper. It carries a vernier, reading up to 1/1000th of an inch. Digital or dial

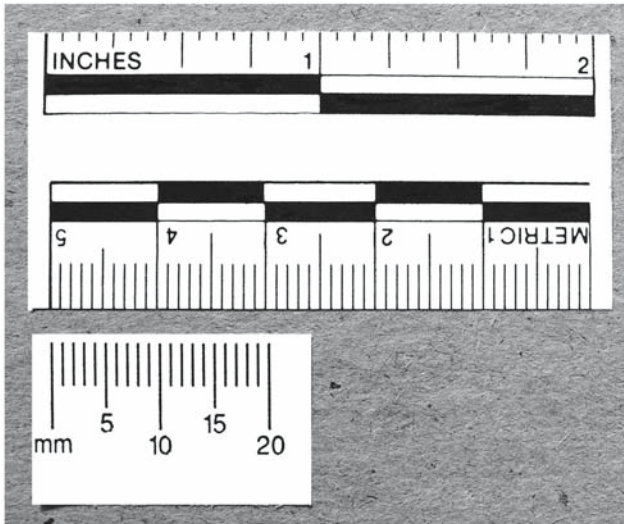


Fig. 8.1. Paper rulers that can be attached to a document to show actual size when photographing documents.

calipers can be used to make precise size comparisons. Some drafting tools are also useful to the document examiner, such as a compass or dividers. The drafting section of an art or office supply store has various templates that can also be helpful.

DUPLICATING DEVICES

Document examiners use camera equipment for close-up photography. They must be able to take clear, close-up photographs of original documents. A good photograph can be studied in place of the original document. Enlarged photographs enable a jury to see the characteristics of writing and the reasons for conclusions more clearly than by looking at the original documents.

One simple-to-use inexpensive camera is a Polaroid Spectra Camera with a close-up stand and case. The camera is placed in the stand on top of the document. It takes a one-on-one photograph with a click of the button. Enlargements can be obtained from the Polaroid Company, or photographs can be enlarged on a color copier.

A good-quality 35-millimeter film or digital camera is most suited for document work. Digital cameras offer the advantage of having the images

immediately available and easily enhanced to improve clarity. A tripod to hold the camera steady is necessary as well as a method of securing the document.

A high-quality photocopier will enable the document examiner to make enlarged photocopies of documents for easy examination. Enlarged photographs can be photocopied to make individual exhibits for jurors. A one-on-one photocopy of questioned documents should be made for size comparisons.

A scanner attached to a computer can be used to create exhibits by scanning the documents into the computer, juxtaposing the relevant material, and enlarging. It can then be printed on a laser or ink jet printer.

PROPER LIGHTING

Proper lighting is crucial for critical examinations in a document laboratory. Daylight should be used for examination of documents whenever possible. In addition, various types and intensity of lighting fixtures should be available because different types of lights can reveal subtle details essential for revealing flaws and stains on documents. White and yellow light should be standard equipment in laboratories along with high-intensity halogen lamps.

Some examinations require special lighting effects. A point source of light is useful for some examinations. These lights have a limited life and can only be used for short periods, but their strong lighting can focus on problem areas. Another type of lighting is oblique lighting (side lighting) that is used to view documents at eye level to detect shadows caused by indentations on a sheet of paper.

A flashlight or portable lamp is used when a power outlet for a plug-in light is not available. Some battery-powered Camcorder lights make excellent temporary high-intensity lighting. A light-duty, 15-foot extension cord and a small desk lamp are other solutions for distant electrical outlets.

A light box is a good investment for examining documents. A light box simplifies the comparison of documents by the use of transmitted light. One document is placed over the other for quick and easy comparisons. Transmitted light is also used to photograph watermarks. Light boxes come in various sizes with the smaller sizes easily carried in a briefcase.

SPECIALIZED EQUIPMENT

Additional equipment based on the document examiner's needs and special interests may be crucial to solving certain cases.

Long- and short-wave UV lights are needed for some cases. Long-wave UV light is the most common wavelength used in document examination and is usually produced by a specially filtered fluorescent light bulb. When documents are illuminated with UV light, certain inks and papers will fluoresce or glow, making them visible to the naked eye in an otherwise darkened room. A

portable cabinet is needed when light cannot be eliminated from the entire room. UV light sources can vary in price from relatively inexpensive hand-held units to expensive forensic light sources.

One of the newer techniques available to document examiners is infrared luminescence. In some instances, it is possible to obtain information about papers and inks using an infrared snooper scope. This hand-held device is sensitive to infrared illumination and may allow one to read obliterated or over-written documents. Infrared film can be used with special filters to photograph documents instead of using the snooper scope. Some black-and-white video cameras are infrared-sensitive and can be used with a special filter instead of a snooper scope. Clover electronics markets a digital microscope with infrared capabilities. This digital microscope can be attached to an A & V Monitor or a computer. A frame grabber can record images into a computer.

Foster and Freeman market a device called Video Spectral Comparator, designed for document examiners. It consists of a camera, a video monitor, various light sources and filters for exciting radiation and reflected or fluorescent light, an image integrator and comparator, and a video recorder. A document placed in the cabinet is subjected to a variety of lighting conditions to differentiate inks and paper.

An Electrostatic Detection Apparatus creates a visual image of indented writing. A document is placed on a vacuum plate that is covered with thin polymer film stretched over it. The film is positively charged by passing a high-voltage corona wire close to its surface. Glass beads containing negatively charged photocopy toner are cascaded over the film. Indented writing and possibly fingerprints, if present, appear in gray to black tones. The resulting image can be photographed, and the film can be covered with a transparent sheet to preserve the findings.

PORTABLE EQUIPMENT

Document examiners must be mobile. Portable equipment can be taken to courthouses to view wills, hospitals to examine medical records, and police stations to look at documents they do not want to release.

Most equipment can be easily transported in a briefcase or small lightweight pieces of luggage. A portable luggage carrier enables a document examiner to carry all equipment easily.

PROTECTIVE EQUIPMENT

Document examiners should use cotton gloves to handle original documents in cases in which fingerprints may be an issue. Place original docu-

ment in mylar sleeves to protect documents from excessive handling because documents are fragile and easily damaged.

A fireproof safe or file box should be used to store original documents to protect them from harm. Documents must be kept cool and dry in a well-ventilated room, away from moisture and sunlight.

CASE STUDY: CHECKS

Background

A widow applied to the Veteran's Administration for benefits. She was denied benefits on the basis that she had collaborated with the Japanese during the Japanese Occupation of Manila from 1942 to 1944. Two checks payable to the widow were produced that bore her signature and several official looking stamps.

Question

What would you do to determine if these checks were forged?

Answer

This type of case requires research into the banking system in use from 1942 to 1944 in Manila. Although the paper used for the checks was old paper, the ink on the paper was fresh and looked new. Enlarged photographs of the signature showed that each letter had been written separately and blended. Research also revealed that the wrong stamps had been placed on the checks.

Outcome

The checks were proven to be fraudulent and the widow received her benefits.

Questions

1. What is the most important piece of equipment in a document examiner's laboratory? Why?
2. What is an Optivisor?
3. What type of measuring devices does a document examiner need?
4. What is a comparator?
5. Why does a document examiner use cotton gloves?
6. What is a light box, and what is it used for?
7. What value does UV light have for a document examiner?
8. What is an Electrostatic Detection Apparatus machine, and what is it used for?
9. How is infrared luminescence useful to the document examiner?
10. Why must a document examiner have equipment that is portable?

Chapter 9

Care and Handling of Documents

INTRODUCTION

A document is any material on which a permanent or semipermanent message can be placed. Although most documents consist of paper containing handwriting, typewritten material, printed matter, or a combination, messages can be left on walls, mirrors, blackboards, or locker doors.

The document examiner thoroughly examines questioned documents to draw conclusions about the authenticity or spuriousness of the documents, including comparing and identifying signatures and detecting alterations, erasures and substitutions, indented writing, sequence of writing, and other problems that concern documents and their content. It may include the contents of the messages as well as grammar, spelling, and punctuation.

The most common type of problem revolves around signature identification on negotiable instruments. These include checks, contracts, wills, deeds, and credit card charges. Other problems involve altered documents. Embezzlement, medical malpractice, and raised checks fall into this category. Holistic documents including holistic wills and poison pen letters may also be questioned.

The term *evidence* includes all the means by which any alleged fact, the truth of which is submitted to investigation at judicial trial, is established or disproved.¹

Physical evidence is defined as articles and material found in connection with an investigation that aid in establishing the identity of the perpetrator or the circumstances under which the crime was committed or that, in general, assist in the discovery of fact.

¹ Giftis, SH, *Barron's Law Dictionary*, 3rd ed. Barron's Educational Series, 1991, p. 182.

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The rules of evidence require the production of the original document unless a sufficient explanation is given for the failure to produce the original, such as the loss or destruction of the original document. Photocopies are often accepted by the courts even though they may have undetected alterations, making them unreliable documents. Document problems can be solved using photocopies if the copies are accurate reproductions of the originals, but it is always best to examine originals. Some problems, such as dating documents and sequence of writing, require the original document to draw conclusions about the document. If originals are not available, a first-generation photocopy should be obtained.

A first-generation photocopy is one made from the original document. Each time a photocopy of a photocopy is reproduced, it produces a later-generation photocopy. As the photocopies are copied, line quality deteriorates and the photocopies lose detail.

With the proliferation of facsimile (fax) machines, faxed documents are being sent to document examiners for examination. The fax machine does not accurately reproduce the original document. The faxed document is reduced slightly in size from the original and the line quality is poor. Diagonal lines have jagged edges on early fax machines that do not have the ability to reproduce the fine lines of curves and diagonals accurately. However, as better fax machines are developed, the quality of the faxed document is greatly improved.

Preliminary examinations may be carried out on faxed documents, but the document examiner should obtain the original for a thorough examination. If the original is not available, a photocopy should be used for the examination.

A conditional opinion should be rendered when originals are not available. The document examiner can state that the opinion is subject to examination of the original document. The examiner has an obligation to review the original when it becomes available, preferably before the case goes to court.

The process of examination involves a thorough and detailed study of the questioned documents. In most cases, a comparison with known genuine writing is done. It may not be necessary to study the entire document in depth, but the entire document, front and back, should be examined even if the questioned material may involve only a part of the document.

CARE AND HANDLING OF DOCUMENTS

Documents are fragile. Paper is a fragile, organic material that can be damaged by a host of agents, such as fire, water, insects, molds, chemicals, sunlight, and dust. Even body fluids can injure papers when handled excessively.

As paper goes through its normal aging process, it becomes brittle and discolored. Some treatments, such as lamination or adhesives affixed to the paper, actually destroy the paper. Some ink formulas are also destructive to paper.

Improper or careless handling of documents can inflict serious damage. Papers are damaged by folding, tearing, crumbling, and staining from rust, food, soil, and grease. Pins, staples, glue, and other fastening devices injure paper. Erasing information from documents, whether by abrasion or chemical eradication, can damage paper fibers and the finishes on paper. Obviously, fire and flood damage wreck havoc on documents.

The paper industry has improved the durability of paper. Various finishes are put on paper to protect and preserve it so it is no longer vulnerable to such agents as insects, mold, and mildew.

Documents maintained in the ordinary course of business should be protected from forces that destroy them. This is especially true for document examiners who are entrusted with the care and preservation of irreplaceable evidence.

TRANSPORTING DOCUMENTS

Ideally, evidence is collected, safeguarded, and preserved before a document examiner enters the case. It is the responsibility of the document examiner to continue to preserve the documents while in his or her care and to return them intact.

Evidence must be protected whenever it is transferred to another party. Original documents must be safeguarded during transit. Originals should never be sent through ordinary mail. Insist that originals be sent by registered mail if the client uses postal mail. Federal Express is preferred by many for its speed and ability to track the whereabouts of its parcels at all times. Courier service is an alternative that keeps the documents secure at all times. Instruct the client that documents must be signed for and handed to a responsible person in the office.

If documents are picked up from the client, be sure to take proper materials for transporting the documents safely. Original documents should be protected in envelopes or folders. Envelopes should be large enough for the documents to lie flat. Documents should never be folded. Clear plastic folders can be used if they are the type of plastic that does not stick to the documents. Mylar folders are best. Manila envelopes may also be used. Be certain that any information placed on the envelope is done before the documents are inserted into the envelope. Documents can also be transported in file folders in an attaché case. They should never be placed in a pocket or pocketbook.

CHAIN OF CUSTODY

Evidence requires a chain of custody to ensure its physical integrity at all times. Each party that handles the evidence must sign the chain-of-custody form.

A chain-of-custody form bearing the date and signatures of all people who handle documents and are responsible for them should be maintained with the documents. A copy of this form should also be kept with the file. It will serve as a receipt from the person who has taken charge of the documents in case the documents are misplaced or lost.

HANDLING AND PROTECTING DOCUMENTS

Original documents should be handled with extreme care. Document examiners should wear white cotton gloves when handling sensitive documents, especially those that will be tested for fingerprints. Original documents should also be held by the edges. Always return an original to a protected environment when it is not being examined. Protected environments include clear plastic Mylar sleeves and envelopes. Originals should not be filed with other papers in an ordinary file folder. They should be stored in a protective envelope in a fireproof safe or a fireproof file cabinet. Always keep originals away from heat and strong light, which can damage them.

The examiner should work from photographs and photocopies as much as possible because any contact with the original can lead to spoliation. Spoliation is the destruction of evidence, either accidentally or deliberately by someone who is not the owner of the documents.

Original documents should not be altered in any way by the document examiner or anyone else. The document examiner must protect evidence from accidents as well as destructive testing unless he or she has permission from the principal parties and the court to do such tests, and the tests significantly increase the likelihood of discovering the truth about the document. Even non-destructive testing can adversely affect a document.

EXAMINATION OF DOCUMENTS

Use an orderly approach to examine questioned documents. Follow uniform procedures for a thorough and systematic study of suspect documents to ensure an important piece of evidence is not overlooked.

Photographs and photocopies should be made of the original documents as soon as possible. Photographs preserve the integrity of the documents by providing an accurate copy of the documents. Enlargements often reveal evi-

dence that cannot be seen without magnification. A one-on-one photocopy should also be made so that the size of the document can be easily determined. A 200% enlargement is useful for examination.

Clear the desk of clutter when working with evidence and have only one case out at a time. This prevents misfiling or misplacing documents. It is easy to temporarily lose documents that get buried in paperwork or placed in the wrong file. Keep all potential hazards away from originals. Do not eat or drink when handling original evidence. Avoid coffee, ketchup, smudges, sneezing, liquid speech, and burns from cigarettes on documents as well.

Never mark an original document. If a document examiner wants to be able to identify the document in court or deposition, careful notes should be taken. Some document examiners mark their initials and the date of examination in an inconspicuous place on the back or corner of a document. This is not a good practice. The client may not want it known that the evidence has been examined.

Sometimes document examiners put their mark on photocopies they were given to examine. If a different copy is presented in court, the document examiner cannot identify a copy that does not have the examiner's initials unless he or she has adequate notes.

Some documents contain distracting material that makes it difficult to examine. For example, banks are noted for stamping checks, which obliterate part of a signature or endorsement. These documents can be scanned into the computer and the extraneous material can be removed electronically.

Sometimes it is helpful to study photocopies, which reduces the documents to black and white instead of other colors that can be distracting. It can be extremely helpful to study 200% enlarged photocopies even when the originals are available.

Be careful not to accidentally write on an original. If an original is mixed with other documents, it could be mistaken for a copy. Or a document may be written on inadvertently with an original underneath, leaving indentations on the original.

If fasteners such as staples must be removed from originals, ask permission from the client and photograph the fasteners first. Do not re-staple the documents when the work has been completed.

Do not mutilate documents by folding them. Folding destroys the paper fibers. The inside of the fold is condensed and crushed and the outside paper fibers are stretched sometimes to the breaking point. New folds should never be made on any original evidence. Remember the IBM cards and their slogan: "do not fold, spindle, or mutilate"? The same is true for questioned documents. Creasing, cutting, tearing, and punching are not acceptable either. Unfortunately,

documents are not always handled properly before they reach the document examiner. Evidence can be destroyed through carelessness. For example, carbon copies will smudge if they are rubbed. Water-based ink smears from perspiration. Pencil writing may become indecipherable if treated with ninhydrin, a chemical used to develop fingerprints. The ninhydrin combines with the amino acids present in fingerprint residue, turning paper pink and purple.

Clients sometimes think they are being helpful by circling words or highlighting them with a colored marker. Clients should be advised that writing on documents, or otherwise altering them might compromise the evidence.

A non-sticky tape can be used to hold documents flat for photographing. This tape is completely and easily removed. Non-sticky paper measuring gauges can be placed on a document for determining size when photographing. They are also easily removed. Photographs should be taken with and without the measuring gauge for use in court cases.

BACKGROUND INFORMATION

The document examiner must have sufficient information to draw correct conclusions about the authenticity of documents. Information on the provenance of the document, that is, the purported history of the document and how it came into the custodian's possession is needed. Where has the document been kept since its creation? Does its condition correspond to its background? Is it too clean, too dirty, torn, or stained? Has it been artificially aged? If so, how?

Is the document dated correctly? Is the date consistent with the condition of the document? Does the printed form contain a copyright date consistent with the document's date? Documents have been proven to be fraudulent because the date of manufacture occurred after the date on the document. Is the writing media (pen, pencil, ink) consistent with the document's date? Does the paper bear a watermark? When was paper containing that watermark first manufactured? Is the number of the document (such as a check or invoice) in proper sequence by comparison with companion documents of the same vintage, or has it been misdated?

Documents examiners will want to know who executed the document. Was it the work of more than one person? Are there any witnesses to the preparation and signing of the document? Is the document notarized?

What was the physical condition of the writer when executing the document in question? Did he or she suffer from any handicaps or long-term illnesses, was there a sudden change in health, was he or she involved in an accident or have surgery? Was the writer addicted to drugs or alcohol? Was

he or she intoxicated or high on drugs when the document was executed? What was the writer's mental or emotional state at the time the document was executed? Was the writer dyslexic?

If photocopies are presented for examination, always ask for the original. If the original is not available, document examiners will want to know why. Document examiners will want to know if the photocopy has been enlarged or reduced. Is it a cut and paste; that is, was a genuine signature cut from another document and attached to a fraudulent one? What generation photocopy was provided? Are there trash marks on the photocopy that provide information about the document?

TESTING

Many non-destructive tests can be safely conducted on documents, including subjecting the document to various types of lighting, such as infrared and UV. Documents can be studied under the microscope using transmitted and incident lighting as well. Watermarks can be photographed by placing the document on a light box and photographing it with transmitted light.

If destructive testing is necessary, permission must be obtained from the court. Destructive testing includes iodine fuming, spraying the document with various chemicals such as ninhydrin, and extracting materials using a small hole-punch or hypodermic needle to test the ink or paper. Only people qualified to do such testing should attempt it. Any surreptitious testing will not be condoned and could cost the client the case.

Documentation through photography must be performed to reveal changes to the document before and during testing. Photographs should also be taken throughout the testing. It is the responsibility of the document examiner to maintain the integrity of the documents in his or her care at all times.

CASE STUDY: SEQUENTIAL WRITING

Background

A major oil company wanted to rescind their service station contract. They provided a series of poor evaluations to justify their position. The service station owner challenged the evaluations, claiming they were manufactured at one time and not over the course of a year.

Question

How would the time sequence be proved?

Answer

First check the condition of documents. Paper placed in the file would show normal wear and tear. Paper will not be crisp and wrinkle-free. Next, compare the writing to see how closely each entry resembles the other entries. If writing is too uniform, it was written at the same time. Normal handwriting penned at different times has more variation than handwriting penned in one setting.

Outcome

In this case, the paper came from the same pad, and the subsequent sheets contained indented writing from the previous sheet. The indentations could be discerned by holding the paper at eye level while projecting a light onto it at about a 45-degree angle, proving that the writing had been done sequentially.

Questions

1. What is a document?
2. What is evidence?
3. What do the rules of evidence require regarding questioned documents?
4. Why must documents be handled carefully?
5. What are the chief enemies of paper?
6. What happens to paper as it ages?
7. How should documents be maintained in the ordinary course of business?
8. How should original documents be transported?
9. What is the purpose of a chain of custody form?
10. What is spoliation?
11. Name the three types of destructive testing.
12. If destructive testing is necessary, what must be done to obtain permission?
13. How can the integrity of the documents be maintained if destructive testing becomes necessary?

Chapter 10

Standards of Comparison

EXEMPLARS

Exemplars are legally admissible, authentic samples of handwriting used for comparison with questioned writing to determine the authenticity or spuriousness of the questioned writing.

The genuineness of the exemplars must be found to be clear and undisputed by the presiding judge. The law states, “In any proceeding before a court or judicial officer of the United States where genuineness of the handwriting of any person may be involved, any admitted or proved handwriting of such person will be competent evidence as a basis for comparison by witnesses, or by the jury, court, or officer conducting such proceeding to prove or disprove such genuine”(C.79 stat 683).

The courts will accept uncontradicted testimony of competent eyewitnesses who saw the execution of handwriting being offered into evidence. The courts also will accept the testimony of the author admitting genuineness or someone to whom the author admitted genuineness. The testimony of a person who received a writing sample from the author and acted on it also is valid although not necessarily accurate.

Exemplars are also referred to as known handwriting samples or standards. There are two kinds of exemplars, informal, which describe documents previously written in the normal course of business and known to be genuine, and formal, which are request writing samples.

When a document examiner is hired to examine documents, he or she is often given material that may not be suitable for examination. A document examiner needs to examine the best evidence, which, in most cases, will be original documents, both questioned and known. Document examiners should

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automatically ask for original documents if they are not provided. They should be given an early-generation photocopy or a photograph if the original is not available. Research has shown that document examiners give accurate opinions on photocopies as long as the photocopy is an accurate reproduction of the original.

A clear photocopy can yield almost as much information as an original and in most cases is sufficient for examination. Document examiners are often given multi-generation photocopies with so much line drop-out that the handwriting is almost illegible. This is the equivalent of making an identification from an out-of-focus photograph.

If locating originals is troublesome, photocopies can be examined while the search for originals is being completed. A combination of original documents and photocopies can be useful. Because photocopies are accepted by the courts as best evidence, document examiners must work with them when originals are not available.

Exemplars must be comparable with the questioned writing. Ideally, writing done around the date of the questioned material should be used for comparison purposes, some dated immediately before and some immediately after the date of the questioned documents. What time frame is considered appropriate? Documents executed within 2 to 3 years are generally acceptable unless there has been a major change in the writer, such as deteriorating health, trauma, or drug addiction, in which case a shorter time period would be necessary.

Comparison materials, when possible, should be written under the same conditions under which the questioned documents were executed. Although this is the standard method of taking request writing, it may be harder to locate informal writing samples written under similar conditions.

Documents similar to the questioned document make the best exemplars. People sometimes have more than one style signature depending on the document being executed. Checks may be executed in a more careless manner than wills and contracts. Compare contracts with contracts and canceled checks with canceled checks.

Obtain like signatures. If the questioned signature is in ink, obtain signatures in ink, if pencil, obtain pencil specimens. If the questioned document is lined paper, find documents written on lined paper. If the questioned document contains handprinting, collect documents that are handprinted.

When no similar documents are available, try to locate documents with authenticity that can be verified, such as canceled checks that have been accepted by a bank. Other documents executed in the normal course of business are also suitable.

Documents can be found in both private and public locations. The client may be able to uncover documents from friends or relatives. Public sources include the Department of Motor Vehicle Records, voting records, and deeds transferring property. Clients are often able to locate originals when they are given suggested places to search. A list of possible places to locate signatures for comparison can be found in Appendix A.

How many writing samples must one collect? Twenty to 25 signatures or 4 to 5 pages of handwriting or handprinting are recommended. Do not rely on too little writing. How much is enough? Collect enough to positively identify or eliminate the writer. Although it may be possible to make a match with only a few exemplars, more are better.

REQUEST WRITING

Request writing exemplars are handwriting samples made at the request and under the supervision of police, document examiners, or attorneys for the purpose of creating known writing samples to compare with questioned writing (Fig. 10.1). Request writing leads to self-consciousness in the writing act, thus request writing samples are generally not as useful as informal writing. The writer may attempt to disguise his or her writing to avoid being identified. Several steps can be taken, however, to overcome the problems associated with request writing.

Request writing forms contain all the upper and lowercase letters, plus numbers and punctuation marks. Material can be dictated to the writer as well. Dictation should include the material in question, plus additional writing containing words or phrases similar to the questioned material.

The document examiner should take the request writing exemplars whenever possible following an established procedure. A document examiner is then in a position to determine if the writing is normal writing or if the writer is trying to disguise his or her handwriting. If someone else is taking the request writing samples, he or she should also follow an established procedure as described:

1. Use a questionnaire to identify any circumstances that could affect the writings, such as illness, injury, or substance abuse.
2. The writing conditions of the questioned document should be replicated. If a suspect writing is handwritten, obtain handwriting for proper comparison. If a suspect document is printed in uppercase printing, the request writing should be uppercase printing as well. Be sure to make notes of any special instructions to the suspect.
3. Replicate the writing instrument. Compare ballpoint pen with ballpoint pen, and pencil with pencil.

REQUEST WRITING WORKSHEET	
DOCUMENT EXAMINER: _____	CASE NO. _____
ATTORNEY: _____	DATE: _____
CLIENT: _____	AGE: _____
MALE _____ FEMALE _____	RIGHT HANDED _____ LEFT HANDED _____
LEVEL OF EDUCATION: _____ COUNTRY EDUCATED IN: _____	
PHYSICAL HANDICAPS: _____	
ILLNESS OR CHRONIC CONDITIONS: _____	
MEDICATIONS USED: _____	
PRESENT PHYSICAL CONDITION: _____	
OTHER PERTINENT INFORMATION: _____	
TYPE OF EXEMPLARS: _____ (SUCH AS FORMS, SIMULATED DOCUMENTS, SIGNATURES, ETC.)	
MATERIAL WAS: COPIED _____ DICTATED _____ SPONTANEOUS _____	
NUMBER OF EXEMPLARS: _____	
STARTING TIME: _____	TIME FINISHED: _____ TOTAL TIME: _____
WITNESS SIGNATURE: _____	

Fig. 10.1. Worksheet to be used to obtain information about a writer when collecting request writing samples.

4. Replicate the writing environment. Photocopy the document, white out the suspect writing, and duplicate the form several times. Have the suspect sign the samples one at a time removing each sample as it is completed so the suspect cannot copy from earlier work. If the questioned document is not available, use similar size paper to make up exemplars.
5. If the questioned document was written under unusual circumstances, those circumstances should be duplicated. If the writer was standing while signing a questioned document, the writer should be asked to write in a standing position.
6. To prevent the writer from disguising exemplars, increase the speed of dictation and rush the writer. Distract the suspect between handwriting samples. The writer will not be able to maintain his or her disguise if distracted.
7. Have the suspect write with both hands. Indicate which hand is being used on each form that is completed.

My Dear Zeb:
 Very soon now tax returns must be made to the United States Department of Internal Revenue by the American citizen, whether he lives in New York City or Xenia, Ohio. Here are some key pointers:

1. Forms are provided.
2. List all dependents.
3. Blind people get extra credit.
4. Employees must list all wages.
5. Get the forms from your company.
6. Jot down expenses.
7. Keep a record of donations.
8. Persons deducting over \$1,000 must itemize. (The law allows you 10%).
9. Husband and wife can file jointly.
10. Quarterly payments must be made by self-employed.

The zero hour is coming! What other questions can I answer for you?

Fig. 10.2. Sample of dictations containing all the letters of the alphabet and numbers.

A tour through our national parks would be very enjoyable to you, I know. We left Los Angeles at 7:45 A. M. September 20, via Valley Boulevard, and motored to the Grand Canyon in Arizona. From there we drove to Zion National Park in Utah; next a jump to Yellowstone. Then we drove to the coast, into California, and through the Redwood Forest to San Francisco, the commercial hub, arriving at 9:30 P. M., October 21. Here Mr. & Mrs. John X. Dix of 685 East Queen St., Topeka, Kansas, joined us. I found the roads good, some quite equal to the best.

Fig. 10.3. An additional sample of dictations containing all the letters of the alphabet and numbers.

8. Date and initial all request writing. Number the documents in the order in which they were executed.
9. Additional request writing can be worded to include words, expressions, letters, names, and combinations found in the questioned writing. When a case involves numbers, have the suspect write numbers from 1 to 100. One can organize a diversity of alphanumeric characters into a paragraph such as those shown in Figs. 10.1 and 10.2.

Ask yourself: Do request writing standards show any signs of attempted disguise? Do they contain suitable material for comparison, such as similar letter combinations and spacing? Have they been properly taken and properly witnessed?

Care must be taken to ensure that request writing is suitable for comparison purposes because the writer may attempt to disguise his or her writing. Normal writing is a result of subconscious habits. The quality of writing

is recognized by repeated significant characteristics executed with ordinary attention to the operation as indicated. Certain precautions can ensure the exemplars are suitable.

POST LITEM MOTAM

The court can reject the use of request writing from the client as comparable standards. The rule of post litem motam (i.e., after the fact) prevents a litigant from creating evidence to support his or her case after a lawsuit has been initiated. Therefore, non-request writing should always be used for comparison. Writing produced at the request of the opposing party is not considered post litem motam.

DO'S AND DON'TS FOR COLLECTING STANDARDS

Do obtain sufficient handwriting exemplars, at least 20 to 25 signatures or 4 to 5 pages of handwriting or handprinting.

Don't rely on too little writing. How much is enough? Enough to identify the writer.

Do collect like samples, handprinting with handprinting, ink signatures with ink signatures, lined paper with lined paper, same size with same size.

Don't rely exclusively on writing that differs significantly from the questioned writing.

Do collect standards dated at approximately the same time as the questioned writing.

Don't rely on documents recently written if the comparison questioned documents were written many years ago.

Do collect documents that duplicate the writing environment, checks with checks, contracts with contracts.

Don't compare writing written under abnormal conditions, such as intoxication, with normal writing.

CASE STUDY: HOLD-UP NOTE

Background

A handprinted hold-up note was dropped at the scene of a robbery. The note was written on the back of a completed employment application. When the culprit was confronted, the suspect admitted completing the application for employment and denied writing the hold-up note.

Question

What is the best procedure for collecting exemplars?

Answer

Request writing consisting of handprinting should be taken using similar wording. Non-request writing should also be collected.

Outcome

The document examiner who compared the note with the exemplars determined that they were all written in the same hand.

Questions

1. What are exemplars?
2. What are the different kinds of exemplars?
3. What is request writing?
4. What is the rule of post litem motam?
5. How many exemplars should be obtained for comparison purposes?
6. What type of samples should be collected?

Chapter 11

Systematic Examinations of Handwriting

PRELIMINARY PROCEDURES

Document examiners need to use a systematic approach to the examination of handwriting. A standard method of operation assures that a complete analysis is conducted methodically and meets the requirements for expert testimony, according to Daubert.

The first step of the initial examination of the material is determining whether the material is of good quality and contains enough characteristics of handwriting to be identifiable (Fig. 11.1). Squiggly lines and initials or short signatures may not contain enough characteristics to enable a document examiner to make any type of decision about the nature of the material because they lack identifying characteristics and can be easily copied by other writers.

Once the examiner has determined the material contains sufficient characteristics that can be compared, his or her attention should turn to the exemplars to determine if they are suitable for comparison with the questioned material. The exemplars must be representative of the writer and written under similar conditions as the questioned material within a reasonable time frame.

Various factors affect handwriting. These factors must be taken into consideration when examining questioned documents, including mechanical factors such as the writing instrument, the type of paper, the writing surface, and the amount of light used. Physical factors incorporate the health of the writer, both physical and mental, any handicaps or accidents affecting the writing hand, and whether the writer was under the influence of drugs or alcohol. It may be helpful to know the amount of formal education of the

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By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ



Fig. 11.1. An over-simplified signature consisting of a series of squiggles.

writer in order to identify the skill level. One would not expect an uneducated writer to have as much skill as a person with a higher education.

The exemplars should be contemporaneous with the questioned material. Exemplars should come from an environment similar to that of the questioned material and should reflect the physical and mental condition of the writer at the time of the questioned writing. Some exemplars should have been written before the questioned material and some shortly after. They should contain suitable material for comparison, such as similar letter combinations and spacing. Handwriting should be compared with handwriting and handprinting with handprinting.

The document examiner must also make certain that all of the exemplars are genuine and can be authenticated for the benefit of the court. If the forger has executed any of the known signatures, a forged signature would be erroneously authenticated. This occurred in the Hitler Diary Case in 1984. Ordway Hilton compared forged exemplars with the Hitler diaries and determined the diaries authentic.

The document examiner must have enough comparable material to draw conclusions about the questioned documents. The amount of material needed will vary. It is easier to compare the questioned to the known handwriting if it is juxtaposed. Enlarging the handwriting to 200% before placing the known and the questioned together for comparison purposes makes it easier to compare. Exhibits can be made that place the material side by side or sequentially on a page. A normal signature at 200% enlargement fits comfortably on a standard $8\frac{1}{2} \times 11$ -in sheet of paper. Extraneous material should be removed. Enlargements can be prepared using a photocopier or a scanner and a computer.

INITIAL EXAMINATION

The examiner is now ready to begin comparing the handwriting. The most logical step is to search for obvious signs of forgery in the questioned

material. Presence of any of the signs of forgery does not necessarily indicate fraudulent handwriting. Any of the signs of forgery could be present in genuine handwriting. The signs reveal the fraudulent nature of the handwriting if they are not present in the known handwriting.

A simple forgery is generally the easiest type of forgery to identify because the questioned signature bears no resemblance to the known. This is usually quite obvious because the pictorial effect will differ considerably from the known writing. You must make sure to have sufficient samples of the known writing to cover all of the types of signatures that the writer makes in order to identify a simple forgery.

If there are two or more identical signatures, one or all of the signatures are falsified. Duplicate signatures are free-hand simulations, cut and paste, computer-generated signatures, or traced signatures. Valid authentic duplicate signatures would be signature stamps or auto-pen signatures.

Once the document examiner has determined there are no obvious signs of forgery in the questioned material, he or she should determine if there is any evidence of self-disguise. The document examiner should also scrutinize the documents to determine if there has been an attempt to disguise the known documents. Disguised writing is any conscious or deliberate attempt to alter the normal characteristics of one's handwriting to prevent recognition.

Originality in disguise is rare. Only about one out of nine writers can disguise his or her cursive handwriting so that it is not recognizable at a glance.¹ Most writers change the slant of their writing, feeling this is sufficient because it alters the appearance of the writing. They do not change any other characteristics.

Lack of internal consistency is the principal sign of disguised writing. Writers revert back to their normal writing when their attention wanes so there is usually some natural writing mixed in with the disguised writing.

DETAILED EXAMINATION

The document examiner should conduct a detailed examination of the questioned material and the exemplars. This requires that the examiner take into consideration all of the characteristics of writing, the full "range of writing." He or she needs to determine if differences are the result of natural variation or different writers. The basic rule for identification of handwriting is that "two writings are identified as being by the same writer by the absence of fundamental divergences as well as by a combination of a sufficient num-

¹ Harrison W. *Suspect Documents, Their Scientific Examination*. 1981; p. 360.

ber of similarities. The process is always a double operation, positive and negative, and if error is to be avoided neither part of the process should be overlooked. In order to reach the conclusion of identity of two sets of writings there must not be present significant and unexplained divergences.”²

MAKING AN IDENTIFICATION

The basic principle of handwriting identification is always a twofold process. There must be sufficient similarities in the class characteristics and individual characteristics to identify the writer and no fundamental unexplainable differences. Fundamental differences include line quality, pressure patterns, method of construction of letters and words, and subtle subconscious handwriting characteristics.

Poor line quality is the most frequently encountered fundamental difference in simulated handwriting. The forger must write more slowly in order to imitate the writing style being copied. This requires the forger to slowly draw the writing, resulting in tremor and poor line quality. The drawing process affects the pressure patterns and usually results in more even pressure between the upstrokes and downstrokes than is found in normal handwriting.

Forgers attempt to copy the pictorial effect while overlooking the method in which the handwriting is constructed. Because writing is a habit, a difference in the method of construction of letters and words is a fundamental difference.

Subtle characteristics are small inconspicuous habits of the writer that go unnoticed by most people. Examples of inconspicuous habits would be hooks or ticks in the writing or unusual connecting strokes.

What are some of the explanations for differences found in handwriting? Any factor that affects the handwriting can account for a difference. Disguise is the most frequently encountered reason for differences between the questioned writing and exemplars. Most writers erroneously believe they can alter their handwriting sufficiently so a document examiner cannot identify their writing. They are unaware of the subconscious characteristics that lead to identification.

Other factors affecting handwriting include injury to the writing arm, trauma, illness, medication, intoxication, drug abuse, and mechanical factors such as the writing surface, the writing instrument, and the type of paper. Lighting, temperature, and body position may also have an effect on the writing but not usually sufficient to cause fundamental differences.

² Osborn A. *Questioned Documents*. Nelson-Hall, Chicago, IL, 1929, p. 262.

A document examiner should list the similarities and differences between questioned and known documents because both are important in the identification process. A document examiner must determine if there are enough similar identifying characteristics without any significant fundamental divergences to make an identification.

A single fundamental, unexplainable difference in writing is sufficient to eliminate a writer as the author of handwriting in question.

ELIMINATION

It is more difficult to eliminate a writer than to make an identification. Identification can often be made with a small sample of known handwriting. To eliminate a writer, one must know all of the different ways a writer can write. This requires much larger samples of known handwriting before elimination can be made.

CASE STUDY: SUBSTANCE ABUSE

Background

A questioned signature was written after a man became addicted to drugs. The man denied his signature on a promissory note.

Question

What type of signatures should be collected for comparison?

Answer

Signatures dated around the same time as the questioned, especially after the man became addicted to drugs.

Outcome

The examiner was able to collect more than 60 signatures dated immediately before and after the note was signed. When the examiner presented evidence in court that showed similarities, the jury decided the man had signed the note.

Questions

1. What type of exemplars does a document examiner need for comparison?
2. How are duplicate signatures created?
3. What is the principal sign of disguised writing?
4. What is the basic rule for identification of handwriting?
5. How many fundamental, significant differences are needed to eliminate a writer?

Chapter 12

Master Pattern

RANGE OF WRITING

The range of writing, also called the master pattern of the writer, includes all the characteristics, patterns, and idiosyncrasies that a writer uses when engaged in the act of writing.

The examination of handwriting requires that a document examiner compare all of the characteristics of writing that make up the range of writing. The master pattern can be divided into three categories: movement, form, and spatial relationships.

Movement covers direction, slant, rhythm, pressure, line quality, and speed. Form includes letter designs and their similarity to the system taught, the method of construction in forming and connecting the letters, and embellishments. Spatial relationships refer to the use of space by the writer, including size and proportions of the writing, space between letters, words and lines, and the baseline alignment.

A document examiner needs to become acquainted with the range of writing of the writer whose handwriting he or she is comparing. This obviously requires sufficient samples of handwriting to cover the various ways in which the writer normally writes. In signature comparison, a more limited amount of handwriting will suffice if signatures are comparable.

One of the main problems that document examiners encounter is lack of sufficient handwriting samples to determine the writer's full range of writing. The amount of writing needed to cover the range of writing varies among different writers. Some writers are more consistent in their patterns of writing and others use a variety of writing styles. Most people fall somewhere in between.

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A consistent writer repeats patterns more frequently than the versatile writer. Consistent writers are careful and deliberate in their writing habits. Their carefully formed letters are easy to recognize.

The versatile writer is more variable. He or she frequently employs more than one letter form. The writer may have two or three designs for some letters or may vary the style of writing.

In many document cases it is not necessary to determine the full range of the writer and it probably is not possible or at least not practical. It is sufficient to identify the unusual characteristics and to verify that other characteristics are consistent.

It is not necessary to match all the handwriting characteristics of questioned writing with the known. The document examiner needs to match sufficient characteristics to identify an individual as being the only one who could have created this combination of traits that makes up the handwriting.

HABITS OF THE WRITER

Once a person has mastered the skill of writing, his or her writing becomes habitual. Because many of the characteristics of handwriting are subtle, the writer is not aware that he or she is executing them.

Writers make choices about some of their handwriting characteristics, such as the letter forms they like, the size of their writing, and the use of space. However, there are many other characteristics over which they have no conscious control, such as pressure patterns, baseline alignment, and hooks and ticks. Because these strokes are created without conscious awareness, they become most valuable as identifiers.

LETTER DESIGNS

Letter designs are the most easily identifiable feature of handwriting. The forger will attempt to copy letter forms in a simulated forgery. Carefully traced letter forms will match the shape of the known writing. Forgers expend much energy in duplicating the capital letters believing that if they reproduce those correctly, the forgery will be accepted as genuine writing. Few forgers take the trouble to carefully emulate the lowercase letters unless there are unusual letter forms in the model signature.

If a writer tends to slur lowercase letters, the forger will do likewise, but he or she will not usually adhere to the same type of squiggle that the genuine writer used. Length, shape, and direction of squiggles can be distinctive identifying characteristics. Highly stylized letter forms may be imitated, which



Fig. 12.1. Example of idiosyncrasies that writers develop. The first example shows short initial strokes called ticks. Small circles at the beginning of letters are called eyelets. Larger circles are called loops.

could lead the document examiner to erroneously conclude that the writing is genuine. Care must be taken to separate imitation from genuine letter designs.

The location of a letter in a word may determine its form. Some writers have different forms if the letter is located individually or at the beginning of a word. Location in the middle or at the end of a word may also affect the letter's appearance. Therefore, it is advisable to compare initial letters with initial letters, medial letters with medial letters, and terminal letters with terminal letters.

Some writers make unique combinations of letters such as "th" or "of." Look for consistent common combinations that aid in the identification process.

Many writers have ticks or hooks imbedded in their letters. They are often not aware that these features exist. Forgers rarely duplicate these idiosyncrasies unless the hook is very large and easy to see (Fig. 12.1). Small hooks and ticks are not usually noticed. Eyelets and small loops are more obvious.

The majority of writers deviate from the copybook style they were taught and will use several designs for an individual letter. Perfect Palmer is so rare that anyone who executes perfect Palmer penmanship can be identified by the uniqueness of the copy.

It is the responsibility of the document examiner to determine if letter variations fall within the normal range of the writer. Writers can have two or three different methods of constructing a letter, not including handprinted forms. Many writers mix printed forms with their cursive writing. Some writers simplify their letter forms, and others decorate them in various ways with embellishments or flourishes (Fig. 12.2).

Forgers limit the letter forms they copy, making fraudulent writing more consistent than genuine writing. Forgers duplicate words exactly when they are repeated in a text. Therefore, lack of variation and exact duplication are signs of spurious writing.

The image shows the word "rare" written in six different cursive styles. From left to right: 1. A standard, elegant cursive. 2. A more compressed and slanted cursive. 3. A cursive with a very high, looped 'r'. 4. A cursive with a very low, flat 'r'. 5. A cursive with a very tall, narrow 'r'. 6. A cursive with a very wide, flared 'r'.

Fig. 12.2. Different styles and methods of construction of various letters in words.

Some writers deviate more than others from the traditional way they were taught to write. The more unique a letter form, the stronger the value it has as an identifier.

Carelessness in the execution of letter forms requires readers to guess at many letters and words. Writers run some letters together, slur others, and leave some out completely.

METHOD OF CONSTRUCTION

Although forgers go to great lengths to imitate another's letter forms, they fail to recognize and follow the same method of construction. A careful comparison of the method of construction of questioned documents with authentic writing will greatly assist in the discovery of spurious writing.

Handwriting should be studied under magnification to determine the construction of writing, including the starting points, the direction in which the strokes are made, and the intersection of lines. Some forgers will write upside down and backwards to eliminate their own habits and more closely copy another's writing strokes. The intersecting lines will indicate which stroke is on top so that the direction of the strokes can be ascertained. Unusual pressure patterns may also be present.

Some forgers are highly skilled at imitating others' handwriting. They will carefully form each letter to correspond to the genuine writing, blending letter forms together to create a simulated forgery that is almost undetectable unless it is enlarged and studied under magnification. Enlargement will reveal the overlap of the strokes of the individual letters where they are blended together.

Some letters are more susceptible to change than others. The lowercase letter *t* has more components that can be altered than most other letters. T-bars vary in length, depth of pressure, and placement on the t-stem. T-stems are sometimes looped or formed in a tent-shape. Some writers make the *t* in one stroke by tying the t-bar to the stem. Others eliminate the t-bar altogether as in the Palmer *t*. Many writers will attach their t-bars to the next letter instead of joining them at the baseline. T-bars can be garlands, arcades, or wavy or



Fig. 12.3. Letters *f*, *g*, *h*, *k*, and *l*, all containing upper loops.



Fig. 12.4. Circle letters displaying various characteristics.

straight lines. They can slant up or down. They may bisect the t-stem or come before or after the stem. They may contain blunt beginning and/or ending strokes or tapered strokes.

LETTER GROUPS

Each letter of the alphabet has distinctive characteristics; however, letters can be grouped according to their method of construction and their form. Similar structures can be compared. Upper looped letters can be compared with other upper looped letters, and lower looped letters can be compared with each other for size, length, and apex (Fig. 12.3).

Letters containing circles are comparable. These include the *a*, *d*, *g*, and *o* (Fig. 12.4). Letters designed with humps, such as the *h*, *m*, *n*, and *r* can be compared. If the writer makes rounded humps, he or she will make them on all of the letters containing humps. If the writer makes pointed humps, all humps will be pointed.

Some handprinted letters are comparable. The similar parts of the structures are compared. Size, shape, and placement are generally consistent with similar letter forms.

INITIAL STROKES

Initial strokes are strokes that occur at the beginning of an unattached letter or a word (Fig. 12.5). These strokes represent well-established habits of the writer. Writers consistently begin their letter forms in the same manner and at about the same place. This is an important clue to identity. Forgers rarely start copying their letter forms in the same position.



Fig. 12.5. Examples of various types of initial strokes in the letter *a*.

The initial stroke of writing is also called the approach stroke, the beginning stroke, or the lead-in stroke. This initial stroke may be a diagonal stroke, a vertical upstroke or a downstroke, a hook or a tick, or a hesitation point. A hesitation point is caused when the pen sits on the paper momentarily before the writing act begins. It is usually round and slightly larger than the line of writing. The initial stroke may be tapered or blunt. A tapered stroke starts thin and gets thicker. A blunt stroke is thick from the beginning of the stroke.

Hooks and ticks creep most frequently into initial strokes; some so small they can only be seen under magnification. A hook is a small, rounded formation that generally starts in the opposite direction of the stroke of writing to which it is attached. Sometimes the initial stroke makes a sharp angle when attached to the lead-in stroke. This is known as a tick. Hooks are more common than ticks.

Capital letters are more likely to have initial strokes than lowercase letters because students are taught to make initial lead-in strokes on many capital letters. These strokes take the form of garlands or ovals. An example would be the Palmer *B*, *P*, and *R*. Ovals are found on *H*, *M*, and *N*.

Some writers simplify their letters by eliminating initial strokes. This simplification of letter forms is a key to identity and generally remains constant.

TERMINAL STROKES

Terminal strokes are not as varied as initial strokes, but they still contain enough individuality to assist in identification. Normal terminal strokes are shaped like garlands. Deviations include horizontal lines, wavy lines, and downward strokes.

Terminal strokes are also known as ending strokes, tails, or finals. They may be curved, straight, blunt, tapered, high flying, or end below the baseline. They may end with a hook or a backstroke over or under the ending stroke. Some writers attach a rubric to their signatures by forming a line under their name that is frequently attached to the ending stroke. Sometimes writers make a circle around their name or cross a *t* with the terminal stroke. Occasionally, a writer will connect the final stroke to the next word. Writers vary the length of their terminals from none to expansive.



Fig. 12.6. Letters joined by rounded connecting strokes called garlands along the baseline.

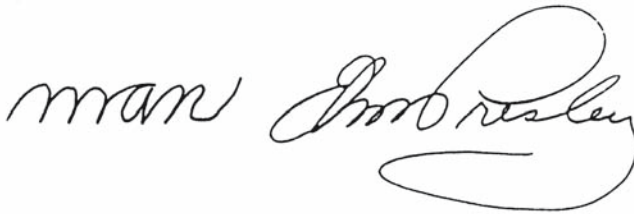


Fig. 12.7. Letters joined by arched strokes above the baseline. These strokes are referred to as arcades because they resemble arches.

MEDIAL STROKES

Medial strokes are strokes found in the middle of words, both the letters and their connecting strokes. Some writers use a different letter design for medial strokes.

CONNECTING STROKES

Connecting strokes, also called ligatures, are used to join individual letters together to form words. There are basically four types of connecting strokes: garlands, arcades, angles, and thready lines.

Garlands are the most common form of ligatures found in handwriting. Garlands flow naturally from one letter to the next and are the proper method of connecting letters (Fig. 12.6). Writers may distort their garlands or combine them with other forms of connectors.

Arcades are arched formations used to connect letters (Fig. 12.7). Arcades do not flow with some letter combinations and are relatively rare. Writers using arcade connectors usually will mix the arcades with garlands. The letter *m* is a series of arcades.

Some writers make sharp angles at the base of one letter and connect the next letter with a straight line forming an angle, as shown in Fig. 12.8. Angles may be mixed with arcades and/or garlands. Angles may also be found between the strokes of the letters, such as the letters *n*, *m*, *h*, and *k*.

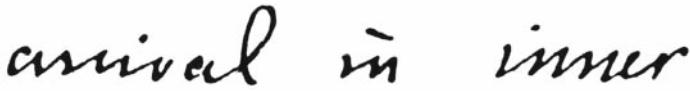


Fig. 12.8. Letters joined by angles (abrupt changes in the line direction).




Fig. 12.9. Letters connected by indistinct forms, called thready because they resemble a thin thread.



Fig. 12.10. Letters that are not connected.

Thready writers usually make poorly formed letters with thin thread-like connectors (Fig. 12.9). Speed and carelessness lead to thready writing. The thready writer holds the pen loosely, forming a thin trickle of ink across the page. Pressure is usually very light. The thready writer is generally not a highly skilled penman.

There will be variations in the size and shape of ligatures, especially in their horizontal expansion. These variations may show up in the same letter combinations. Some writers use particular connectors consistently between similar letter forms, such as *t* and *h*. Some writers do not connect their letters (Fig. 12.10). Lack of connecting strokes is a characteristic that can assist in the identification of a writer. Some writers only connect certain letter forms. Others break their connections in consistent patterns. Some use the t-bar as the connecting stroke. Document examiners need to pay careful attention to the method of connecting letters.

EMBELLISHMENTS

Although some writers deliberately embellish their letter forms, many are not aware they are adding anything to their writing. Flourishes and orna-

mentation on letters are examples of consciously acquired habits, and hooks and ticks are added without conscious awareness. Hooks and ticks may be found imbedded anywhere in the writing but are most common as initial strokes. Terminal strokes are also candidates for hooks in the writing. Some writers place hooks at the beginning of all their words. Others make hooks only on certain letters or place them randomly.

Small hooks will be overlooked by forgers. Even if the forger recognizes a hook, he or she may have trouble duplicating it or may not consider it an important part of the writing. Because hooks and ticks are subconscious characteristics, they carry significant weight in the comparison of handwriting.

Flourishes are embellishments in the form of wavy lines or curves that are added to letters by a writer. Because flourishes are not found in most penmanship systems, their presence is a significant individual characteristic. Forgers will copy flourishes, but they do not always copy them correctly. Flourishes should be studied for their placement, size, and shapes.

Ornamentation is more elaborate than flourishes, taking more complex shapes such as circles added to letters.

USE OF SPACE

Spatial relationships can be significant identifying characteristics because writers frequently disregard the rules of penmanship when spacing their writing. Idiosyncrasies in vertical alignment or horizontal expansion help identify a writer. Unless spatial relationships are highly individualized, forgers overlook this aspect of writing when attempting to imitate a person's writing style.

People establish patterns for the use of space. Margins, paragraph indentation, and line spacing all play significant roles in the organization of space. Writers develop habits for size of margins as well as uniformity of the margins. All the margins, top, bottom, right, and left, are taken into consideration. Side margins may drift to the right or left as the writing descends down the page. Is the pattern of the margins the same on all pages? Writers are generally consistent in the placement of their margins.

ARRANGEMENT

Placement of the indentations in paragraphs becomes set. The amount a writer indents is habitual. The number of indented paragraphs can also assist in identification. Some writers start new paragraphs frequently, and others may indent only once. The arrangement of the writing is an individual preference that may be copied in forgery cases.

When space is limited, it is important to check the use of space. How does the writer adjust his or her writing to accommodate the space available? Does the writer extend beyond the space or reduce the writing accordingly? Does the writer squeeze all the letters together or only a few?

SPACING

Line spacing is generally consistent. Check the lines to see if any of the strokes intermingle with strokes from other lines. Sometimes upper loops overlap lower loops. Document examiners need to study patterns of line spacing.

Penmanship lessons teach proper spacing between words as being the width of two letters. The amount of space between words will fluctuate among different writers and will be varied by some writers.

Space between letters is another consideration. The amount of space between each letter is significant. Sometimes idiosyncrasies exist between particular letter forms that can assist in identification. It is helpful to measure the length of words, especially signatures.

ALIGNMENT

How the writer aligns the writing to the baseline is an individual preference. Document examiners need to compare the alignment of individual letters with the baseline. Some writers place their letters directly on the line; others go through the baseline with some or all of their letters. Some writers never touch the baseline but place all their letters above the line. Some writers have an uphill slant, and others slant their baseline downhill. Writers who use wrist movement tend to form an arc with their letters.

Look for patterns of specific letter forms because some writers develop habits of placing certain letters on or above the line. Most forgers ignore the alignment of the signature on the baseline unless the baseline contains some unique qualities. Therefore, the natural baseline can be a strong identifying characteristic.

SIZE

Size of writing is not generally as significant as other characteristics of writing. Writers adjust the size of their writing to accommodate the available space.

PROPORTIONS

Writers may have to adjust the size of their writing to accommodate space available, but they will maintain their proportions when they do so.

Compare the letters in each zone of writing; that is, ascenders and descenders with middle zone letters and compare capital letters with ascenders and descenders and middle zone letters. Excessive emphasis on one zone of writing also occurs for many writers. Note size and shape of various loops of writing. Forgers do not always adhere to the proportions of the writer they are copying.

Some writers' middle zone letters start out high and taper down as the word progresses. A few writers reverse this trend, and some will make a particular letter taller or smaller. Most writers are consistent in their relationship of capital letters with lowercase letters. For example, if a writer makes upper extenders higher than the capitals, he or she consistently does so. Some writers only enlarge the capital letters in their signature. Other capital letters are more modest. The relationship of the initials in a signature is also a habit that tends to remain constant.

The relationship between t-bars and diacritics (i-dots) is a significant factor. The height of the t-bars is usually consistent, although there are some writers who vary the placement of their t-bars, also an identifiable habit. The placement of i-dots in relation to the stem of the letter is habitual. Size and shape of i-dots is another identifiable feature.

Proportions should always be compared. Differences in proportions are important criteria in determining authenticity or spuriousness.

SLANT

Slant is the angle of a letter in relation to the baseline. It is sometimes called slope and is measured with a protractor. The angle is measured from the baseline to the top of the letter on the upstrokes above the baseline.

Most writers slant their letters primarily to the right between 20° to 50° from the baseline. The rest angle their writing from a leftward slant of about 130° to a rightward slant of 50°. The slant of writing will vary somewhat with each writer, some writers being more versatile than others. Forgers will attempt to copy slant but will revert to their own slant when their attention wanders. A sudden and brief change of slant is suspicious.

RHYTHM

Good rhythm has an even slant and an even return to the baseline. Poor rhythm is reflected in uneven slant and an irregular baseline. Good rhythm reflects a higher skill level of writing and is a consistent habit for writers.

Displaced rhythm is indicative of a different writer. Rhythm is one of the most important criteria in handwriting identification because it is such a fundamental habit and the most difficult to alter.

PRESSURE PATTERNS

Pressure patterns resemble breathing habits in that they occur automatically without awareness on the part of the writer. Like breathing, pressure patterns can be altered temporarily, but the writer will revert to normal pressure patterns when his or her attention wanders.

Most writers form pressure patterns with light upstrokes and heavier down strokes. Light upstrokes occur when the writer is pushing the writing instrument away from his or her body. When the writing instrument is drawn back toward the writer, pressure increases. A normal flow of pressure patterns exists in most handwriting.

Because pressure patterns are made without awareness, they are significant indicators of authenticity or spuriousness. Always compare the pressure patterns of the known writing with the questioned writing.

When a forger is copying writing, he or she is drawing, not writing. Drawn writing results in even pressure. Therefore, even pressure can indicate a false signature. Keep in mind that some writing instruments may conceal pressure patterns. It is more difficult to discern pressure patterns on photocopies; however, a variation in line thickness indicates pressure differences.

WRITING SPEED

Writing speed affects the appearance of the writing and may reveal the skill of the writer. Fast writing forces the writer to streamline letter forms. Because ornate letters take longer to make, simplification of letter forms is one indication of fast writing. I-dots seem jabbed and carelessly placed. T-bars are dashed and sweeping or tapered and may be joined to the following letter. Word endings become blurred and decrease in size. The writing may be illegible. When one continues to write quickly, left margins increase and right margins become uneven or diminished. The writing slants to the right and rhythm is smooth and natural with good line quality (Fig. 12.11).

Slow writing, on the other hand, is stiff and labored (Fig. 12.12). Letter forms are carefully executed and exact. Strokes show repeated patterns with less variation from the norm. Letters tend to be narrow and are frequently retraced. Connections are more often broken. T-bars will be carefully placed and even, often with blunt endings. I-dots are more rounded and closer to the i-stem. Word endings tend to be blunt. The writing is more vertical and may even slant to the left. Pressure is monotonous.

Very slow, labored writing may contain tremor with poor line quality. Slow writing does not always mean spuriousness, although slow writing can be



Fig. 12.11. An illegible signature written rapidly resulting in blurred letter forms.



Fig. 12.12. A carefully executed signature of an elderly writer.

a sign of forgery. Illiterate writing is slow and awkward. Some writers have never developed skill in writing and always write with poor line quality.

FLUIDITY

Fluid writing contains lines that blend easily from one letter to the next as opposed to abrupt or labored changes in direction found in uneven writing. Fluid writing is generally an indication of rapid writing of a highly skilled writer with good line quality.

LINE QUALITY

Line quality refers to the smoothness of the writing line. The more skilled the writer, the better the line quality. Line quality depends on numerous factors, speed being the most significant. Slow writers sacrifice good line quality. Tremors creep into slow writing. Line quality is frequently the most important criteria in the identification of spurious handwriting.

SKILL OF THE WRITER

The skill of the writer can be determined from some of the characteristics of writing, primarily, line quality, rhythm, fluidity, and speed. A writer

cannot exceed his or her ability. This fact assists the document examiner in eliminating writers who lack the skill to execute a higher skilled writing.

GRAMMAR

Grammatical errors in the writing sample can help identify a writer. Misspelled words and incorrect syntax can lead to the identity of the writer. Some writers consistently misspell words or mix syntax. There may be colloquialisms in the writing that link the writer with a particular area of the country.

Identification cannot be made on grammatical or spelling errors only. There must be other supporting evidence to make a verification of similarity. Improper punctuation is a clue to identity. Writers may misplace punctuation. Some writers overuse commas, and others overlook them. Other writers make excessive use of exclamation points. Cases have been solved by improper placement of commas outside of quotation marks.

MASTER PATTERN

The range of the writing of an individual makes up the master pattern of that writer. Once the document examiner has identified the range of the writer, he or she can determine which characteristics fit into the master pattern of that writer. There must be agreement in the handwriting characteristics without unexplainable fundamental differences.

Signatures tend to be more constant than other handwriting. A person writes his or her signature more frequently than any other letter combinations, and he or she develops a pattern that is hard to change.

Mistakes in identity result from looking only for similarities and ignoring the differences or not considering the importance of these differences. The document examiner must take all of the handwriting characteristics into consideration.

As you can see, the identification of handwriting includes many factors other than the actual formation of the letters. These handwriting characteristics are important aides in identifying a writer.

THE KEY

A thorough examination of an individual's handwriting will acquaint the document examiner with the peculiarities of the writer. Some characteristics will be more consistent and more evident than others. Generally, one can establish a key that helps to identify a particular writing more easily. This key is usually some idiosyncrasy or combination of letters that stands out as an identifying factor.

CASE STUDY: CONTRACT IN DISPUTE

Background

The owner of a company fired an employee whom he had hired to handle sales. The employee sued the owner for performance of a contract. The contract was in the form of a letter drafted by the salesman with an agreement allegedly signed by the owner. The owner said he never signed it. Furthermore, it is signed with a nickname and no middle initial.

Question

How would you prove that the owner never signed his nickname?

Answer

Ask to examine all available signatures. Look at all available business records to discover if the owner ever signed his nickname. **DO NOT LET THE OWNER PICK THE EXEMPLARS.**

Outcome

The business owner made available all his records from his business going back several years. He was totally consistent in his method of signing his name, always using his middle initial and never using his nickname.

Questions

1. What is meant by the range of writing?
2. What are the most easily identifiable features of handwriting?
3. What identifying characteristics are most valuable?
4. What are initial strokes?
5. What is the most common type of connecting stroke?
6. What are embellishments?
7. What slant is used by most people?
8. Why are proportions important?
9. How do most writers form pressure patterns?
10. How can slow writing be differentiated from fast writing?
11. What is line quality?
12. What is the master pattern?
13. What is meant by a “key”?

Chapter 13

Detecting Fraudulent Documents

INTRODUCTION

Most writers gradually depart from the penmanship system they were taught in school. They stylize letter forms, individualize handwriting characteristics, and ignore many of the rules of penmanship.

When handwriting deviates significantly from the traditional forms of writing, the reader must guess at the content of the material that has been written. Letter forms blur and merge with other forms to create new forms. The letter *o* resemble *a*'s and *i*'s cannot be distinguished from *e*'s. In many cases, the letters are completely illegible or improperly designed.

FACTS THAT ASSIST IN HANDWRITING IDENTIFICATION

No two people write exactly alike. A person's writing is the expression of his or her particular habit of movement. Individual characteristics that are unique to a writer exist in everyone's handwriting, distinguishing it from every other handwriting. Variation in writing is personal. It is different for each individual.

Writing can be identified as belonging to an individual when there are sufficient similarities in the writing characteristics and no basic unexplainable structural differences. There is no established number of similarities needed to identify the writer. The diversity and uniqueness of the similarities help determine authenticity. A single basic structural difference eliminates a writer. It must be a fundamental difference, such as line quality, rhythm, pressure patterns, or method of construction of letters.

There can be striking similarities between two different people's handwriting. This is most likely to appear in families or groups of people who

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

share a common bond. It is often the result of imitation, especially in individual characteristics. There will always be some differences that can be identified, if enough handwriting is available for comparison.

It is beyond the capability of any person to see all the typical features of a script and to reproduce them exactly.¹ No one can duplicate the entire intricate subconscious writing habits of another while eliminating all of his or her own subconscious habits in an extended writing sample.

A good forger can imitate some of the writer's habits and may be able to create a signature that bears a close resemblance to that of the original writer's. If the original writer oversimplifies his or her signature, it can be easily duplicated. Squiggles may contain enough similarities to pass as genuine signatures.

Some forgers are highly skilled in imitating others' handwriting. Luckily, they are few in number and they usually imitate celebrities' signatures.

The more diverse and unusual the combination of mutual characteristics and individual handwriting habits, the more difficult they are to imitate. Extended writing samples are impossible to duplicate because the average writer cannot sustain the intense concentration necessary to maintain another person's writing style through extended writing samples. The more the forger writes, the more the writing reverts to his or her natural characteristics.

Imitated writing intentionally bears some resemblance to the writing from which it is copied. Forgers concentrate on the pictorial effect and neglect the minute details. They imitate the outstanding features of a signature. Capital letters and letters containing flourishes are most likely to be copied. Middle zone letters and endings tend to be slurred by the forger. The subtle habits of the writer are often ignored.

Because no one can duplicate the entire intricate subconscious writing habits of another, it is these subconscious writing habits that the document examiner studies to determine authenticity or spuriousness of handwriting.

Signs of Forgery

Obvious signs of forgery include patched writing, hesitation as revealed by ink blobs and breaks in the line of writing, unnatural pauses in the writing, tremor, which causes poor line quality, erasures, and backward writing. Blunt initial and/or terminal strokes can indicate forgery, but blunt strokes are also found in genuine writing (Fig. 13.1).

¹ Saudek R. *Experiments With Handwriting*. Books for Professionals, Sacramento, CA, 1978, p. 30.

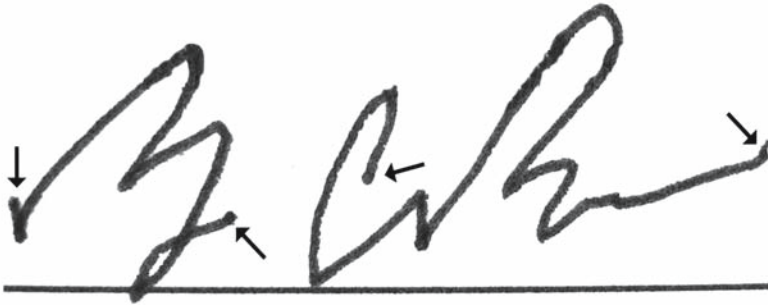


Fig. 13.1. A signature containing indications of forgery in blunt initial and terminal strokes and line tremor.

Presence of any of the signs of forgery does not necessarily indicate that the handwriting in question is not genuine because any of the signs could be part of the writer's normal habits. Conversely, lack of any sign of forgery does not indicate genuineness.

Freehand simulations by a skilled forger can be difficult to detect. Obvious signs of forgery are usually not present in good freehand simulations. It is the lack of similarity in the subtle habits of the writer that will reveal the spurious nature of the freehand simulation.

A tracing can generally be identified from the model signature. A tracing doesn't have to be an exact copy of the model from which it was traced. It typically has less detail than the model signature because the forger fails to capture all the subtleties of the original. A tracing may deviate from the model because of slippage of the tracing paper or the deliberate moving of the paper to distort the copy. The forger generally presents the model signature for comparison to support the authenticity of the traced signature.

Forgers make mistakes. It is their mistakes that help identify them. They may copy the handwriting of an individual from the wrong time period. They may overlook important details that affect handwriting. Their writing may be more skilled than the person they are attempting to imitate. Their attention may wander and they revert to their normal writing habits.

Some forgeries are successful because they are never questioned. Close scrutiny would reveal the spuriousness of many documents that have been accepted as genuine. The forger depends on a cursory examination of a fraudulent document to ply his or her trade. They know that under detailed examination the treachery will be discovered.

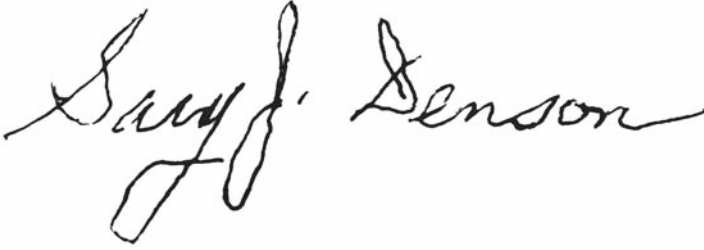
A handwritten signature in cursive script that reads "S. J. Benson". The writing is characterized by significant tremor, with irregular, wiggly lines and uneven spacing between the letters and words. The ink appears slightly shaky and uneven in thickness, particularly in the loops and descenders of the letters.

Fig. 13.2. Tremulous writing of a forger trying to imitate tremor of an elderly writer. The tremor of an elderly writer is erratic.

A document examiner must be able to determine if differences in writing are the result of natural variation of the writer or a different writer. It takes several years of experience to make the distinction.

Only a small percentage of forgeries are created and uttered by expert forgers. Most fraudulent signatures are created by amateurs who see an opportunity to take advantage of others. Most amateur forgers are not very good and leave obvious signs of forgery in their work.

TREMOR

Tremor is the most easily detected and the most frequently found sign of forgery. Tremor results from slow writing or drawing. Writing is a little like riding a bicycle. When the bike rider slows down, the wheels will wobble. If the rider leaves a path in the dirt, it will resemble a wiggly line. The same is true of the writing line. When the writer slows down to copy or trace a line, the line will waiver. A fine waiver causes corrugation in the writing line, tiny side-to-side motions that can be seen under magnification (Fig. 13.2).

Fine-line tremor is known as criminal tremor. This deterioration of the writing line is an example of poor line quality. Line quality relates to the smoothness of the writing. Forgers sacrifice line quality when copying another's handwriting. Poor line quality will be most evident in traced signatures.

There may be other signs of forgery present with tremor. Patching, retracing, erasures, blobs of ink, or other signs of hesitation can help identify a forgery.

Some forgers attempt to imitate writing that contains tremor. This is much harder to duplicate than normal writing. Genuine tremor is erratic. When faking a tremor, the forger has a tendency to develop a rhythmic to and fro

movement. The forger will usually not place tremor on curves but will execute a smoother stroke than the known writer could have made.

There is a clear distinction between breaks from tremor and careful retouching and patching. A tremulous writer may go back and touch up a stroke, but it will be obvious. Forgers try to blend their strokes to hide their alterations. Any lifting and replacing of the pen may show a break in the line. There will be a heavier deposit of ink at points of overlap, which does not occur in the tremulous line made by the elderly or infirm writer.

PRESSURE PATTERNS

Simulated and forged writing usually lacks the normal pressure patterns of the writer being imitated. Forged writing that is slowly traced or copied looks as though it has been drawn instead of written. And it has. Most writers have varied pressure. Their downstrokes are heavier than their upstrokes. Forged drawn writing doesn't resemble natural writing. The pressure of a forgery is too uniform. There is no change between upstroke pressure and downstroke pressure.

Pressure patterns are subtle but highly significant characteristics of writing. A difference in pressure patterns is one of the fundamental differences in identifying non-genuine writing.

Some writing instruments, especially ballpoint pens, make it difficult to distinguish pressure patterns. Writing surfaces can affect pressure as well, but careful study of the handwriting under magnification should enable the document examiner to distinguish the pressure patterns of the writer.

Pressure patterns may be valuable clues to the identity of the writer because it is difficult to consciously control pen pressure. The author of the writing might be identified by comparing changes in pressure of genuine writing with questioned writing.

Depth of pressure is an important consideration, although writing surfaces and instruments can distort the depth perception of pressure. Indentations are created in the paper by the writing instrument forming ridges on the back of the paper; the heavier the pressure, the deeper the indentations. The depth appears heavier from a soft writing surface such as a pad of paper. Hard surfaces restrict the formation of indentations.

The type of grip pressure used to hold the writing instrument could be a clue to the writer's identity. If the writer held the writing instrument too tightly, the writing will appear cramped and rigid. If the grip is too light, the pen will slide around and leave air strokes and stray marks on the paper. Unskilled writers tend to grip the pen too tightly, limiting their control of the instrument.



Fig. 13.3. Patched writing showing that a writer wrote over an existing line to improve its appearance. Forgers patch their work to improve its appearance.

PATCHING OR RETRACING

Forgers are rarely satisfied with the quality of their work. They are always trying to improve the appearance of their forgeries. They touch up their work by patching letters and retracing strokes. Occasionally, these strokes can be detected with the naked eye, but magnification will make them more obvious. What often appears to be a genuine signature will be exposed as spurious when magnification reveals patches and touched-up lines.

Sometimes forgers will misspell a name and attempt to correct their mistake by patching or overwriting the incorrect letter (Figs. 13.3, and 13.4). People rarely misspell their own names. Occasionally, a writer will leave out a letter and insert it later, although it is rare and this type of insertion is obvious. Most people sign their name and never even glance at it. They do not go back and try to make their signatures look better.

A highly skilled forger will make each letter individually and will blend the writing. This type of forgery can be detected under magnification.

BACKWARD WRITING

Some forgers turn the model signature upside down and copy it backward in an attempt to suppress their own characteristics. Upside down writing will have altered pressure patterns, usually with the upstrokes appearing



Fig. 13.4. Example in which a writer wrote over an existing word.

heavier than the downstrokes. The pressure may be even as a result of drawing the signature instead of writing.

Backward writing can be identified by the intersecting lines that cross in the wrong direction. That is, the wrong stroke will be on top. Ballpoint pens reveal direction from circle or semi-circle formations. Burr striations radiate outward on circle formations. The gooping common to ballpoint pens will also assist in determining line direction. Ballpoint pens leave blobs of ink immediately after the pen goes around a curve.

TRACING

Forgers who lack skill in simulations will trace a signature to copy it. Tracing is difficult to accomplish and leaves indications that the document has been traced. First, the forger must find a way to transfer the signature from one page to another, sometimes with the use of carbon paper. He or she will place the carbon paper under the known signature and over a sheet of paper on which the signature is to be placed. The forger then traces the outline of the signature with a sharp instrument, such as a stylus or a pen. He or she removes the original and follows the lines of carbon with a broad point pen to hide the carbon line and to compensate for any deviations. However, it is difficult to keep within the lines, and sometimes carbon traces or indentations in the paper may be obvious (Fig. 13.5).

Another tracing method involves using a transmitted light source, such as a light box or a window, to trace a signature. In this case, the forger places the genuine signature under a sheet of paper and traces the lines that show through the paper. Some forgers trace signatures on onion skin.



Fig. 13.5. Side-lighting has been used to show indentations in a forged signature.

Forgers who trace signatures tend to miss subtle details. They follow the outline of the signature but eliminate the less obvious characteristics. They generally deviate slightly from the model signature. When a signature ends with a long line, the forger may attempt to simulate the line without tracing it. The rest of the signature, however, will match the model.

Some ingenious forgers are using pantographs or scribers to copy signatures. These devices enable one to copy a design and change the size of the design. Everything remains the same but the signature is reduced or enlarged.

More astute forgers will copy parts from several signatures, tracing them from different documents and presenting them as a single genuine signature. If the signatures used for models are presented as proof of genuineness, the document examiner may be able to match the signatures, because the parts copied will overlay the traced signature. Another ploy is to move the signature slightly after copying the first few letters or the first name. This prevents the material from aligning exactly.

Modern-day forgers are scanning signatures into their computers and placing them on fraudulent documents. Without an original, it may not be possible to identify the copy unless the forger supplies the original signature.

A tracing doesn't have to be an exact copy of the original. It may deviate from the original because slippage of the tracing paper slipping or the deliberate moving of the papers to distort the copy. The act of tracing results in tremulous lines. Tracings will generally have blunt beginning and ending strokes as a result of the nature of the tracing act. The forger places the pen on the starting point before he or she starts tracing and stops moving the pen before lifting it from the paper once the trace is finished.

BLOBS OF INK OR SIGNS OF HESITATION

When the writer pauses with pen on paper, the ink continues to flow from the pen and leaves a blob of ink on the writing line. Forgers will stop to check their progress and leave these telltale signs on the signature they are copying. Normal pauses occur in appropriate places, but forgers stop at awkward spots. They will hesitate in the middle of a circle or along a line where there is no reason for a pause (Fig. 13.6).

Do not confuse these blobs of ink with gooping caused by a ballpoint pen going around a curve. When a ballpoint pen changes direction, some of the ink adheres to the housing and is deposited on the paper. These blobs of ink will be seen immediately after curved letters and are not signs of hesitation (Fig. 13.7).

PEN LIFTS IN UNNATURAL PLACES

Forgers sometimes lift the pen when checking their progress instead of resting it on the paper. When they return the pen to the paper they sometimes leave a gap or they overlap the writing. Although all writers lift the pen to the next letter or word, forgers tend to have pen lifts in unusual places, interrupting the normal flow of the line. Writers do not lift the pen in the middle of a letter, particularly a curved line, yet forgers do. Look with suspicion upon pen lifts in inappropriate places (Fig. 13.8).

ERASURES

Erasures are suspicious and can be an indication of forgery. Erasures may be used to cover mistakes or to raise the value of a check or other negotiable instrument. Although all erasures are not suspect, signs of erasures on a document bear close scrutiny, particularly chemical erasures. Why has the document been altered? What is the erasure hiding or changing?

UNDUE ATTENTION TO UNIMPORTANT DETAILS

Forgers pay undue attention to unimportant details. They will cross a *t* too carefully, dot an *i* too exactly, and sometimes even form the letters too precisely. Writing is a habit to which most of us give little attention. When close attention enters the writing act, we may be dealing with a forgery, especially when the known writing does not show the same care.

CLOSE SIMILARITY OR EXACT IDENTITY

Close similarity or exact duplication of words or combinations of letters indicates that the forger had one form in mind when imitating the writing.

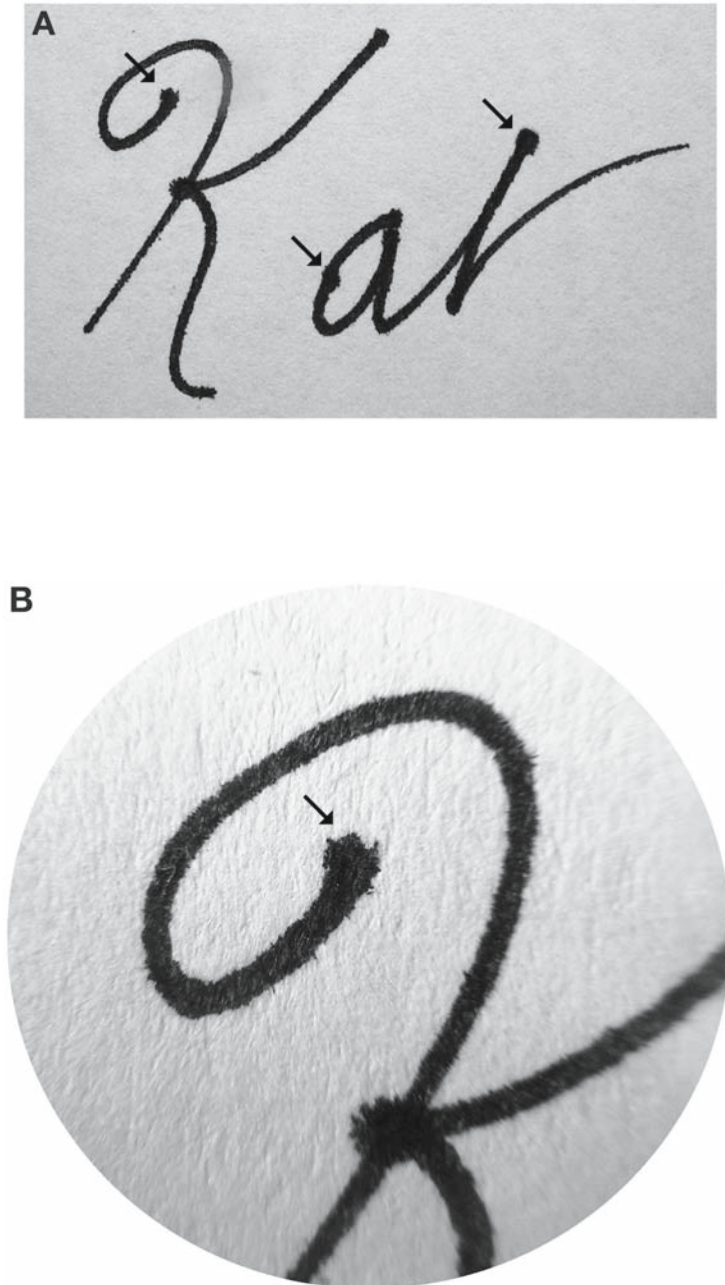


Fig. 13.6. Tiny blobs of ink where a writer hesitated during the act of writing indicative of a forger pausing to check his progress while copying a signature.

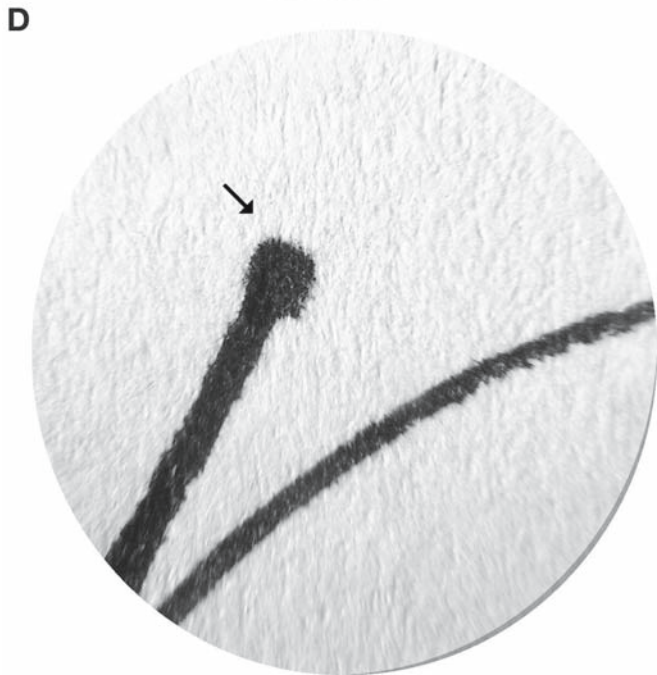
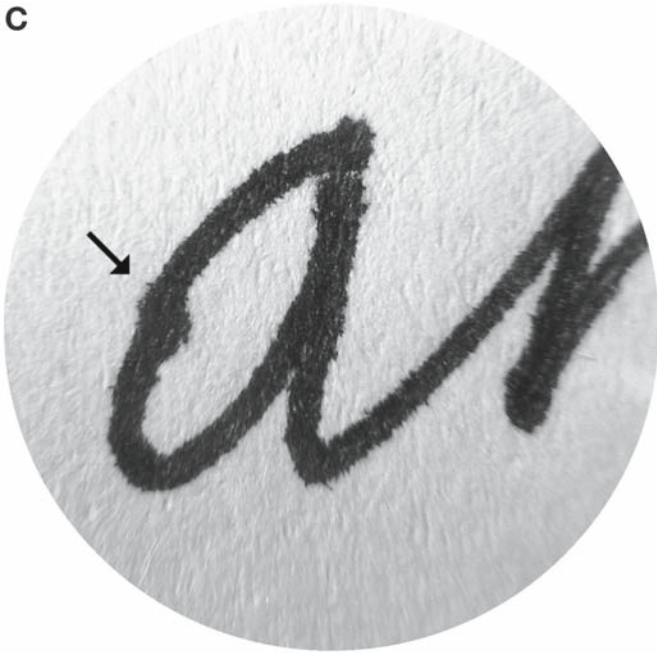


Fig. 13.6. (continued)

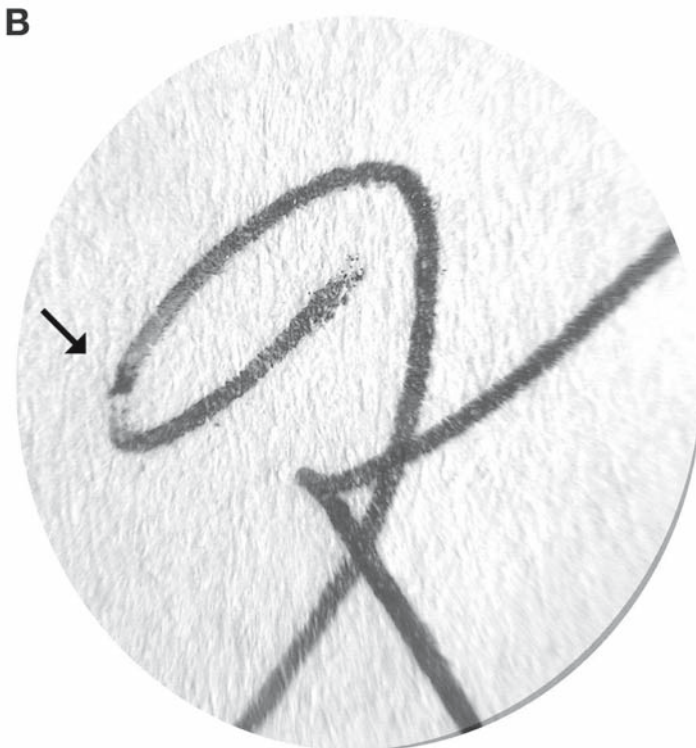


Fig. 13.7. Gooping is the result of ink collecting on the housing of a ballpoint pen deposited on the line of writing where a writer changes direction.

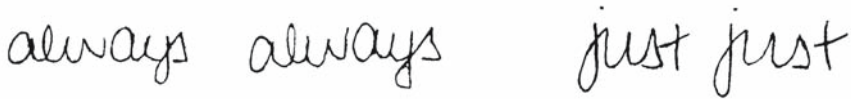


Fig. 13.8. Example of a writer lifting the pen to check his progress and then returning to continue the writing line.

The forger doesn't recognize the need for natural variation and makes the words and letters as close to the known writing as possible. This is obvious when he or she attempts to copy extended writing. The forger will exactly duplicate the letter form, crossing the "i" at the same angle and in the same place, dotting the *i* in the same location, forming the design of the letter exactly like the model, giving the writing a rubber stamp look (Fig. 13.9).

Some forgers will cut a genuine signature from a legitimate document and paste it onto another document, creating a fraudulent document. They recopy the document and try to pass the photocopy as authentic. If the original signature is located, it is easy to recognize the duplication.

Identical signatures can only be obtained by tracing the original signature, scanning it into a computer and printing it on a document, using a signature stamp or an autopen, or by cutting and pasting a genuine signature to another document (Fig. 13.10).



The image shows the words "always" and "just" written twice each in a cursive script. The two instances of "always" are nearly identical in their letter shapes and slants, as are the two instances of "just". This illustrates a lack of natural variation in handwriting.

Fig. 13.9. Overwhelming and unnatural similarity of writing showing that the forger used the same model to create the words that appear to be almost identical.



The image displays two identical digital signatures of "Katharine M. Kopperduwe" stacked vertically. The two signatures are perfect duplicates of each other, demonstrating the lack of natural variation in digital signatures.

Fig. 13.10. Example of authentic digital signatures placed sequentially. Digital signatures will be exact duplicates.

DISSIMILAR LETTER CONSTRUCTION

Because forgers concentrate on the appearance of the writing, they overlook the method of construction of the individual letter forms. Although the letters resemble the known writing in appearance, the method of construction is often different.

Forgers will copy the obvious unusual letter forms, particularly capital letters. They do not pay as much attention to lower case letters. In some cases, they slur the letters instead of imitating them.

Forgers expect their handiwork to be given only a cursory glance. They know that their fraudulent signatures will not pass close scrutiny.

BLUNT BEGINNINGS AND ENDINGS

Blunt initial and/or terminal strokes can indicate forgery. The blunt initial stroke is made when the forger places the writing instrument on the paper before he or she begins to write. If the forger stops the pen before lifting it from the paper, a blunt ending is left on the writing line.



Fig. 13.11. Blunt beginning and ending strokes.

The act of simulation lends itself to blunt beginnings and endings just as tracing does. The forger places the pen on the paper, checks the model and begins simulation, pausing periodically to check the model as he or she continues writing. If the forger is a highly skilled forger, he or she may complete each name without pausing. The forger generally stops writing, keeping the pen on the paper, and checks his work before lifting the pen. This leaves a blunt ending with a blob of ink (Fig. 13.11).

HABITS OF THE FORGER

Although forgers are concentrating on imitating another's writing, their own habits creep into the writing. It is not possible to concentrate on all the characteristics that make up another's handwriting while eliminating one's own habits. Thus, many of the more subtle characteristics of the forger may be present, particularly those characteristics that lack awareness. Check rhythm, pressure patterns, and line quality because these characteristics are the most subtle.

DISSIMILARITIES

A simple forgery is one in which there has been no attempt to imitate the genuine writing. This is one of the easiest types of forgeries to identify because there are significant differences between the known and the questioned writing. Simple forgeries generally do not contain other signs of forgery because they are fluidly written.

CONSCIOUS ATTENTION TO THE ACT OF WRITING

People develop habits by repeating actions until the motor response becomes automated. We practicing many actions to develop their skill in the activity of choice, such as handwriting. This includes handwriting. Writing skills are developed through repetition until conscious attention to the act of writing is no longer necessary.

When a forger copies someone else's signature, he or she must pay conscious attention to the act of writing. Conscious attention usually results in several obvious signs of forgery, such as poor line quality because the writing is drawn and not written. Forged writing appears to be more deliberate and lacks the spontaneity of natural writing.

Conscious attention to the act of writing can be seen in the way a signature sits on the baseline. Normal writers do not pay close attention to the placement of the writing on the baseline. Therefore, when the questioned writing sits evenly on the baseline and none of the known writing does, this can be an indication of spuriousness.

ADHERENCE TO THE RULES OF PENMANSHIP

When conscious attention enters the writing act, the writing adheres more closely to the rules of penmanship. Letters are carefully formed and proportions maintained.

OBVIOUS FORGERIES

Although a simple forgery is easily identified, determining the lack of genuineness of a simulated forgery generally depends on multiple factors, rather than a single indicator.

IDENTIFYING FORGED DOCUMENTS

Some forgeries are so obvious that they will stand on their own merit as being forged. It is not always necessary to have known signatures for comparison. The signs of forgery, such as poorly formed and/or badly patched signatures, can identify a fraudulent document (*see* Fig. 13.12).

NO SIGNS OF FORGERY

Handwriting that does not show obvious signs of forgery is not necessarily genuine. Some forgers are capable of copying another's writing with enough proficiency to mask the noticeable indications of forgery, especially

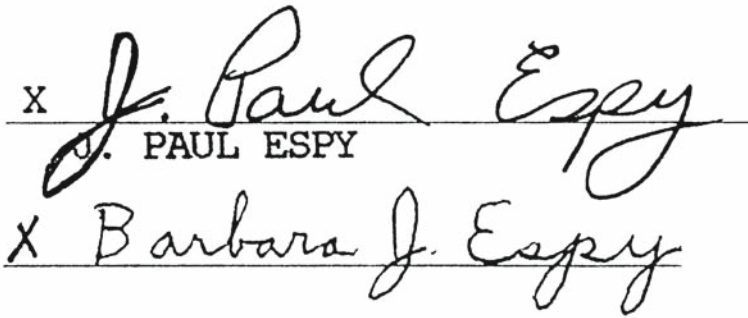


Fig. 13.12. The letter *j* is overwritten to improve its appearance. Tremor of forgery is also present most notably in the second signature.

when the genuine writing has a low form level. In these cases, identification is generally made on the subtle differences in construction.

IDENTIFYING THE FORGER

Most forgeries are committed by amateurs who are opportunists. They not only fail to copy all of the writing habits of the victim, but they also subconsciously include some of their own characteristics in the writing. This enables the document examiner to identify the forger. Skilled, simulated forgeries may not contain any characteristics that identify the writer. Because a tracing is drawn, not written, the forgers suppress their writing habits to hide their identity.

HOLISTIC FORGERIES

Although a forger may successfully imitate a signature or a small sample of handwriting, it is impossible to maintain a successful simulation of a lengthy document.

It requires a strong sense of concentration to duplicate another’s writing. Most people cannot maintain total concentration for a sustained period of time. As they tire, their attention wanders, and they return to their normal handwriting characteristics. Therefore, the longer the handwritten sample, the more likely the writing reverts to the forger’s normal habits.

Forgers of holistic documents grow careless as their writing progresses. The writing at the end of the holistic document will likely resemble the natural writing of the forger. Therefore, document examiners should begin by studying the end of the document.

Holistic forgeries can be identified by a lack of internal consistency. Variations in the handwriting characteristics can be observed throughout the writing.

Holistic simulated forgeries can also be identified by a lack of normal variation. The forger is intent on imitating a specific form and fails to recognize the need for variation.

The forger has to choose between writing slowly to adhere to the model or writing rapidly, which causes deviations from the model. Slow writing results in more obvious signs of forgery.

In most cases, document examiners compare questioned handwriting with known writing. Careful comparison of the habits of the known writer enables the document examiner to identify the spuriousness of a handwriting sample. By focusing attention on the subtle influences that are most likely to escape the attention of the forger, one will be able to draw correct conclusions about spurious writing.

CASE STUDY: A CASE OF TREMOR

Background

Family members discovered that a very helpful neighbor was assisting their elderly and infirm father with his affairs, while also helping herself to his money and property. After the man died, the deed transferring the property was discovered, and a document examiner was hired to determine if the signature was genuine. The known writing was slowly executed with much tremor.

Question

Would it be possible to determine authenticity or spuriousness of this type of signature?

Answer

In many cases, yes. Many of the characteristics of writing would remain the same. In addition, anyone copying the writing of the infirm may not duplicate the same type of tremor.

Outcome

An examination of the tremor in the questioned document showed even and controlled escalations as opposed to the erratic tremor of the elderly writer. The skill level of the forger was higher than the known writer. The forgery was exposed.

Questions

1. How many dissimilarities must one find to determine that a handwriting doesn't match?
2. Give an example of a fundamental difference.
3. What are the obvious signs of forgery?
4. What must a document examiner be able to determine about differences in handwriting?
5. What causes tremor in handwriting?
6. What type of pressure patterns usually appear in simulations?
7. How is a signature traced?
8. Why do forgeries have blunt initial and terminal strokes?
9. What is a simple forgery?
10. If a document contains no obvious signs of forgery, is it genuine?
11. What is a "holistic forgery"?

Chapter 14

Weighing the Evidence

WEIGHING THE EVIDENCE

The strength of one's opinion is based on the number of similarities that exist between the known and the questioned documents. This is similar to identifying a person. One starts with general or class characteristics such as sex, build, height, weight, hair color, and eye color. When a match is found, it can be said the person fits the description, but, because many other people also fit that description, a positive identification cannot be made. When class characteristics such as the penmanship system, connecting strokes, line quality, and rhythm match in handwriting, one can say a writer could have written the material, but there is not enough information to make a positive identification. More specific information is needed.

One looks for specific identifying marks that distinguish one individual from another, for example, scars, tattoos, and birthmarks—any individual characteristic that can assist in identification. The more specific the characteristics match, the more positive our identification. This is also true in handwriting identification. One looks at the idiosyncrasies of the writer. Any unique characteristics of handwriting assist in identification. The more unusual characteristics that show up, the stronger the opinion.

Writing can be altered by the effects of drugs, intoxication, illness, or other transitory factors that may occur. If any of these conditions are known to have been present at the time the questioned documents were executed, they must be taken into account in rendering an opinion. Any one of these conditions may make identification impossible unless material written under the same circumstances can be found.

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“Accidentals” may also occur in handwriting. An accidental is the result of an unusual situation. The writer’s arm may have been bumped while signing his or her name. The writer may have hit a rough spot on the writing surface. Startling the writer could cause the occurrence of an atypical stroke of writing. Because of the transitory nature of an accidental, it will not be repeated in the handwriting.

STANDARD TERMINOLOGY

The American Standard and Testing Materials established standard terminology for opinions. Most document examiners use the following terminology when giving their opinions.

Identification: Definite identification, the highest degree of confidence in one’s opinion that the handwriting belongs to the identified party. Unqualified opinion. Example: “It is my professional opinion that the handwriting in the documents examined is genuine.”

Strong probability: Highly probable, very probable, not as strong an opinion. “It is highly probable that the document is genuine.”

Probable: Evidence indicates the questioned and known were written by the same person but it is not conclusive. “It is my professional opinion that the document probably is genuine.”

Indications: There are some indications of similarity but not enough to identify conclusively or exclusively. “There is evidence suggesting that the handwriting samples compared were written by the same person but not enough material to support a definite conclusion” or “More likely than not, the signature is genuine.”

No conclusion: Totally inconclusive, unable to make a determination. The zero point, a neutral position. “It is not possible to reach a conclusion based on the materials submitted.”

Indications/did not: Equivalent to the positive “Indications” but on the negative side. “I found indications that the handwriting was not written in the same hand.”

Probably did not: Evidence strongly against the questioned and known having been executed in the same hand. “It is my professional opinion that the questioned writing was probably not written in the same hand as the known.”

Strong probability did not: Evidence indicates that the writing very probably is not done in the same hand, almost certainty that it is not the same, a qualified opinion. “It is highly probable that the writer of the known writing is not the author of the questioned.”

Elimination: Definite conclusion that the questioned and known writing are not in the same hand. Highest degree of confidence. "It is my professional opinion that the writers of the questioned and known material are not the same."

The degree of probability or improbability is based on the quality of the evidence available. This refers to suitable, comparable material in sufficient quantity to make an identification. Only when there are sufficient similarities and no fundamental, unexplainable differences can a writer be positively identified.

There must be agreement in both class characteristics and individual characteristics to give an unqualified opinion. The document examiner must not have any reservations about the authenticity of a document when he or she gives an opinion of identification. He or she must be satisfied that no one else could have written the questioned document.

The strongest level of opinion is used exclusively for original handwriting. Opinions are more limited when the document examiners are dealing with copies.

When exemplars for comparison are limited, an opinion must be qualified. There is generally some flaw that prevents the document examiner from giving a more positive opinion. It may be that he or she is working from photocopies instead of originals, or there may not be enough genuine handwriting to make a positive identification. One or both of the handwriting samples may be disguised.

An opinion of highly probable is given when there are many similarities but not enough individual characteristics to make a positive identification. It is a strong probability but falls just short of a positive identification.

An opinion of probable is based on the fact that some similar individual characteristics were present in the known and the suspect writing but not enough to eliminate the possibility of someone else having written the document.

Indications means the known and questioned writing have only a few features of significance that are in agreement. There are not enough similarities to make an identification. Although the writing is consistent, not enough individual characteristics exist to eliminate other writers.

Similarities exist in most people's handwriting, particularly those who have learned the same system of penmanship. Identification must be based on the individual characteristics of writing and not just a few matching class characteristics.

Sometimes it is not possible to determine the author of spurious writing because of a lack of sufficient identifying factors. There are limiting factors, such as disguise or lack of proper exemplars. An inconclusive opinion is a valid opinion in these situations.

It is more difficult to prove a writer could not have written a questioned document because no one can assess the full range of another's writing. Negative opinions are based on the significant differences found when comparing handwriting samples.

Probable opinions point more strongly against the questioned and known writing having been done by the same person. There may be a few similarities in the class characteristics but the individual characteristics are not comparable. Limitations may be based on lack of sufficient material to completely eliminate the writer. Examination of photocopies can lead to a qualified opinion.

A suspect is eliminated when there are fundamental differences between the known and the questioned writing that cannot be reconciled. The document examiner must be certain the exemplars used for comparison purposes were adequate and they were not disguised before eliminating a suspect.

QUALIFYING YOUR OPINION

In addition to the various degrees of probability, it is wise to qualify opinions. Caution should be exercised when rendering an opinion in the absence of the original documents. The document examiner should add a qualifying statement such as, "Subject to examination of the original documents."

Even with original documents a stipulation should be made as follows, "My opinion is based on the documents submitted," or "The evidence supports the opinion that..." This enables the document examiner to modify his or her opinion if new evidence becomes available.

CASE STUDY: WEIGHING THE EVIDENCE

Background

In many cases, original documents are not available for examination. In some cases the original is lost or destroyed. Determine what qualifications you will place on your opinion under these various conditions.

Questions

What level of opinion would you give if:

1. You do not have an original questioned document, only a photocopy?
2. You have a photocopy that contains obvious signs of forgery not present in the genuine signatures?
3. You have all original documents but the exemplars are current and the questioned document is 5 years old?

4. You have all original documents, the questioned document resembles the current signatures but is dated 15 years ago, and the signature has changed significantly in the past 10 years?

Answers

1. Probable or highly probable subject to the original depending on the amount and quality of the photocopy.
2. Highly probable or probable that the signatures are not genuine.
3. If the signatures are consistent you can give a definite opinion. If there have been some changes in the exemplars, you may want to limit yourself to probable or highly probable.
4. The signature probably is not genuine.

Outcome

Opinions should be qualified whenever it is not possible to give a positive opinion.

Questions

1. What is the strength on which a document examiner's opinion is based?
2. What are some of the causes of alterations in normal handwriting?
3. What is an accidental?
4. What does an opinion of identification indicate?
5. What must be present in order to give an unqualified opinion?
6. What are the other degrees of probability?
7. Under what circumstances is it possible to positively identify a writer?
8. How can a suspect be eliminated?
9. When should an opinion be qualified?
10. What stipulation should be made when giving a written opinion?

Chapter 15

Preparing Reports

REPORT PREPARATION

Once a document examiner completes an examination of documents, he or she is expected to prepare a report for the client. It is important to have a standard method of operation for handling reports. In the majority of cases, the document examiner is expected to give an oral report first. The client then informs the document examiner if he or she wants a written report.

In anticipation of giving a report, the document examiner needs to make notes during an examination to assist in preparing the report. Because anything document examiners write in their notes is subject to discovery by an opposing party, notes should be succinct and without elaboration. If a document examiner fails to make any notes, his or her opinion may be subsequently hard to defend. In fact, the examiner may forget the opinion was formed. Therefore, it is essential to devise an easy note-taking system.

Once the document examiner has given an oral report, a written report should be offered to the client. In most cases the written report will be a brief statement of the problem, the methods used to solve the problem, and the conclusions reached by the document examiner.

There is certain information that must be included in a written report. First, the question or problem the examiner is asked to solve must be stated. The document examiner will then cite all documents used to reach the conclusion. These documents must be described so that they can be easily identified. The documents are usually given a letter and/or number designation that is used on exhibits and subsequent reports. The date the documents were executed should be included, as well as the number of pages and/or number

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of signatures. It should be noted whether the examiner looked at original documents, photocopies, carbon copies, photographs, faxed copies, or computer-generated copies. Next, the document examiner should list the methods used to draw the conclusions. A brief description of the instrumentation used and a list of the handwriting characteristics compared may be included.

It is appropriate to add a generic sentence to the report stating that an identification is based on sufficient similarities to identify a writer with no unexplainable fundamental differences between the known and the questioned handwriting. You may want to add additional factual information based on the principles of document examination.

The document examiner then states his or her opinion on the case. Because forgery involves intent to defraud, document examiners do not use the term forgery in giving an opinion. Instead, the document examiner will opine the signature is genuine or non-genuine or is written in the same hand as the exemplars.

Occasionally some of the documents identified as exemplars may be spurious. Unless the document examiner saw the exemplars executed, he or she should not state the document was signed by naming the writer of the signature. The examiner should state that the questioned is written in the same hand as the known and, he or she may add, "has been identified to me as the writing of Jane Doe."

The examiner offers to prepare exhibits and to go into more detail if the client so desires. The document examiner usually closes with the comment that he or she is prepared to demonstrate the findings, if necessary.

A copy of the examiner's curriculum vitae is included to verify his or her credentials to render such an opinion. A declaration attesting to adherence to the rules of evidence may also be added.

Sometimes the client will request an affidavit (Fig. 15.1). A statement may be added to a letter of opinion making it an affidavit, or a separate form may be prepared. An affidavit is a sworn statement that usually begins with a statement similar to the following: "I, name, am over 18 years of age and am qualified to give opinions in questioned document cases." Most affidavits are notarized, but that is not necessary.

The Federal Rules in Civil Cases have been amended to require that an expert witness give all reasons in writing for his or her conclusion in Federal cases. This requires a more detailed report when the document examiner gives a written opinion in a case. Any information that is not included in the report will be excluded in court.

If exhibits are planned to graphically demonstrate the examiner's findings in court, then the document examiner should include them in the opinion letter. Other jurisdictions may also request a detailed report.

I HEREBY AFFIRM UNDER THE PENALTIES OF PERJURY AS FOLLOWS:

1. My name is *(Insert your name)*. My address is *(Insert your address)*. I am over the age of 18 and competent to testify. Attached hereto and incorporated herein as **Exhibit A** is a copy of my Curriculum Vitae. The facts and qualifications referred to therein are true and I am a competent court-qualified Certified Document Examiner specializing in handwriting identification. I am capable of forming an opinion regarding the authenticity of handwriting samples.
2. On *(Insert date)* I was ask to examine and compare the following documents, which are attached hereto as Exhibits. The document in question is *(Insert information about the Questioned Document)*.
3. The standards used for comparison are *(Insert information on the exemplars)*.
4. Based on the documents examined, the evidence supports my professional opinion that the signature, *(Name the Questioned Document)*, which appears on the Questioned Document is not written in the same hand as the standards and is therefore not genuine.

I, *(Insert your name)* do solemnly declare and affirm that the foregoing statements of facts are true and correct.

Date

Forensic Document Examiner

STATE OF MARYLAND
CITY OF BALTIMORE

I HEREBY CERTIFY that on this ___ day of, 200___, before me, the subscriber, a Notary Public of and for the City aforesaid, personally appeared who made oath in due form of law that the matters and facts contained in this Affidavit are true and correct.

My Commission Expires:

NOTARY PUBLIC

Fig. 15.1. Example of an affidavit used by document examiners to describe their opinions.

The document examiner may add that new information could require an addition to the report. If new information is acquired, an amended report should be promptly submitted.

*CASE STUDY: SUFFICIENT EXEMPLARS****Background***

A document examiner was hired to determine the authenticity of a signature on a letter to Workman's Compensation indicating the writer did not want insurance. The client supplied the document examiner with 60 checks, and the document examiner found significant differences. The opposing expert asked to exchange reports and evidence.

Question

Should a document examiner inspect reports and evidence used by the other examiner?

Answer

The document examiner should always ask to see all of the evidence in a case. It is appropriate to exchange information with the other side.

Outcome

The other expert was given wider range of exemplars and the handwriting was consistent with the signature in question. The client deliberately picked signatures that differed. The document examiner gave an opinion that the signature in question was signed by the writer of the exemplars.

Questions

1. What types of reports does a document examiner give?
2. What is included in a written report?
3. What should be attached to a letter of opinion?
4. What is an affidavit?
5. What type of report must be prepared in Federal Cases?

Chapter 16

Alterations of Documents

INTRODUCTION

Document examiners must be able to identify documents that were altered to change the conditions of a contract or other legal entity. Alterations can take the form of erasures and replacement and/or insertion of material into a document.

Handwriting, typewriting, and other marks on paper can be removed by abrasion or chemical eradication or covered with an opaque substance. Document examiners need to be able to decipher the material that has been altered or erased.

ABRASION

Abrasion includes erasures usually executed with a rubber eraser or scraped with a sharp object, such as a knife or razor blade. Abrasion disturbs the paper fibers and affects the finish on the paper, making it more porous. But not all abrasion is easily detected.

Graphite from pencil writing can be more easily erased than colored pencils and indelible ink. Rubber erasers absorb some of the graphite while spreading the rest of it around the paper, usually leaving a smudge around the location of the erasure.

The Eberhard Faber Kneaded Rubber Eraser is a plastic rubber eraser that pulls the graphite from the paper and cleans itself when kneaded. It can completely remove graphite particles from some documents.

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The invention of the Paper Mate Erasable Ink Pen makes it possible to completely remove the erasable ink from the writing surface when the ink is still wet. Once the ink sets or dries, it cannot be easily removed.

Water- or alcohol-based ink cannot be easily removed from a document because the ink penetrates the writing surface and is absorbed into the paper. Ballpoint ink, which is glycerol-based, does not penetrate as much, but the ink dries quickly and is difficult to remove. It requires hard rubbing with an abrasive eraser to remove ballpoint ink from a document. This type of erasure greatly disturbs the paper fibers and leaves obvious signs of the erasure.

Writing with a pen over erasures that have destroyed the finish of the paper will cause ink to be absorbed more readily into the paper, creating a feathering effect. Writing with a pencil over an erased area will leave bumps if the erasure was uneven.

DETECTING ERASURES

The document examiner should make a visual examination of the paper using strong light and magnification to see if evidence of erasures is present. Use various types of lighting, including daylight, to assist in the detection of disturbed fibers and residue on the paper.

It may be possible to see the indentations left by erased material (Fig. 16.1). Use oblique lighting to create shadows from the indentations. This can be accomplished by holding the paper at eye level and directing a source of light across it at different angles. An electrostatic detection apparatus machine also detects indentations.

Expose the writing surface to infrared or ultraviolet lighting to detect a change in fluorescence or luminescence. Examining the paper with transmitted light may reveal thinner paper in the area of the erasures.

Various powders can effectively reveal rubber erasure sites. However, they may stain the document and should not be used without written permission from the client and the court. A mixture of methylene blue and potato starch aids significantly in the discovery of erasures. Methylene blue is an intense dye, and minute traces of it can remain on a document even after it has been cleaned with a brush. It is soluble in fluids such as perspiration, ambient humidity, and latent fingerprint development solutions that may be found on documents.

Another erasure-sensitive powder that is effective, easily available, and easily removed from the document is a composition of bicarbonate of soda (commonly called baking soda) and toner powder. Sprinkle the powder onto the document and shake the paper gently back and forth to distribute the mix-

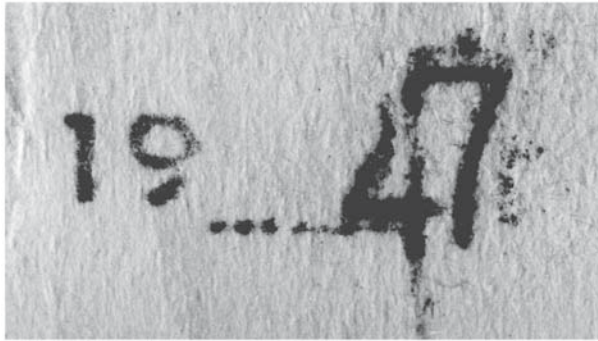


Fig. 16.1. The last two numbers of the date have been erased and a new date has been typed over the erasure.

ture over the entire surface of the document. Carefully tip the excess powder off the paper. After examining the paper, use a soft brush to remove the rest of the mixture from the document.

CHEMICAL ERADICATION

Chemical eradicators bleach the color from ink and in some cases remove the ink from the paper. Chemical eradicators leave evidence that the paper has been altered. They are only partially effective on removing ballpoint pen ink. Some ink residue is usually left on the paper.

Paper readily absorbs moisture that causes it to expand. Any treatment of paper with chemical fluids will expand the paper fibers. When the paper dries it does not go back to its original size but leaves wrinkles at the location of the fluid. It may be necessary to use oblique lighting to see the wrinkles.

Ink eradicators also stain the paper on which they are applied and may cause the paper to change color. Ink written over a chemically treated area will react differently on the affected section of paper. Visual examination of the paper under magnification should reveal the changes in the paper and the ink.

DETECTING CHEMICAL ERASURES

The document examiner should subject the questioned document to the same type of nondestructive testing that is used to determine abrasive erasures. The document should be examined under various types of lighting including ultra-violet and infrared lighting.

Enlarged photographs may prove helpful when taken with oblique lighting or transmitted light. Transmitted light is light that passes through the document. Place the document on a light box for transmitted lighting.

RESTORATION OF ERASED MATERIAL

Not all writing can be restored, although modern techniques make it possible to decipher many documents that have been altered. Chemical erasure fluids do not affect the line indentation made by the writing instrument, especially if the pen was a ballpoint or roller ball pen. Indentations can be deciphered using the electrostatic detection apparatus or other indentation detection methods. Side-lighting techniques reveal indented writing, which can be photographed.

Iron-based ink that has been chemically erased can be restored through fuming with sulfocyanic acid fumes. The fumes combine with the iron to reveal the writing, which will appear red. Iodine fuming requires the process of sublimation, that is, the crystals are heated so they pass directly from the solid to the gas state.

Iodine fuming may intensify the writing impressions. The iodine deposits accumulate in the writing grooves. Place a shallow dish containing iodine crystals in an enclosed glass container. Suspend the document in the container and saturate it with iodine fumes. Use a glass container so the paper can be inspected through the glass and removed as soon as the impressions from the writing are developed to a reasonable degree of legibility. The process may be hastened by heating iodine crystals with a light bulb.

Iodine fuming is no longer in general use because iodine fumes are toxic and the restored writing is transient. Documents must be photographed as soon as the impression can be read.

Obtain permission before subjecting any document to fuming because some stains may not be removable. Complete all non-invasive examinations first and make sure adequate photographs were taken of the document in case the fuming damages the document.

If abrasion does not penetrate the paper too deeply, the indentations from pencil may be read by using the indentation restoration techniques. Many of the techniques used to restore writing require sophisticated knowledge of chemicals, special types of photography, as well as other specialized equipment. A document examiner should know what can be deciphered and how it can be done.

There are ink specialists who can solve the more difficult problems. Document examiners should keep a list of resource people whose services may be required to assist in solving problems with questioned documents.

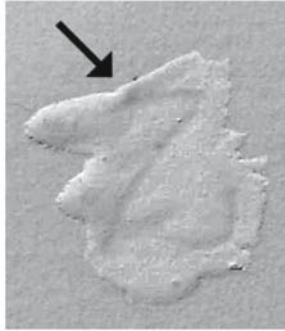


Fig. 16.2. White Out on a document. The outline of the number can be seen through the White Out.

OBLITERATIONS

Another method of obliterating material from a document consists of covering the material in question with an opaque substance. These substances come in different forms, liquid or dryline. Liquid Paper, sometimes known as White Out, is the most frequently used substance. It comes in a variety of colors and is sold under different labels as correction fluid. Different formulas have been developed to cover writing ink, photocopy toner, and typewriter ribbon ink. They are dispensed with a brush attached to the cap of the bottle. Correction pens containing a liquid tempera are also available. Dryline Single Line Correction Film is manufactured by Liquid Paper. These tapes are dispensed from a cartridge. When the original altered document is photocopied, it obscures the alterations. Ultraviolet light will also reveal material under an opaque substance. Correction tapes cover the written or typed material. Writing or typing can be done on the tape.

There are several ways to decipher writing that is covered with opaque material on the original document. A document can be photographed using transmitted light. This is accomplished by placing a document on a light box and photographing it. In some cases the opaque material leaves an outline of the printed material, as seen in Fig. 16.2.

The paper can be sprayed with a solvent that will make it translucent. The spray does not damage the paper because the paper will return to its original form when dry. To increase the drying time, lay the paper on a flat surface and place a piece of clear glass over the paper after spraying it. Use a mirror to read because you will be looking at the back of the paper.

Opaque material can be removed from a document with a solvent such as acetone. This will permanently alter the document so permission must be obtained and the process documented. Photographs should be made of the document before the substance is removed and during the removal period.

A simple non-destructive new technique for deciphering opaque writing and documenting the scanned material uses acetate sheets and a photocopier. Place the document on the photocopier with the opaque material face up. Cover with a piece of black paper and adjust the toner level to full dark. Insert a transparency sheet in the paper tray and make a transparent copy. The copy will contain the obscured material read through the paper.

INSERTIONS

Material is sometimes fraudulently added to a contract or other legal document after it has been signed. This material can drastically change the intent of the document. It is more difficult to detect additions that are skillfully added to a document than erasures. It becomes the task of the document examiner to determine if the addition or alteration was made after the document was executed.

Alterations may crowd the material that has already been placed on a document. Look for misalignment of material as well as material that has been squeezed into a limited space. The writing will be smaller and tighter than the surrounding material, or the material will have a different style of writing or a different writing instrument.

Handwritten material written by a different writer can indicate a fraudulent entry. Even writing scripted by the same writer may show significant differences owing to being added after the document was signed. Initials penned with the addition may also be forged. A careful inspection of all the written material should be conducted to determine if unauthorized material was added to a document.

Typewriter additions can be identified by the slight misalignment that occurs when a document is taken out of a typewriter and reinserted. It is impossible to exactly align the type vertically and horizontally. A grid placed over the text will reveal any misalignment, which could indicate that text was added to a document.

If a different typewriter was used, a study of the typeface will reveal subtle differences in the characters. A typewriter is a mechanical device that develops idiosyncrasies. This includes misalignment of letters, broken serifs, ink-clogged circle letters, and other similar features. The perpetrator may use a similar style typewriter, but his or her deception can be uncovered by the differences in the idiosyncrasies (Fig. 16.3).

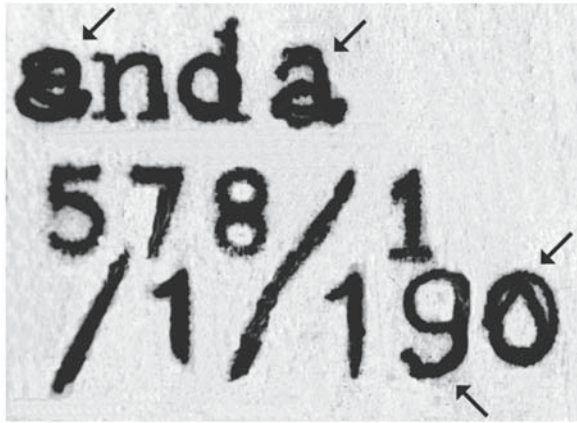


Fig. 16.3. Another example of a date being overwritten as well as the words "and a."

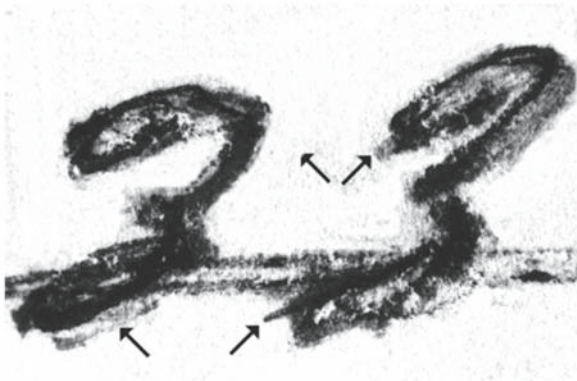


Fig. 16.4. The number 33 was overwritten in black ink.

Examine the ink under various types of light, including ultraviolet and infrared, to identify differences. Try natural sunlight as well as indoor lighting. Colored filters can sometimes show differences. Thin-layer chromatography will reveal different inks, but this is a destructive test and should never be conducted without written permission from the court.

PAGE SUBSTITUTION

Occasionally an entire page is substituted in a multi-paged document. When page substitution is suspected, the paper on each page of the document should be carefully compared to determine if a different type of paper was used. Study each page under various types of lighting because differences in color or texture may be revealed. Ultraviolet lighting should also be used because different papers fluoresce differently. Back lighting should also be tried. Check the size of the paper, the edges for cuts, and the weight, and check the thickness with a micrometer. Check each page for watermarks.

In addition to comparing the paper, compare any marks on the paper. Look for staple holes or holes from other fastening devices. Is there an extra set of holes on some pages and not others? Are there indentations from paper clips on some but not all of the pages? Are there indentations from writing on a previous page? Some writers will write on and sign documents starting with the top page with other pages underneath. Are the indentations consistent from page to page?

INTERSECTING LINES

In some cases, lines of writing co-mingle with lines previously placed on a document. By determining which line is on top, the document examiner can ascertain the sequence of writing. This includes handwritten material as well as typed material.

The direction of writing done with an ink pen can be determined by identifying the line on top. It may not appear to be difficult to determine which line is on top in intersections but some problems lead to false readings. For example, darker ink appears to sit on top of lighter ink. This optical illusion can lead to incorrect conclusions.

Some writing instruments leave a ridge of darker ink along the outer edge of the writing line. When a line of writing crosses another, the ridge of the first line is obliterated. The top layer of ink will have a continuous ridge along the edge of the line. This phenomenon occurs with some ballpoint pens.

Fountain pens have nibs in the point that separate slightly when pressed against the paper. These nibs leave a set of tracks on the paper. Some fiber tip pens also form a set of tracks on the paper. Sequence of line can be determined by the set of tracks on top.

Comparing the writing line is like looking at a piece of transparent tape that has intersected another piece of tape. When another piece of tape is placed across the first, the edges under the bottom tape are hidden. The top layer of tape has a continuous edge that can be clearly seen. The direction of the ink can be determined by the continuous line on the top layer.



Fig.16.5. Intersections of lines magnified to determine line sequence.

Fluid ink flows onto the paper and some of it may be absorbed by the paper. When a new ink line crosses the first ink line, the earlier ink may spread at the point of intersection. Sometimes the first ink is dissolved and bleeds when crossed, blurring the edges. If the ink runs when crossing another line of ink and dissolves some of the ink in the first line, there may be no way to determine which line was put on first.

Some cases of intersecting lines deal with two different inks. Magnification using the microscope or enlarged photographs should reveal the sequence. Various lighting should be used when photographing line intersections (Fig. 16.5). Magnification under the stereoscopic microscope should be between 15 to 45 power to detect the sequence of writing.

Handwritten material that has been inserted over typewriting can usually be identified with sufficient magnification. The ink may dim the typed letters when it passes over them. Because typewriter ink and stamp ink are oil-based inks, they repel water-based ink, which may skip over these surfaces or thin the ink line. Ballpoint pens may pick up pieces of carbon from typed letters formed with correctable ribbons and redeposit them on the page. Felt-tip pens push the carbon aside because the sticky ink of ballpoints causes the carbon to adhere to the pen.

Ballpoint pen over typewriting can be discerned by low-angle illumination that causes the ink to reflect. Lack of reflection indicates that the typing is on top of the ballpoint ink.

A continuous typed letter indicates that typing is on top of ink, and a break in the type indicates the ink is on top. A lift-off technique can be used to determine sequence. A semi-sticky tape can be applied to the typed material. Some of the typed material will be lifted by the tape although ink will not. Be careful not to use a sticky tape that will damage the document. This is a destructive technique and you will need permission to perform this test.

Another lift-off method can be accomplished with Krometone paper, a high-gloss backing material used for mounting lifted latent fingerprints. Place the glossy side of the paper against the ink line and rub the back of the paper with a blunt object using even pressure. Experiment with these methods before applying them to the questioned document.

Pencil over ink will leave graphite particles on the ink. Pencil under ink may present problems because the ink may be absorbed by the paper and the graphite sitting on the paper can create the illusion that the pencil writing is on top.

Pencil over pencil can usually be deciphered by the direction of the graphic particles. The pencil tends to drag particles from the first line, giving a good indication of sequence. Pencil lines show continuity on the upper line.

It is not possible to determine line sequence in photocopies in most cases. The document examiner must work with original material, and even with original material it is often difficult to determine line sequence. Although occasionally line direction in a photocopy can be determined, which may aid in detecting sequence.

FOLDS

When paper is folded, a crease develops at the fold unless it was a soft fold. Newspapers come with a soft fold that does not leave a crease when it is opened. Most documents that are folded are creased with a sharp fold.

A sharp fold can break the paper fibers at the fold line. Folding stretches the paper on the outside of the fold while compressing the paper on the inside. A hollow is created on the inside at the location of the fold.

The folds in a document may indicate a substitution particularly if the folds in substituted pages do not match. Check the folds on all the pages for consistency. Is there an extra set of folds on any of the pages?

If writing is placed on a document after a sharp fold has been created, the ink will spread into the fold when it crosses the fold line. Therefore, if an addition is made to a document that has a pre-existing fold, the feathering of the ink in the fold indicates that the material was added after the fold was made. Ink made prior to the fold will have a clean break across the fold line.

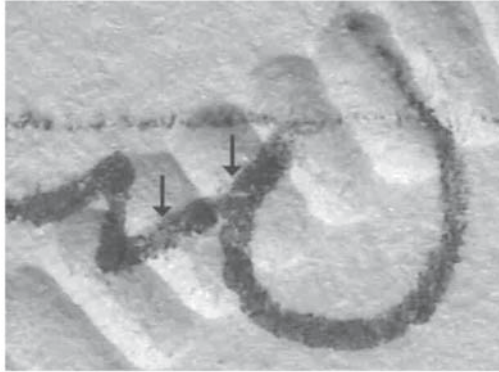


Fig.16.6. Writing placed on a document before an embossing seal was applied.

WRITING OVER EMBOSSING

Writing can be identified as having been written before or after a notary seal is placed on a document when the writing and the seal come in contact. Writing that is placed on a document before the seal is added will sit evenly in the raised portion of the embossing (Fig. 16.6). When someone attempts to write over an embossed seal, the pen will skip over the depression and will catch on the raised portion. When the pen catches, it may leave a blob of ink at the point of contact or the pen will change direction creating some erratic lines.

CUT AND PASTE

Cases arise when no original documents can be found, and the document examiner must deal with the best evidence available. Many times this involves using photocopies. The main problem with photocopies is the fact that alterations may not be detectable. The document examiner cannot always identify a cut-and-paste document, that is one in which material is cut from genuine documents and pasted to another to form a fraudulent one. For example, a genuine signature may be cut from a document and attached to a different document so skillfully that the alteration is difficult to discern.

There are usually some flaws in cut and paste that will reveal the spurious nature of this technique. The section inserted into a document may leave a shadow when passed through a photocopier. The perpetrator usually covers the shadows with a white opaque substance and recopies it. Sometimes he or she misses some of the lines and leaves marks on the document that can be interpreted to show cut and paste.

One of the main problems with a cut and paste is the difficulty of aligning it with existing material. The culprit must align the material vertically and horizontally, which is very difficult to do. A grid placed over the page will show the misalignment. Keep in mind that misalignment can be the result of removing and replacing a sheet of paper into a typewriter and does not always indicate fraud.

Trash marks can be used to help determine cut and paste on spurious documents. Trash marks are the marks left on the copy by a photocopier when a document is copied. They are caused by nicks on the drum and dirt on the glass. If the drum has a scratch or nick, it will produce a mark that is repeated at regular intervals on a paper according to the size of the drum.

Dirt on the glass will leave a mark on each page in approximately the same location. Because there may be some slippage when the paper goes through the copier, the location of the marks on each page may vary slightly, but the marks from each page will align exactly.

Multiple passes of a document through the same copier will produce a cluster of trash marks. These marks will be close together and form a pattern on the document wherever they are found.

If a multi-paged document has been cut and pasted, the trash marks will be different in the area that has been inserted. If the cut-and-paste page has had several passes through the copier, there may be a cluster of dots instead of a single trash mark.

Staple holes and small tears in a document will show up on a photocopy as black marks. Sometimes a sharp fold in a document will leave a shadow. These should also be compared.

Compare a one-page document with any contemporary documents that may have been copied at the same time on the same machine as the questioned document. Trash marks change when the drum is repaired or the glass is cleaned on a photocopier. Therefore only contemporary documents will have the same trash marks.

Sometimes a forger will cut and paste the same signature on several documents. A comparison of the duplicate signatures will reveal their fraudulent nature.

ELECTRONIC ALTERATIONS

Modern word processors enable one to edit a document and then print it so that any insertions or substitutions cannot easily be detected on the altered document.

When several lines are added to a page of printed material, the spacing must be adjusted to accommodate the extra lines. Additions or deletions can

be determined from the difference in line spacing on the altered page when compared with the line spacing on other pages.

Original signatures can be scanned into computers and inserted on any document. Without an original document, it is not possible to determine if a fraudulent alteration or insertion has taken place.

CASE STUDY: SUBSTITUTIONS

Background

A document examiner was hired to determine if a three-page contract had been altered. The signature was genuine, but the signer had no recollection of having ever signed the contract. There was no original, and the client was able to provide the document examiner the earliest generation photocopy of the document that was entered into the court record as best evidence.

Question

How would you determine if a document was altered?

Answer

Check alignment. Compare trash marks.

Outcome

In this case, the document had been altered. The tops of all three pages contained the same trash marks. The trash marks on second and third pages did not match the first page. Material on pages two and three was misaligned, indicating where the document had been altered. A genuine signature was pasted onto the last page of the contract.

Questions

1. What types of alterations are found on documents?
2. How can a document examiner detect erasures?
3. How do chemical eradicators work?
4. How can erased material be deciphered?
5. How can insertions be identified?
6. How can the sequence of intersecting lines be determined?
7. How can page substitutions be discovered?
8. What happens to paper when it is folded?
9. What happens to writing when it is done over embossing?
10. How can a cut-and-paste document be identified?

Chapter 17

Disguised Writing

INTRODUCTION

Disguised writing is any deliberate attempt to alter one's handwriting to prevent recognition. Anonymous letters, blackmail attempts, ransom notes, threats, and similar documents are created by writers who feel their altered handwriting cannot be attributed to them. Request writing is also subject to disguise when a writer does not want to be identified. Fraudulent checks and credit card transactions sometimes contain disguised writing when a writer uses a fictitious name or creates a simple forgery.

Disguised writing presents several problems for document examiners. The examiner may fail to identify the writer because of pictorial differences, or the examiner may attribute the writing to the wrong person. Conversely, disguise may be erroneously suspected. Examiners run the risk of dismissing dissimilarities as disguise when they indicate a different writer. It is important for document examiners to distinguish between normal writing and disguised writing.

METHODS OF DISGUISE

The document examiner needs to consider the possibility of disguise in questioned writing. He or she needs to be familiar with the elements of disguise. Most disguise is relatively simple in nature; the writer changes the pictorial effect of the writing. The principal methods of disguise are change of slant, change of size, substitution of letter forms, block letters, opposite-hand writing, inverted writing, use of broad pen, or change in speed of writing. Originality in disguise is rare.

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

Most attempts to disguise handwriting are ineffective. Writers feel safe when they change the pictorial effect of the writing. Because the appearance of the writing is altered, the writer never realizes that many of his or her habits are evident in the handwriting. Only one out of nine people can change their handwriting so that it cannot be identified at a glance.¹

CHANGE OF SLANT

The most frequently used method of disguise is change of slant because it has the most dramatic effect on the appearance of the writing. Most writers change from a forward slant to a back slant. A writer who normally uses a vertical slant may change the slant to a far forward one. Writers are seven times more likely to use the backward slant than a forward one in disguise. Both Osborn and Harrison note that a writer will change his or her slant more than 15° when disguising his or her writing. The change of slant also affects the rhythm, letter forms, and fluency in the writing. Most writers feel that the change of slant is sufficient disguise and make no other deliberate changes in their writing habits.

The average writer cannot maintain the disguise. As attention wanes, the writer reverts to his or her normal handwriting. This is most obvious when a writer changes the slant (Fig. 17.1). He or she tends to revert back to the normal slant as the writing progresses.

CHANGE OF SIZE

Although the overall size of handwriting changes according to space available, significant changes in size will be used in an attempt to conceal one's identity. Most writers prefer to enlarge their letter forms, but some will greatly reduce the size. They are hoping the reduced letter sizes will make the letter forms too difficult to identify. Although letter sizes may alter the appearance of the writing, many other handwriting characteristics will still be present.

Occasionally a writer will squeeze letters close together in an attempt to divert attention. He or she usually maintains the proportion of the letters, that is, the size relationship of uppercase with lowercase and middle-zoned letters (such as *a*, *c*, and *e*) with looped letters (*b*, *d*, *f*).

¹ Harrison, W. *Suspect Documents*. Nelson-Hall, Chicago, IL, 1958, p. 360.



Fig.17.1. Example of a change of slant in a writing sample. Most writers have a consistent or uniform slant.

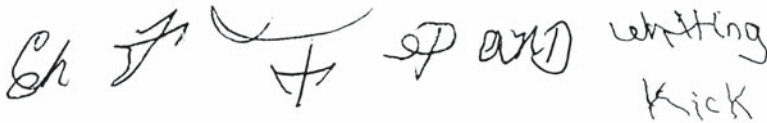


Fig.17.2. Altered and unusual letter forms in anonymous writing cases for the purpose of disguising handwriting.

ALTERED LETTER FORMS

Writers alter letter forms from the system of penmanship they were taught, as shown in Fig. 17.2. Some letters are stylized because the writer likes the effect. Others are created to cover mistakes in the writing or to make the writing more legible. Writers also alter letter forms in an attempt to disguise their writing. The simplest alteration is changing a cursive letter to a printed form. Some writers only change the initial letter of a word, particularly a word that contains a capital letter. Few writers change more than an occasional letter form.

Some writers will add flourishes and extended endings to their normal letters in an attempt to hide their identity. Others simplify letter forms by omitting initial and terminal strokes. Extended letters may have exaggerated loops, or the loops may be omitted completely so that the letter contains a down stroke or upstroke without a return to the baseline. Grotesque letter forms have sometimes been incorporated into disguised writing. These letter forms are generally considerably larger than the rest of the writing.

The basis for making apparently pointless modifications of letter forms is that writers believe these alterations will effectively disguise their handwriting (Fig. 17.3). They fail to consider the majority of letters that conform to their normal letter designs.

BLOCK LETTERS

Many writers (about 25%, according to Harrison) believe they can effectively disguise their handwriting if they use block letters instead of cursive.

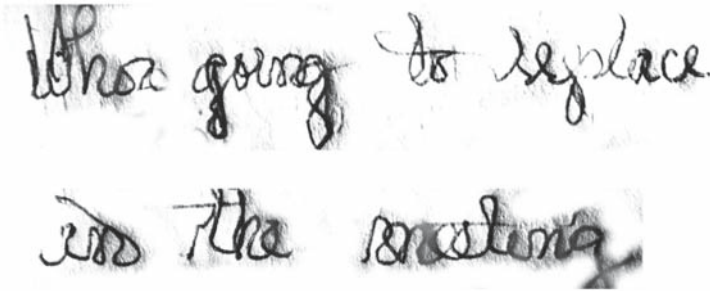


Fig.17.3. Altered writing as a method of disguise in an anonymous writing case.

Block letters are uppercase, printed letterforms. Many writers believe no comparison can be made between cursive writing and block printing. The pictorial effect may change but many of the writer's normal characteristics will remain, including the methods of forming many of the letters.

Some writers use only uppercase letters and merely increase the size of the letters designated as capitals. Few writers are consistent in using block printing. It is quite common to see a writer mingle upper- and lowercase letters at random. Occasionally, cursive letter forms are mixed with block print. This is especially common with the letter *a*.

Block letters will contain similarity of construction with some cursive letters. For example, humped letters (*h, m, n*) can be rounded, pointed, or square-topped. Circle letters (*a, o, d, g*) may be fully rounded or narrow ovals. They will have the same starting and finishing points. I-dots and t-bars will be similarly shaped. Block letters containing extenders sometimes are made with loops as in cursive.

The majority of writers who use block printing mix printed letter forms, both upper- and lowercase, cursive designs, and modified cursive capital letters. As a result, print script is more individualized than cursive writing. Variations in letter sizes within an individual's print script will assist in identifying the writer as well. Exemplars of handprinting should show many similarities.

OTHER-HAND WRITING

Other-hand or opposite-hand writing refers to writing with the unaccustomed hand. Not many people are ambidextrous. Most writers favor one hand over the other and have developed their handwriting with a dominant hand.

The image shows a sample of handwriting written with the left hand. The text is arranged in two lines: "KATHY TOLD ME" on the top line and "LAST YEAR. YOU GUYS" on the bottom line. The letters are slanted to the right, and the overall appearance is awkward and uncohesive, with irregular letter shapes and spacing.

Fig.17.4. An example of attempted disguise by using the unaccustomed hand resulting in poor letter formations.

Writing with the unaccustomed hand produces poor quality writing that some writers feel is an effective disguise (Fig. 17.4).

Because the pictorial effect of other-hand writing is considerably different than the accustomed-hand, writers feel safe in using this method as a means of disguise. They will not incorporate any other methods of disguise with their other-hand writing. Other-hand writing will look awkward with poorly formed letters and a lack of cohesion. Lack of muscle control of the unaccustomed hand will cause poor line quality and poor rhythm as well. Tremor may be present. Abrupt changes of direction may be seen in the loops and circle letters. The baseline will be uneven. Reverse letter forms may be found.

Many of the writer's normal characteristics of writing will be present in other-hand writing. Because handwriting is brain writing, that is, the brain directs the movement, many handwriting characteristics will carry over to the non-dominant hand. Letter designs will be retained as well as spacing, proportions, initial, terminal, and connecting lines, and ticks and hooks peculiar to the individual.

Document examiners should take request writing of the non-dominant hand whenever other-hand writing is suspected.

OTHER METHODS OF DISGUISE

Some writers will write upside down in an attempt to disguise their writing, as shown in Fig. 17.5. Because few people can write extended passages upside down, this method is usually employed for short messages. The document examiner should invert the writing to study it. Many characteristics of writing will be discernible.

The image shows a sample of handwriting written upside down. The text reads: "I watch you every evening when you get out of your truck at home. Smoking takes and". The slant of the letters is consistent with the writer's normal style, despite the inverted orientation.

Fig.17.5. The writer attempted to alter his handwriting by writing upside down. Although change of slant is a well-known disguise, this writer used his normal slant.

Another method of disguise is changing the writing instrument. Writers have been known to use a wide-tipped pen to distort their letter forms. They feel the wide strokes will prevent comparison with normal writing. They fail to take into consideration the many characteristics of writing that have not been altered.

Some writers will increase their writing speed and slur their writing in an attempt to conceal their identity. Because an increase in speed reduces the writer's control, this method is not very popular.

A writer is more likely to decrease speed and write with slow deliberate effort. The slow writing is actually drawing. The writer exaggerates strokes, and the writing appears strained and labored. As soon as the writer's attention wanders, he or she reverts to his or her normal style. When the writer realizes the slip, he or she will return to the slow drawn writing and ignore the lapse of the disguise. The writing can be identified from the changes throughout the page as concentration slips and is reestablished.

REASONS FOR DISGUISE

Circumstances surrounding a case might aid the examiner in determining whether there is a possibility of disguise. People disguise their handwriting when they want to deny their writing. Disguise is found in poison pen letters, threatening letters, and ransom notes. Forgers disguise their handwriting when creating fraudulent signatures on checks and credit cards. Suspects disguise their writing when giving request writing samples.

SIGNS OF DISGUISE

When a document examiner suspects disguised writing, he or she should look for the signs of disguise in the writing. The more material the examiner has to work with, the easier the evaluation will be because writers cannot maintain disguise consistently.

The primary sign that a writing sample may be disguised are inconsistencies within the writing. If the writer has changed slant, he or she will revert to normal slant during a lapse of concentration. If the writer has introduced unusual letter forms into the writing, normal forms may be found interspersed with the atypical forms. Changes of size may be evident as well as changes of speed. Therefore, if the writing lacks internal consistency, it probably is disguised.

Poor rhythm can indicate disguise, particularly in other-hand writing. Of course, some writers have a poor sense of rhythm, so poor rhythm does not automatically indicate disguise. However, when poor rhythm is found with inconsistent writing, disguise is likely.

If the writing is erratic followed by smooth rhythmic writing, disguise may be the cause. Occasionally, a writer will begin writing with the unaccustomed hand and change to the dominant one within the same text. At other times, the writer's disguise slips and the writer reverts to his or her normal hand.

Certain documents lend themselves to disguise. Anonymous letters, blackmail attempts, ransom notes, threats, and similar documents mentioned at the beginning of this chapter should be scrutinized for disguise because they are suspect by their very nature.

Request writing that is slowly executed is probably disguised. Attempts should be made to increase the writing speed of a writer giving exemplars to overcome efforts to disguise. The amount of time taken to write a passage should be recorded for the document examiner.

METHODS OF DETECTING DISGUISE

One of the most difficult tasks of the document examiner is differentiating between the normal range of writing and the introduction of disguise in writing.

A German psychiatrist, Dr. George Meyer, determined that the focus of attention in writing is conscious at the beginning of the writing act. Thus attention is given to the beginning of a word, a line, a sentence, or a paragraph. Conscious awareness diminishes as writing progresses. Therefore, document examiners should focus on the endings of words, lines, sentences, and paragraphs. Start the examination at the end of the writing and work backward.

Keep in mind the methods of disguise that a writer is most likely to use. Look for these patterns of disguise when the writer is suspected of altering his or her writing. Look for changes in slant, size, letter forms, and speed

within the writing. Did the writer use a wide-tipped pen? Was the writing done with the unaccustomed hand? Does the writing contain grotesque letter forms? The most prominent sign of disguise is inconsistency in the writing. This is a red flag for writing that may be disguised.

IDENTIFYING THE WRITER

Persons attempting to conceal their identity through disguised writing fail to realize the difficulty of succeeding at such a formidable task. The complex nature of the writing act makes it impossible to change many normal characteristics because they are ingrained as habits. Handwriting is the result of a lifetime of practice and a collection of muscular and nervous habits that cannot be suppressed at will. When enough writing is present, a sufficient number of identifying characteristics will appear in the writing to reveal the identity of the writer.

No one can write a disguised hand of higher quality with respect to fluency, rhythm, and letter design than that which is normal to the writer. This enables the document examiner to narrow the search for possible suspects.

A writer may attempt to feign poor writing skill. He or she may introduce tremor into the writing to divert attention. However, these writers will usually reveal their skill in subtle areas of writing that would be inconsistent with a poor writer. They may include smooth curves within their writing that could not be executed by unskilled writers. Look for changes in skill level within the writing sample.

The easiest characteristic of handwriting to compare is the design of the letters. All writers have an image of letter forms in their minds, and even when attempting disguise they will incorporate some of these designs into their work. Therefore, a comparison of letter forms is appropriate.

Although writers who disguise letters try to change the appearance of their writing, they overlook many of their normal habits. The use of space is one such characteristic. Some writers will duplicate the spacing of a questioned writing without realizing they are doing so. It is a good idea to obtain request writing by dictating the questioned writing without showing the suspect the material. Dictate the writing and allow the suspect to arrange the material on the page to see if it corresponds with the layout of the questioned document.

Although a writer may change the size of his or her writing, the proportions are rarely changed. Look for similar relationships between the uppercase and lowercase letters as well as the middle-zone letters and the extended letters.

Writers tend to use the same spacing in their disguised writing as their normal writing. If the letters have not been squeezed together to distort the appearance, then compare the spacing between letters as well as the spacing between words and lines of writing.

One of the strongest points of identification in handwriting is the alignment of the writing with the baseline. Except in other-hand writing, the baseline generally remains consistent whether it is written on a line or on unlined paper. Does the writing sit above the baseline, sit on the baseline, or go through it? Does the writing rise from the baseline in a consistent pattern? Some writing rises from the baseline and returns, and other writing may rise or fall at the end of the line. Writers do not pay conscious attention to their baseline writing.

Many writers have unusual punctuation habits. Some overuse punctuation marks such as commas. Others misuse punctuation such as placing the period after quotation marks. Punctuation signs are rarely disguised and can easily be compared (.,,:?!).

Paragraph formatting and other grammatical habits may help to identify the writer. Some writers feign illiteracy by misspelling easy words yet correctly spell more difficult ones. Others have problems spelling certain words such as inadvertent and occurred. Some use improper grammatical structures such as, "Watch Kay and I" or "she don't mean it."

Numbers are rarely disguised. The only number that may be disguised is the number 8. Some writers make it with two circles in an attempted disguise. They generally do not make changes in the rest of their numbers. Writers seem to be oblivious to the individual characteristics of numbers.

Writers have a tendency to revert to their normal writing when attempting to disguise. Look for undisguised features that reveal normal writing habits of the writer.

Many of the writer's inconspicuous habits will probably be present in disguised writing. These inconspicuous habits can be strong identifiers. Look at the connecting strokes because they are least likely to be changed. Are there any hooks or ticks on the initial or terminal strokes of writing? How are the i-dots made? Where are they situated in relation to the i-stem? What is the height and width of the t-bars? Where do the circle letters begin and connect? Are they full circles or compressed loops? Do the terminal strokes end above the line? Does the writing contain tapered strokes or blunt beginnings and endings? All these features must be taken into consideration in the comparison of handwriting.

You need sufficient similarities to make a positive identification of the writer. Disguise is an unexplainable difference. Disguised writing is a challenge to the document examiner. He or she must be careful not to attribute a

difference to disguise when it is caused by another writer or to eliminate a writer because the disguise was not recognized.

CASE STUDY: THREATENING LETTER

Background

A judge received a threatening letter demanding charges be dropped against the writer, or the judge would be killed. There were no charges pending against the writer, but he had been arrested in the past. A document examiner was asked to examine the letter and determine the author.

Question

What type of request writing should be taken to identify the writer?

Answer

The questioned material should be dictated to the suspect. He should not be allowed to see the letter, and no words should be spelled for him. Additional writing could consist of similar phrases. Some of the request letters could be used.

Outcome

The document examiner was able to eliminate the suspect as the writer of the threatening letter. The perpetrator turned out to be an ex-girlfriend of the suspect.

Questions

1. What is disguised writing?
2. What is the most common method of disguise?
3. Why does a writer change his or her slant when attempting to disguise?
4. What are block letters?
5. How can other-hand writing be identified?
6. What are some other methods of disguise?
7. Name some signs of disguise.
8. Where should a document examiner begin examination of disguised writing and why?
9. How can the writer of disguised writing be identified?
10. What feature do writers usually not disguise?

Chapter 18

Disguise Versus Simulation

INTRODUCTION

Most document examiners can identify genuine writing without difficulty. Distinguishing between simulated and disguised writing is more difficult because both processes result in writing that is usually close to normal writing with some deviations.

Document examiners must be able to evaluate questioned signatures to determine if they are disguised or simulated. This can be accomplished by distinguishing the characteristics of simulation from the characteristics of disguised writing.

METHODS OF DISGUISE

Most disguise is relatively simple. Writers believe that changing the general appearance of the writing is an effective disguise. However, few people can successfully change their handwriting so that it cannot be identified because writing habits are difficult to suppress.

The most common method of disguise is a change of slant. Other methods include altered letter forms, block letters or script, change of size of the letters, change of speed, use of the unaccustomed hand, and abnormal spacing.

A writer who wants to disguise his or her signature usually makes superficial changes in his or her handwriting. Frequently the only change in a signature is the capital letter. Writers will often change the design of their capital letters and point to that as proof that it is not their signature. The subtle characteristics of writing are still present.

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

Most attempts to disguise handwriting are ineffective. The intense concentration, which is essential for the maintenance of any complicated scheme of disguise, is beyond the capability of the average person.¹

METHODS OF SIMULATION

Simulation is the imitation of someone's signature or handwriting through tracing or freehand. Tracing is easy to recognize by the poor line quality and its close adherence to a model signature. A freehand simulation is more difficult to detect. It is also more difficult to create.

When a writer wants to simulate another's writing, he or she must choose between a more accurate signature written slowly or a faster, smoother signature that deviates from the desired path but looks more natural.

Only a small percentage of forgers are able to create a signature that would pass as genuine when closely inspected. Often a good imitation signature is created by a family member who shares familial writing characteristics with other family members whose writing they are copying.

Regardless of the method used, it is impossible to concentrate on all the characteristics of writing of another's while successfully suppressing one's own writing habits. Any fundamental, unexplainable difference with the known writing will be sufficient to demonstrate the questioned writing is a simulation.

Questioned signatures should be evaluated for signs of disguise as well as signs of forgery. Although some of the signs overlap, there are many differences between disguised writing and simulated writing.

RECOGNIZING DISGUISE

Disguised writing exhibits less fluency than normal writing. The rhythm is disturbed in disguised writing. A German psychiatrist, Dr. George Meyer, determined that the focus of attention in writing is consciously at the beginning. Thus, attention is given to the beginning of a word, line, sentence, or paragraph. Conscious awareness diminishes as writing progresses. Therefore, document examiners should focus on the endings of words, lines, sentences, and paragraphs. Start your examination of the writing at the end of the writing and work backward.

No one can write a disguised hand, which is of higher skill level with respect to fluency, rhythm, and letter design than that which is normal to the writer. A writer may attempt to feign poor writing skill. He or she may intro-

¹Harrison, W. *Suspect Documents*. Nelson-Hall, Chicago, IL, 1958, p. 351.

duce tremor into the writing to divert attention. However, these writers will usually reveal their skill in subtleties that would be inconsistent with a poor writer. Look for changes in skill level within the writing, for example, smooth curves that could not be executed by an unskilled writer.

The writer of disguise will alter the obvious characteristics of his or her handwriting and overlook inconspicuous features. The writer will change the capital letters of his or her signature and ignore the lowercase letters. The writer concentrates on altering the pictorial effect of writing to make it appear different than his or her normal writing.

RECOGNIZING FORGERY

Simulation is less fluid than normal writing and often looks drawn instead of written. The primary signs of forgery are poor line quality, tremor, patching, erasures, blobs of ink, hesitation strokes, pen lifts, and conscious attention to the act of writing. Tremor often accompanies poor line quality. When the writer slowly copies another's handwriting, corrugations develop in the writing. These fine, to-and-fro movements are subtle and can be seen clearly when the writing is viewed through a microscope. Some tremor may be visible without a microscope.

No one can write better than oneself. If the questioned material is of a higher skill level than the writer could write, it is not genuine. This is especially true of the elderly or infirm, whose writing is erratic. Generally, people attempting to copy the writing of the elderly or infirm will introduce deliberate tremor into the writing but will make intricate designs and smooth sections of writing that are not consistent with the rest of the writing. An improvement in line quality is an indication of simulation.

Simulations will frequently bear a strong resemblance to the signature used as a model. Because no one can exactly duplicate one's own signature, a penned signature that matches another is not genuine.

Consider the focus needed in simulation. The writer is attempting to put aside his or her own characteristics while copying someone else's. Writing is such an ingrained habit that it is difficult for one to set aside one's own writing habits and imitate another's.

Because a writer's focus of attention wanes as he or she moves the pen across the paper, the writing returns to the normal writing of the writer. Look for changes in characteristics of writing toward the end of the word, line, or passage.

The writer who is simulating will concentrate on the obvious features and overlook the inconspicuous characteristics. Forgers cannot concentrate on copying all of the habits of another writer.

TYPES OF DISGUISE

Most disguise is superficial, ineffective, and limited to altering one or two features of the handwriting. Change of slant is the most common method of disguise because it dramatically changes the pictorial effect of the writing.

Writers resort to other-hand writing because it also changes the appearance of their writing. Opposite-hand writing usually contains tremor and abrupt changes in direction.

Sometimes handwriting features are mirror images of features in normal writing. Many writers feel that alternate letter forms will hide their identity. For example, they will print if they generally use cursive or introduce grotesque or exaggerated features into the handwriting.

TYPES OF FREEHAND SIMULATION

Few people are capable of copying another's handwriting so that it cannot be detected as coming from a different writer. Most forgers concentrate on the pictorial effect of the writing they are copying and overlook the habits of the writer. They will pick obvious peculiarities of the writer they imitate and miss the subtle details.

Although forgers attempt to copy handwriting, they will frequently use a different method of construction. The method of construction includes the direction of the writing, the sequence of strokes, or the touching up of letter forms.

Some characteristics of writing are the same for disguise and simulation; rhythm may be disturbed in both. Writing may be slower and inconsistencies are more likely. However, there are more differences between disguise and simulation than similarities (*see* Table 18).

Most writers are not aware of their subtle characteristics and are therefore unable to suppress them. Most writers who are attempting to disguise can only concentrate on one or two changes at a time. There are a few writers who can concentrate on three or four changes in their writing habits, but no one can concentrate on all of the characteristics of writing. Most writers feel that a slight change will be sufficient to avoid detection.

Simulation is more difficult than disguise because simulators must concentrate on imitating someone's handwriting while suppressing their own characteristics.

Some characteristics are easier to change than others. These include slant, speed of the writing, letter forms, size of the writing, and spacing because writers are more aware of these characteristics. Some characteristics are overlooked by writers. These include the method of construction of letters and

Table 18.1
Characteristics of Disguise and Simulation

Disguise	Simulation
1. Moderate writing speed.	1. Slowly written material.
2. Deviation from model.	2. Attempt to imitate model.
3. Capital letters changed.	3. Capital letters close to model.
4. Subtle characteristics present.	4. Subtle characteristics missing.
5. Correct master pattern.	5. Incorrect master pattern.
6. Inconsistent.	6. Lack of natural variation in writing features.
7. Adheres more closely to known	7. Adheres more closely to rules of penmanship.
8. Correct method of construction.	8. Incorrect method of construction.
9. Moderate rhythm.	9. Poor rhythm.
10. No pen lifts or blobs of ink.	10. Pen lifts and blobs of ink.
11. No patching.	11. Patching.
12. More natural writing.	12. Conscious attention to the act of writing.
13. Change of slant.	13. Similar slant.
14. Different size.	14. Same size.
15. Proportions the same.	15. Proportions different.
16. Some unusual letter forms.	16. Similar letter forms.
17. Arrangement similar.	17. Different arrangement.
18. Utilization of space similar.	18. Different utilization of space.
19. Baseline similar.	19. Different baseline.
20. Pressure patterns the same.	20. Even pressure indicative of drawing.
21. Pictorial effect different.	21. Attempt to imitate pictorial effect.
22. Spacing similar.	22. Spacing more variable.
23. Similar line quality.	23. Poor line quality.
24. Similar margins.	24. Different margins.
25. Similar pressure patterns.	25. Different pressure patterns.

words, baseline alignment, and the use of space. The subconscious characteristics that are not altered are pressure patterns, proportions, involuntary hooks and ticks, and pattern formations.

OBSERVATIONS

Compare any natural writing that can be found among disguised or simulated samples. It is impossible to concentrate on extended passages of writing when attempting to disguise or simulate. The writer's own habits will come through.

Keep in mind the key differences between disguise and simulation. It may not always be possible to distinguish disguise from simulation, but if these guidelines are followed, the difference can be discerned.

CASE STUDY: DISGUISED SIGNATURE

Background

Document examiners must be able to distinguish between disguise and simulation. A man deliberately disguised his signature on a contract hoping that it would not be executed. One document examiner said the signature was genuine and another said it was not genuine. Four eye witnesses (two were notaries) witnessed the signature.

Question

What does a document examiner look for when confronted with a signature that is being denied by a writer?

Answer

Always look for signs of disguise and inconsistencies. Document examiners need to take into consideration that any signature that is denied could be disguised.

Outcome

The trier-of-fact determined that the signature was genuine.

Questions

1. What type of handwriting is the easiest to identify?
2. What is disguised writing?
3. What is simulated writing?
4. How can disguised writing be recognized?
5. How can simulated writing be identified?
6. What characteristics of writing are the same for both disguised and simulated writing?
7. What are some of the characteristics of disguise?
8. What are some of the characteristics of simulation?
9. Which is more difficult, simulation or disguise?
10. What characteristics are easy to disguise?

Chapter 19

Check and Credit Card Fraud

INTRODUCTION

More than \$600 million are lost annually from forged and fraudulent checks in the United States. Banks are liable for only 15% of all falsified checks; 85% are cashed by businesses. Consumers pay \$500 more per year for goods and services to cover the cost of counterfeit cash and forged checks. The most common type of check fraud is forgery.

The US government issues more than 600 million checks each year, attracting criminals who specialize in stealing and forging them. Thousands of dollars are lost annually by firms and banks that cash stolen and forged government checks.

To pass a forged check, the criminal must obtain blank checks on which to forge, or checks meant for another person to which the criminal adds the endorsement. Forgers also steal checks and fill out all the information plus the endorsement. Forgers can purchase safety paper from a stationery store to create counterfeit checks. Stolen checkbooks provide blank checks. Mail order check companies make it possible for forgers to have fraudulent checks printed in anyone's name. Although these companies try to screen buyers by requiring a check reorder form or a voided check, clever forgers are able to bypass the screening. Check kit software enables anyone to print their own checks on their computer. Counterfeiters print the necessary information using easily recognized names of reputable companies on checks because most people readily accept checks from firms with names they recognize.

Many professional forgers use modern equipment to make the check look more genuine, such as a rubber stamp that says "Certified." Forgers use checkwriters, protectographs, typewriters, rubber stamps, date stamps, and

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By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

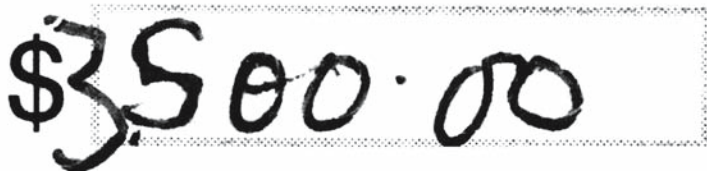
A close-up photograph of a check's amount field. The amount is handwritten in black ink as "\$3,500.00". The number '3' is written in a large, bold, slightly slanted font. A comma is placed after the '3'. The rest of the amount, '500.00', is written in a more standard cursive style. The entire amount is enclosed in a dotted rectangular border.

Fig. 19.1. Check with an amount that was changed from \$500.00 to \$3500.00 by inserting the number 3 and a comma. The written amount was also changed.

printing equipment. With the advent of modern computer systems using scanners and laser printers, anyone can forge checks that appear to be genuine.

People who present forged or fictitious checks to be cashed use forged identifications. Often identification has been stolen and altered. Genuine credentials can be altered and names substituted. Ink eradicator may be used to make alterations. When the card is held up to the light, the blemish made by the ink eradicator is plainly visible.

Chemically treated checks that are self-destructing have shown up in some transactions. A dilute solution of sulfuric acid causes paper to disintegrate.

A marking pen with a special disappearing ink formula is being used to write checks. The purple ink disappears in about 48 hours leaving a blank check. The ink can be made visible with a dilute solution of caustic acid. The check should be photographed as soon as the writing appears because it disappears when the check dries.

ALTERATIONS

Stolen checks are altered to change the name or raise the amount of the check (Fig. 19.1). Changes on checks may be evident under microscopic examination. Ultraviolet light may help detect alterations and additions to checks.

Handwritten as well as typed numbers are easily altered to raise the amount of a check. In written amounts 4, 6, 7, 8, and 9 can be changed to 40, 60, 70, 80, and 90. A number can be added at the beginning of digits to raise the amount to the hundreds. Checks have been cashed when a caret (^) was used to insert the word "hundred" placed above the written amount.

The digits 1, 2, 3, 6, 7, and 0 are most easily changed to higher numbers. The number 1 can become 4, 7, or 9. The number 2 can be changed to 3, and 3 and 6 changed to 8.

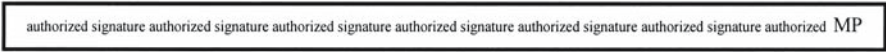


Fig. 19.2. An example of the enlargement of micro print used as a safety feature on the signature line of checks. Micro print cannot be copied. It breaks up into small clumps. This safety feature is used to distinguish between originals and copies of checks.

Examine checks to detect a raised amount (Fig. 19.1). Do the numbers look crowded? Is the spelling crowded or corrected? Look for different color ink on the amount of the check.

CHECK SAFETY PAPER

Check safety paper has been in use for more than 50 years to protect against erasures. The most common and clumsy form of erasure is by abrasion with an eraser or a knife. Erasing disturbs the continuous design of the paper on the check, making it difficult to avoid affecting the background color or design. Ink placed over an erasure will spread into the paper, appearing fuzzy or feathered.

Some of the newer checks contain fugitive ink, which appears when the check is photocopied. The ink marks the check “VOID.” This is done to prevent a thief from duplicating checks on color copiers and cashing them.

Chemicals used to eradicate the ink leave a residue on the paper that is easily detected under close scrutiny. When chemical eradicator is applied to safety paper, it leaves a blank area within the design pattern.

Some safety paper contains invisible fluorescent designs that help to thwart counterfeiting of duplicate checks. Ultraviolet light is needed to detect the identifying features. Watermarks are also used to prevent counterfeiting. Watermarks are usually created during the manufacturing of paper making it impossible for a counterfeiter to duplicate.

OTHER SAFETY FEATURES

Because of the ease of duplicating checks on color copiers, bank stationery companies are offering their customers other features to protect their checks from being reproduced. Micro printing is one such method (Fig. 19.2). Checks contain signature lines that say “Authorized Signature” in very small print that can only be read under magnification. The line disintegrates when it

is copied or scanned. Micro printing is also being used on other valuable documents such as stocks, bonds, and other negotiable instruments. A micro printed check can be identified by the MP at the end of the signature line.

Additional safety features include security bands listing the special features on the check. If any of the features are missing as a result of copying, the warning band alerts the check-casher.

METHODS OF PASSING FORGERIES

Forgers count on the fact that the average person merely glances at a check presented for payment or cash. Forgers depend on the person accepting a check to give their identification only a cursory examination.

INDICATORS OF FRAUDULENT CHECKS

Counterfeit or fictitious checks cannot always be easily identified. However, there are indications of counterfeiting that can alert you to the fraudulent nature of the check.

Stamps made by forgers from individual letters will have a poor alignment because of the limitations of the hand-setting process with rubber letters. Look for misalignment in "Cashier's Check" or "Payroll Check."

Place the check under a strong light to spot blemishes caused by ink eradicator. A blemish on any check is an indication of spuriousness.

Magnetic ink has a dull finish. If the magnetic strip contains a shiny surface, the check may be fraudulent. Hold the check up to the light. Magnetic ink is opaque. If you can see through the ink, the check is probably not genuine.

Crease the check. If the ink peels off when creased, it may be a colored copy of an original check. Look at the back of the check to see if the watermark shows through. Safety paper is usually printed on both sides of the paper.

If the check does not have perforations on one side, it may be counterfeit. All checks except government checks contain perforations on at least one side. Most counterfeiters do not go to the trouble of simulating perforations.

Compare the handwriting of the signature of the payee with that of the endorser. Does the handwriting appear to be the same? Are there any indications that the same person wrote both names?

CHECK NUMBERING SYSTEM

Banks send their checks to an assigned Federal Reserve Bank for clearance. If the wrong routing number is placed on a check, payment will be

Table 19.1
City Prefixes

1. New York, NY	26. Memphis, TN
2. Chicago, IL	27. Omaha, NB
3. Philadelphia, PA	28. Spokane, WA
4. St. Louis, MO	29. Albany, NY
5. Boston, MA	30. San Antonio, TX
6. Cleveland, OH	31. Salt Lake City, UT
7. Baltimore, MD	32. Dallas, TX
8. Pittsburgh, PA	33. Des Moines, IA
9. Detroit, MI	34. Tacoma, WA
10. Buffalo, NY	35. Houston, TX
11. San Francisco, CA	36. St. Joseph, MO
12. Milwaukee, WI	37. Ft. Worth, TX
13. Cincinnati, OH	38. Savannah, GA
14. New Orleans, LA	39. Oklahoma City, OK
15. Washington, DC	40. Wichita, KS
16. Los Angeles, CA	41. Sioux City, IA
17. Minneapolis, MN	42. Pueblo, CO
18. Kansas City, MO	43. Lincoln, NE
19. Seattle, WA	44. Topeka, KS
20. Indianapolis, IN	45. Dubuque, IA
21. Louisville, KY	46. Galveston, TX
22. St Paul, MN	47. Cedar Rapids, IA
23. Denver, CO	48. Waco, TX
24. Portland, OR	49. Muskogee, OK
25. Columbus, OH	

delayed until the check is routed to the proper clearinghouse. The routing number is the magnetic number across the bottom of the check that directs it to the proper Federal District. Forgers deliberately reroute checks to delay discovery. By understanding the numbering system used by the banks, document examiners can spot a fictitious check that has the wrong routing number.

The American Bankers Association developed a system for numbering all the banks in the United States. They started by numbering large cities from 1 to 49. New York is number 1, Chicago number 2, San Francisco number 11, and Los Angeles number 16. The complete list of cities is included in Table 19.1.

Areas outside large cities have a state number between 50 and 99 (*see* Table 19.2). New York is number 50. The state number for California is 90 and any bank outside of a large city in California will contain the number 90.

Table 19.2
State Codes

50. NY	60. PA	70. IL	80. MO	90. CA
51. CT	61. AL	71. IN	81. AR	91. AZ
52. ME	62. DE	72. IA	82. CO	92. ID
53. MA	63. FL	73. KY	83. KS	93. MT
54. NH	64. GA	74. MI	84. LA	94. NV
55. NJ	65. MD	75. MN	85. MS	95. M
56. OH	66. NC	76. NE	86. OK	96. OR
57. RI	67. SC	77. ND	87. TN	97. UT
58. VT	68. VA	78. SD	88. TX	98. WA
59. AK, HI	69. WV	79. WI	89.	99. WY

Locate the number for your area. Also become acquainted with the bank numbers in your area.

Savings and loans and some credit unions use the Plus 20 Rule for their bank routing numbers. The first 2 digits, which determine the Federal Reserve District that issued the check, will be 20 digits higher than that on a check issued from a bank.

The magnetic ink numbers at the bottom of checks enable high-speed electronic machines to sort and process checks. The first two numbers reveal the Federal Reserve District. These numbers are repeated in a different format at the top left of the checks. The third number indicates the specific bank in the Federal Reserve District that handles the exchange. Next comes the bank number beginning with the city or state. The final number of the series is a control number.

Most people are familiar with the sequential check number in the upper right-hand corner of the check. The corresponding number can be easily spotted at the bottom of the check. The next set of numbers is the individual bank account number. When the bank processes the check, the amount of the check is added to the magnetic strip in the lower right-hand corner of the check.

If the magnetic strip cannot be read, the bank will add a new magnetic strip across the bottom of the check. Thus, forgers who do not use magnetic ink will have their information put on the check by the bank.

The first two numbers on the routing line identify the Federal Reserve Bank. The third number identifies the branch of the Federal Reserve and the next number is the account number (Fig. 19.3).

The country is divided into 12 Federal Districts (*see* Table 19.3).



Fig. 19.3. The interpretation of the various check numbers found on checks.

Table 19.3
Federal Reserve Districts

Number	Bank location	States
01	Boston	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
02	New York	Connecticut, New Jersey, New York
03	Philadelphia	Delaware, New Jersey, Pennsylvania
04	Cleveland	Kentucky, Ohio, Pennsylvania, West Virginia
05	Richmond	Maryland, North Carolina, South Carolina, Virginia, West Virginia, Washington, DC
06	Atlanta	Alabama, Florida, Georgia, Louisiana, Mississippi, Tennessee
07	Chicago	Illinois, Indiana, Iowa, Michigan, Wisconsin
08	St. Louis	Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri, Tennessee
09	Minneapolis	Michigan, Minnesota, Montana, North Dakota, South Dakota, Wisconsin
10	Kansas City	Colorado, Iowa, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, Wyoming
11	Dallas	Arizona, Louisiana, New Mexico, Oklahoma, Texas
12	San Francisco	Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Utah, Washington

Some states are listed more than once because the banks in those states are assigned different Federal Reserve Districts.

CHECK PROTECTORS

Check writers, also called check protectors, were designed to prevent anyone from manipulating or raising the value of a check. These machines were designed to imprint the amount of the check in the paper in such a way that a check could not be erased or altered. The machine drives inked type-faces into the paper simultaneously perforating or embossing the paper. Indelible ink penetrates the paper making it impossible to remove the impression.

The first check protectors were produced circa 1870, but check protectors did not become popular until after the turn of the century. The Federal Government uses check protectors on its treasury checks, savings bonds, and related documents. Businesses and individuals also use check protectors. Professional check forgers employ check protectors to make their fraudulent checks look more official.

Each company that manufactures check writers has incorporated features into their machines that enable the document examiner to identify the manufacturer. Individual check protectors, like typewriters, can often be identified by any idiosyncrasies they develop.

In addition to the amount of the check, check protectors contain an oscillating prefix such as "THE SUM OF," "EXACTLY," "BONDED," or "REGISTERED" prior to imprinting the amount in figures. The words "DOLLAR OR DOLS, AND" and "CTS" for cents are found with the amounts. A few models spell the amount. Some will say, "NOT OVER \$50.00," or a similar number.

Check writers are manual or electric. They consist of an operating arm, a platen, a payee perforator, and the oscillating prefix. The operating arm contains the typeface. Numbers can be moved into position for units, tens, hundreds, and thousands. The platen presses the paper against the typeface. The payee perforator is usually optional. It enables the operator to perforate or emboss the payee line. The oscillating prefix is placed against the first number of the amount.

Check protectors contain an ink supply or a ribbon and many use multi-colored ink. Over-inking or defects in the inking generally occur in the areas of the words, "dollars," "and," and "cents." The ink may cake or clog the letters.

Check protectors can be examined for the same type of defects found on typewriters. Numbers may become vertically misaligned. Numbers or letters may become askew. Perforations may be blunted and fail to penetrate the paper.

The date a check protector was first manufactured may help identify the age of a document. Because manufacturers make changes in their models, the

earliest date a model is available may assist in pinpointing the earliest a document could have been created.

Checks impressed with check protectors can be altered. Amounts have been raised by enterprising individuals who hand-cut and marked checks to increase their amounts. These changes can be discovered by using magnification to study the check.

The document examiner should obtain standards from check protectors for comparison. Document examiners must be careful to identify class characteristics of check protectors versus individual characteristics.

CREDIT CARD FRAUD

A credit card is an unsecured loan. Credit card companies lose billions of dollars a year through credit card fraud and abuse. There are six types of credit card fraud.

1. Use of lost cards by unauthorized individuals.
2. Use of stolen cards by unauthorized individuals.
3. Altering a credit card.
4. Counterfeiting of credit cards.
5. Fraudulent applications for credit cards.
6. Fraudulent use of someone's credit card number.

CREDIT CARD ABUSE

Credit card abuse is the furnishing of false information by the applicant for the purpose of evading payment of debt. This is accomplished by using any of the types of credit card fraud listed above. Credit card numbers are stolen from vendors, unsecured emails, and carbon copies of transactions.

STOPPING CREDIT CARD ABUSE

Some credit card thefts have been eliminated by better handling procedures. Credit card companies used to mail their cards to prospects, hoping the prospect would use the card. Now cards are only sent to prospects who agree to accept the card. Credit cards are not forwarded by the post office if a customer moves. The cards are returned to the credit card company, and new cards issued with the correct address.

Credit cards are being designed with holograms and other modern technology to thwart would-be counterfeiters. The designs make it difficult to alter or copy the credit card. Carbons are being destroyed when purchases are made so that would-be thieves cannot get valid credit card numbers from carbons.

Stores accepting credit cards have a direct phone line to the credit card company that gives them instant approval for the transaction at the time of purchase. The money is transferred into the vendor's account immediately. This assists in detecting altered and counterfeit cards.

To fraudulently file for a credit card, the would-be culprit needs information about a person who has a good credit history. Once this information is obtained, he or she needs an application. Sometimes applications and information are stolen from mailboxes. People with a good credit history receive several offers a month for credit cards. After the thief files the application, he or she checks the mailbox for the credit card. Unsuspecting victims do not know that someone is impersonating them until a bad report shows up in their credit history or they receive a bill from the credit card company.

Lost or stolen cards are used quickly and discarded. Sometimes the numbers are altered. Credit cards are soaked in warm water so that the embossing can be flattened and new embossing added to alter the card.

Credit card companies have added safety features to prevent counterfeiting but despite this, some criminals will still attempt to do so. Generally, a close examination of a fraudulent credit card will show many errors when compared with a genuine card.

Fraudulent applications for credit cards are filed by organized gangs, criminals, and family members such as an ex-spouse.

Document examiners may be asked to determine the author of fraudulent applications or receipts used by an unauthorized person. Receipts are generally small and difficult to read. Photocopies of carbon copies presented to document examiners for identification usually do not reveal much information because they are difficult to decipher.

The Secret Service handles credit card fraud. Occasionally private examiners are asked to examine credit card fraud cases for a credit card company or a suspect who has been accused of fraud.

Credit card fraud and abuse cost millions of dollars each year. The companies pass these losses on to the cardholders through higher interest rates.

FEDERAL BUREAU OF INVESTIGATION RESOURCES

The Document Section of the Federal Bureau of Investigation (FBI) maintains files to assist in identifying check fraud.

1. Prochek File. Prochek is a computerized file of professional check passers, containing information on their description, habits, and methods of operation.
2. National Fraudulent Check File. This file contains approximately 100,000 specimens of fraudulent checks submitted by police agencies.

3. FBI Standard Files include:

- a. Checkwriter Standards File. This file contains sample impressions of different styles of check protectors manufactured by various companies. Checkwriter impressions on fraudulent checks can be compared with this file to identify the type of check protector used.
- b. Safety Paper Standards File. This collection of samples of safety paper used for check forms can assist in identifying the type of paper used to create counterfeit checks.
- c. Ink Standards Collection. This collection contains samples of inks from various manufacturers to enable the FBI to match similar ink on forged or fraudulent checks. This is especially useful because ink manufacturers started putting traces in their ink so that the ink is more easily identified and can be dated according to the time it was manufactured.
- d. Rubber Stamp and Printing Standards File. A collection of catalogs and samples of products made by rubber stamp and printing type manufacturers for comparison with checks bearing rubber stamp or printing type impressions are found in this file.
- e. Typewriter Standards File. Samples of styles of type used on typewriters are found in this file. This file includes not only typewriter styles manufactured in the United States, but also those of foreign manufacturers.
- f. Watermark File. This file consists of photographs and brand names of watermarks as well as directories of paper manufacturers, enabling the FBI to identify the origin of paper containing a watermark.

CASE STUDY: PAYROLL CHECKS

Background

A business was unable to reconcile their payroll account. Several checks of unusual amounts of money were debited from the account. The bookkeeper had not issued the checks, and the copies of the checks in question were not in the statement. The checks were taken from the back of the business' checkbook, and the returned checks were removed from the statement after it arrived in the office.

Question

How can the business find out what these transactions were?

ANSWER

Contact the bank and ask for a copy of the missing checks. The bank makes microfiche copies of all checks.

Outcome

The unauthorized checks were made payable to one of the employees. She had stolen the checks and forged the authorized name on the checks. She cashed these payroll checks using her identification, and when the checks were returned with the statement, she had removed them. She was terminated but never prosecuted even though she admitted taking the checks.

Questions

1. What must a forger have in order to pass a forged check?
2. What type of identification is used to pass forged checks?
3. How are checks altered?
4. What are some of the safety features of safety paper?
5. What is microprint and how is it used to prevent forgery?
6. What are some of the indications of forged or counterfeit checks?
7. What do the magnetic numbers on the bottom of checks tell us?
8. Name the six types of credit card fraud.
9. What is credit card abuse?
10. What department in the federal government handles credit card fraud?

Chapter 20

Paper

INTRODUCTION

Humans have searched for suitable writing material since the start of communicating through the written word. Many substances were used as writing surfaces, including rocks, clay, and similar substances found in nature. The Egyptians used papyrus as a writing surface. To make papyrus, they mashed reeds together into a flat sheet of pulp and dried them. They mixed soot with water as ink and sharpened a reed into a pen to write on the papyrus.

Vellum was created as a writing surface from the skin of calves. It came into use in the second century bc and was the precursor of parchment that is made from the skins of goats and lambs.

In the first century, the Chinese began making paper from the inner bark of bamboo and hemp. The Arabs learned to make paper when they conquered the Chinese in 751. Eleven hundred years later Europeans began making paper, using cotton and linen as the base. William Rittenhouse of Roxborough, PA founded the first paper plant in America in 1690. Today most paper is made from wood pulp and may contain some cotton. Higher quality paper uses cotton rag.

Papermaking has become a scientific process that employs highly sophisticated equipment in the manufacture of thousands of varieties of paper. The process begins by chipping pulpwood into small pieces that are then mixed with chemicals and fed into pressure vessels called digesters to soften the lignin, which binds the fibers together. In this cooking process, the cellulose fibers are separated. They proceed through several stages of washing, screening, cleaning, and, if necessary, bleaching to the desired brightness. Next, the

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fibers are combined with pigments, dyes, and sizing. This mixture is more than 99% water and less than 1% fiber and other solids. It flows onto a moving screen called a Fourdrinier, on which the fibers mat, forming a continuous sheet of paper with much of the water drawn through the screen into collection tanks to be recycled.

The web of pulp passes through heavy rollers, which press moisture from the sheet. This sheet proceeds over steam-heated cylinders to complete the drying stage through the evaporation of the water. Frequently, a starch application or pigmented coating is applied by a size press or coater. The paper then passes through a series of calendar stacks (iron rollers stacked together) that smooth the paper. The paper is rewound into smaller rolls or converted into sheets ready for shipment.

During the pressing process the paper passes over a dandy roll, which imprints the watermark on the paper. The watermark is actually a thinner area of the paper. The dandy roll contains the design of the watermark in a metal form, which pushes the paper fibers aside, leaving an imprint in the paper. Most sheets of paper contain a single watermark, but some paper, such as safety paper, may contain multiple designs. The dandy roll also makes the imprint for woven or laid papers, particularly rag bonds. Laid paper has a grid pattern impressed in the paper.

In addition to indented watermarks, some watermarks are chemically placed on paper. Others are embossed, creating a three-dimensional impression on the paper.

Many different types of paper are manufactured for a variety of uses. Papers are treated to obtain characteristics to meet various needs. Paper comes in a variety of styles, colors, weights, and finishes. It is identified by many of its qualities.

PAPER FOR PRINTING OR WRITING

Newsprint is the least expensive paper manufactured. It is composed mostly of ground wood, causing it to discolor easily. Its principal asset is opacity, a result of the impurities of the wood. Covering the paper with printing helps hide the impurities.

The next line of printing paper is offset, an uncoated paper that usually contains fillers and additives. It is bleached and sized to resist water. Cost is slightly more than double the cost of newsprint. It is used for the publication of books as well as catalog sheets, loose-leaf inserts, and tablet paper.

Bond paper is so named because it was originally used to print stocks and bonds. It is popular in the modern business office. Rag bonds, made from cotton, are commonly used for business stationary and come in a variety of

colors. The finish can be smooth, laid, or cockle. The higher the rag content, the more expensive the paper. Law firms frequently use high-quality bond paper.

Lightweight, uncoated papers include onionskin, which comes in smooth or cockle finishes, and snap-out forms, which are frequently made with manifold papers made from wood fibers. Another classification in lightweight paper is "bible" paper.

Specialty papers include carbonless paper, which is coated on both sides to transfer data from one page to another. Both sheets contain special finishes that must come in contact with each other to transfer the writing or typing to the subsequent page.

Gummed papers are used primarily for labels and come with a variety of features. The major desire in gummed papers is their curl-proof feature.

Text papers are the most expensive, uncoated papers because of their superior grade. They are used for promotion pieces and come in a wide variety of colors and finishes. Cover stocks are used for announcements, invitations, and greeting cards. They come in antique, vellum, or smooth finishes. Deckle edges are found in this category.

Coated paper, used primarily in publications, is the next level of paper. The better grades of coated paper go through several layers of coating. Some papers are dull-coated to cut down the glare. Many textbooks use dull-coated paper. Some coated papers are coated only on one side.

Bristol is used to make index cards and tag paper. Tag paper is used for file folders. Strength is the most important feature of tag paper.

OTHER TYPES OF PAPER

Kraft paper is a coarse, unbleached, heavy paper also noted for strength. It is used for paper bags, package wrapping, and corrugated boxes.

The proliferation of plastic has brought about a new kind of paper strengthened with plastic filaments, known as Tyvek. This paper is noted for its strength and inability to tear. It is principally used in the manufacture of large mailing envelopes. It repels most ink, thus gummed labels must be used with the envelopes.

SAFETY PAPER

Safety paper, used principally for checks, is designed to reveal alterations. Originally, checks were used exclusively by banks and large businesses to exchange funds. After 1850, clearinghouses were established making the circulation of checks easier and more widespread. However, it was not

until the 1940s that banks began wooing private customers and developing personal checking accounts.

In 1955, the American Bankers Association encouraged a common language for automatic systems. Today, banks use magnetic character coding throughout the industry, and checks are sorted by high-speed machines.

The banks must balance safety and service against expense and convenience. Although safety paper prevents alterations such as raising the amount of the check, it is easily available to anyone, making it easier to counterfeit and pass fraudulent checks.

How does safety paper reveal alterations? There are several methods. Papers are printed with fugitive inks in backgrounds and designs. Fugitive inks, also known as invisible inks, develop a strong color when treated with ink eradicator. Most popular among the designs is the word VOID that appears when ink eradication solutions are applied to the safety paper. VOID also appears on modern safety paper when it is photocopied. Ink eradicator bleaches the design and leaves a blank spot on checks.

Invisible fluorescent designs are a popular security feature. Their biggest disadvantage is the necessity of a fluorescent light to reveal their presence on a document.

Although safety paper prevents the alteration of checks, it does not stop the flow of counterfeit checks on fictitious accounts or forged endorsements on stolen checks.

With the proliferation of modern day computer equipment, quality printing is now available to everyone. Computers enable anyone to create excellent counterfeit documents that cannot be easily detected.

PAPER MONEY

Although counterfeit money is within the purview of the Secret Service, document examiners should have some basic knowledge about our currency. Modern day color copiers make it possible to duplicate a bill that is an accurate depiction of our currency, although the paper will be different. As a result, the government is using many new security features such as a special nylon thread that cannot be copied on photocopiers. Magnetic ink is used to imprint the information.

PROPERTIES OF PAPER

Paper contains many properties that are important considerations when determining how the paper will be used. Generally, the first property considered is weight. Paper is weighed by the ream. Letterhead stationery is usually 25 pounds per ream.

Paper is categorized by its strength. Strength is measured as tensile strength and as tear strength. Tensile strength is the amount of force parallel to the plane of the specimen required to produce failure. It is used to determine the durability of paper. Tear strength refers to the internal tearing resistance. Bursting tests are also used to measure paper strength, as are puncture tests.

Corrugated paper is used when tensile strength becomes an important factor. Cardboard boxes are made of paper that has corrugation on one side or are sandwiched between two sheets of heavy Kraft paper.

Durability of paper is an important attribute of paper. On the one extreme is newspaper, which has short durability, and at the opposite end are high-quality papers designed to last a very long time. Durability is used to ascertain the wear-ability of books, book covers, and edges. Some paper is acid resistant, which adds to the life of the paper.

The thickness of paper varies considerably and is a notable characteristic of paper. Document examiners measure the thickness of paper with calipers to determine if a substitution has been made in a set of papers.

The finish on paper is a significant property. Finishes include coated or uncoated, dull or shiny, smooth or rough, or glare proof. Paper may be treated to prevent bacterial contamination or fungus. Finishes are added for brightness and opacity.

Water absorbability is important for blotting paper and paper towels. Water resistance and water repellency are additional features of paper that can be tested. Ink absorption is an important consideration because various papers have different absorption rates that can affect the appearance of the writing line. Paper may be tested for its wet strength.

Paper may be stiff or limp, porous or impermeable, and/or soil resistant. Document examiners need to know what additives have been added in the manufacturing process, what brighteners, and how flammable it is. All these properties of paper are taken into consideration during the manufacturing process to fill various needs. And these same properties aid in the identification of paper when questions are raised about the paper in a document case.

PAPER TESTING

Paper can be tested for any of its properties. There are several laboratories that routinely test paper for brightness, creasing quality, tear resistance, gas permeability, density, curling tendencies, folding endurance, moisture content, porosity, ink permeability, sizing, softness, spot stain, static properties, and water vapor permeability.

Content can be identified including the amount of ground wood and additives. Fiber analysis is available. Heat testing is used to determine the relative

stability of paper. The warp (grain) and weave (machine direction) can be determined.

Who does the paper testing, and how is it done? The Paper Institute now located at Georgia Tech in Atlanta, GA, conducts all kinds of tests, as does the United States Testing Company in Hoboken, NJ. There are other labs as well.

What type of equipment is used by the testing companies? The scanning electron microscope integrated with energy dispersive X-ray spectrometric detectors is on the top of the list. Transmission electron microscopes, electron probe microanalyzers, the electron spectrometer, and the X-ray photoelectron spectrometer, as well as X-ray units and infrared spectrometers are used by laboratories in the analysis of paper and other materials.

WATERMARKS

Paper manufacturers use distinctive designs as their watermarks. Watermarks are a form of identification, as shown in Fig. 20.1. Not only do they identify the manufacturer, but the manufacturer can inform its consumers when a particular watermark was first used. The watermark is coded generally by placing a line under a letter of a word. This code is changed frequently. Thus a document dated prior to the manufacture of the paper is obviously misdated.

OBTAINING INFORMATION

Information about paper and its watermarks is listed in Lockwood-Post's *Directory of the Pulp, Paper, and Allied Trades*. Public libraries have a copy of it in their reference section. Lockwood-Post's directory contains information about the companies that manufacture paper, the industries that supply the paper companies with materials, and the companies that use the paper after it is manufactured.

To find out what company produces a particular watermark brand of paper, look in Lockwood-Post's directory for a list of all the watermarks currently manufactured. If you need to know when a watermark was first introduced by a company, call the company or contact Spencer Dandyroll Factory in Holyoke, MA. Lockwood-Post's directory is published annually, but you do not need to update each time a new directory is published.

PAPER PROBLEMS

What types of questions are document examiners asked to determine about paper? The date is important on many documents, and the examiner may have to determine if the date is accurate. Identifying the age of the paper will be

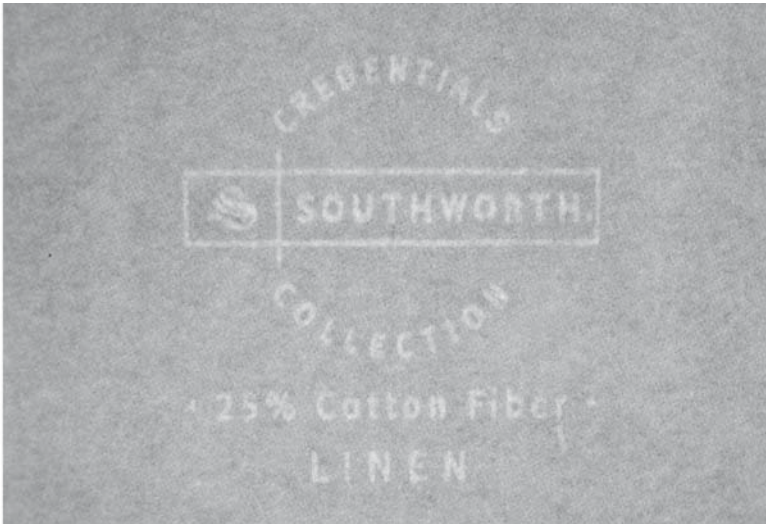


Fig. 20.1. Watermark found on high-quality bond paper. The watermark identifies the manufacturer and can be used to date the paper.

helpful in these types of cases. You can contact the paper manufacturer or the dandy roll factory to find out when a watermark was first used. Sometimes the composition of the paper tells its age. Additives found on the paper may not have existed on the date written on the paper. *The Hitler Diaries* contained whiteners and plastic filaments in the labels that were not in existence during Hitler's lifetime.

You may be asked to compare two sheets of paper to see if they are similar. Has a substitution of a page been made in a set of papers such as a will or a contract? Sequence of writing may be questioned. Was the writing or typing done at one sitting or was evidence manufactured after the fact to support a theory or claim?

A case was brought against a service station owner based on reviews that were supposed to have taken place over a period of 1 year. The papers presented to support this claim were torn from two pads of paper. The ragged tops where the papers were torn from the pads matched and they were sequential. The writing on the first page was indented onto the second page and some of the ink bled through. Although this was not conclusive, the likelihood of using sequential pages 2 months apart is slim, especially when there were two more pages with the same sequence. None of the pages were soiled when originally

examined. If they had been in and out of a folder for a year, then there should have been some damage from handling. By the time the case went into deposition the papers were soiled and dirty.

You may be faced with the same type of case and asked to make the same analysis. In the case above, an analysis of the handwriting was done to determine if it had all been written at the same or different times. The opinion was given that the writing had not been done over a period of a year as purported but had all been written at one time.

OTHER WRITING SURFACES

What are some other writing surfaces you may be asked to examine? Anything that can hold a permanent or semi-permanent message can be examined. This includes, but is not limited to, mirrors, windows, walls, locker doors, and cardboard boxes; in fact, any flat surface. Messages have been scratched with sharp objects onto cars, bathroom doors, rocks, trees, and other rough surfaces.

Traditional writing surfaces such as blackboards and whiteboards may contain questioned writing. Graffiti can be found on walls, lipstick on mirrors, and spray paint on various surfaces. All of these can be examined and compared with known writing to identify the author.

Questions to Ask About Paper

- What kind of paper was used?
- Was more than one kind of paper used on a multi-page document?
- Are the watermarks the same? In the same direction?
- Is the paper the same size, thickness, color?
- Are there any marks on the paper?
- Are there any holes where the paper may have been stapled? Are the holes consistent?
- Was the paper torn or damaged?
- Did it come from a pad? Can the tears be matched?
- Are those grip marks from a printer feeder?
- Is the paper lined?
- Is the paper soiled? Crumbled? Faded?
- Was the paper cut by hand?
- Are there any discolorations or stains on the paper? What caused them?
- Did ink from another page bleed through?
- Is there any indented writing on the paper?
- Are there any signs of erasure through abrasion or the application of chemicals?
- Are the margins on the paper all the same? (The standard is 1 inch on each side of a typed document.)

RESTORING DOCUMENTS

Many damaged documents can be restored. Some documents are only slightly damaged and can easily be restored. Others may require more effort to restore. No method should be used by anyone who is not properly trained because additional harm could result from using improper methods.

Conservators are trained to restore damaged documents. Centers in the United States that offer restoration services on documents are located in the Boston and Philadelphia areas. Conservators also provide information on proper preservation to prevent deterioration of fragile documents.

Soiled documents can be cleaned. This includes documents damaged by soot and smoke, or dirt and soil from just being handled.

Paper can be washed. Washing not only removes the dirt from the paper but also puts moisture back into its fibers.

Water-soaked papers can be dried and separated. Some papers need to be freeze-dried. Others can be hung to dry or blow-dried. Once they have dried sufficiently, the pages can be individually separated and laid on a flat surface to finish drying.

Fire-damaged and charred documents can sometimes be salvaged. Charred paper is brittle and needs to be handled carefully. If it is mishandled, it will fall apart and cannot be salvaged. Spraying the paper with acetate will strengthen it so that it can be moved and handled. Charred paper should be placed on cotton batting or firm paper for transport. It may be necessary to spray it with a fine mist of water to put moisture back into the pages. It is a good idea to photograph it at its original site, if possible.

Documents that are brittle from age or heat should also be handled very carefully. Sometimes old papers are held together with cellophane tape that has yellowed. Attempts to remove the tape may destroy the paper.

Pages that are stuck together with glue may be separated by carefully steaming the documents to soften the glue.

CASE STUDY: WATERMARKS ON PAPER

Background

A will was presented for probate. It was typed on erasable bond paper, and there was evidence of erasing and retyping. The witnesses to the will were deceased. The document examiner took photographs of the watermark and checked the date that this watermark was first manufactured.

Question

How does one photograph a watermark?

Answer

The photographer places the will on a light box and photographs the watermark with the light shining through the document.

Outcome

The date on the will preceded the manufacturing of the paper containing that watermark, positively identifying the fraudulent nature of the will. The signatures of the testatrix and the witnesses were all written in the same hand. The witnesses had died before the will was executed.

Assignment

1. Start a paper library. Collect as many different kinds of paper as possible.
2. Make a collection of watermarks.
3. Wet a piece of paper and let it dry. What happened to the paper?

Questions

1. What is a dandyroll? What does it do?
2. What is a watermark?
3. What does a watermark tell us?
4. What is the least expensive paper manufactured?
5. Name some types of paper.
6. What is safety paper?
7. What are fugitive inks?
8. Name some of the properties of paper.
9. What type of paper problems might a document examiner solve?
10. How can a document examiner obtain information about paper and its watermarks?
11. What are some other writing surfaces that a document examiner might examine?
12. What do conservators do?
13. What can be done to restore damaged documents?

Chapter 21

Writing Instruments

INTRODUCTION

Since the cavemen began marking walls with pictures that told stories, humans have looked for ways of communicating with others through the written word. Early people painted pictures on walls, chiseled marks into stone, pressed a stylus into clay, and used reeds on papyrus. Modern instruments for writing include chalk, graphite, paint, wax, crayons, pencils, and various types of pens.

The cuneiform stylus of ancient Mesopotamia was the first identified writing instrument. It was used to imprint wedge-shaped characters into clay tablets, which were then allowed to dry.

These were replaced by the reed pen made from calamus plants, found along riverbeds. The porous fibers absorb ink readily. However, the reed's soft fibers tend to break down in a short period of time, and the reed must be set aside to dry.

Writing is applied to a surface by adhesion or absorption. An example of adhesion is the result of a pencil being pushed against the writing surface so that pieces of graphite cling to the paper following the path of the writing instrument. It is a dry method that places marks on the surface of the paper. Other adhesive media include charcoal, chalk, and crayons.

Absorption causes a liquid (ink) to penetrate the paper. The ink flows from a pen onto paper and must dry quickly to prevent smearing. Paper is treated so that the ink is absorbed without feathering or running on the paper.

PENS

The quill pen was used as early as 56 BC. The word pen comes from the Latin word *penna*, meaning feather. Feathers of various birds, such as the goose,

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crow, and swan, were used to make quill pens. Benjamin Franklin raised geese for their quills. The quill pen maker dipped the tip of the quill into a bed of hot sand and removed the outer tissue of the quill. The quill was then strengthened with alum or nitric acid. Metal points were added to quills to make them last longer.

The first usable steel pen was manufactured in France in 1784. Perigreen Williamson of Baltimore was the first to make the two side slits in the pen. Joseph Gillot of Birmingham, England, devised the steel pen press and introduced the practical manufacture of pens in 1822.

Although a pen that carried its own ink supply was invented in 1650, fountain pens did not come into popular use for another 200 years. Lewis E. Waterman patented the first fountain pen in the United States in 1884. The first fountain pens had to be filled with an eyedropper that squeezed ink into the pen. W.A. Sheaffer developed the lever-fill fountain pen in 1913. A disposable fountain pen came on the market in 1980. The pen was intended to be discarded when the ink is depleted, however, the cartridge can be refilled with a hypodermic needle to force new ink into the cartridge. The fountain pen was replaced by the ballpoint pen but has made a comeback, especially since the introduction of ink cartridges.

The first ballpoint pen was patented in 1888 by John J. Loud but did not become popular until 1945. The introduction of the ballpoint pen revolutionized writing instruments.

A ballpoint pen is a precision instrument consisting of four parts: the ink, the tube, the ball, and the ball holder. The main problem faced by ballpoint pen manufacturers was to maintain viscosity of the ink without it crystallizing or becoming a gel. In other words, the ink must flow through channels hundreds of thousandths of an inch wide without clogging and yet dry quickly on the paper to prevent smearing.

In 1979, the Paper Mate company began marketing the Eraser Mate, a pen containing erasable ink. The ink in these pens is about 100 times thicker than normal ballpoint ink. The ink sits on the paper without penetrating and can be erased until it sets, or dries. The tightness of the paper fibers determines the amount of time it takes the ink to set.

It is difficult to determine the age of ballpoint ink with any exactness. Sometimes similar inks can be compared. The degree of dryness will indicate a range of time the ink could have been placed on the document. Until the ink completely dries (up to 3.5 years), the manufacturing date will also limit the time factor in general. Tags were placed in ink for a number of years, enabling forensic experts to determine the date a particular ink was first placed on the market. However, the process was expensive and was discontinued in 1994.

Fiber tip pens were first manufactured in 1963. Also known as porous tip or felt tip, these pens use a fluid ink filler. Broad-tipped flair pens were the first felt tips. Modern felt tips come in a variety of pen tip widths and materials. These pens were the first pens used in outer space by our astronauts. They contain a water-based ink.

The first roller ball pen also made its debut in 1963. It is similar in design to the ballpoint, but the ink is much thinner and flows more easily onto the paper. Water-soluble ink is frequently used in roller ball pens.

Waterproof roller ball pens came on the market in 1988. The Micro Permaroller by Pentel was the first roller ball pen that contained permanent waterproof and fade-proof ink. It is available with black, red, or blue ink.

Gel pens are the newest innovation. These pens contain a permanent gel in a liquid solution. The gels are fade proof and come in many different colors.

IDENTIFICATION OF PENS

A document examiner can distinguish the type of pen used to create a handwriting sample by studying the characteristics of the pen and the ink used in them. The fountain pen contains two parallel nibs that penetrate the paper, leaving a slightly heavier line of ink along these grooves. Flow-back of the ink at the end of the grooves is also characteristic of nib pens.

The ball from a ballpoint pen leaves a groove in the paper in the center of the line of ink, which can be seen under a stereoscopic microscope. The heavy ink of the ballpoint pen sits on the paper. The ink is shiny. Ballpoint pens are susceptible to gooping. The ink collects on the ball, on the curves, and deposits a goop of ink onto the paper when the pen position changes. Sometimes the ink leaves burr striations on the ink line. Burr striations are blank spots in the ink line where the ball failed to deposit ink on the paper, usually the result of a clogged hole in the ball (Fig. 21.1).

The porous pen point leaves flat, even inking sometimes accompanied by hairline dragging of ink along the edge of the line. The roller ball has the same type of ink, but the ball leaves a slight indentation in the paper similar to the ballpoint but with a dull surface. Gel pens can be identified by their bright colors and the groove made by the roller ball.

PENCILS

The friction of the point of a pencil against the paper leaves particles of graphite on the writing surface. These marks can be removed by brushing off the particles with a rubber eraser.

Pencils are disposable or mechanical. A standard pencil is a wooden cylinder with a graphite compound in the center. The compound is composed

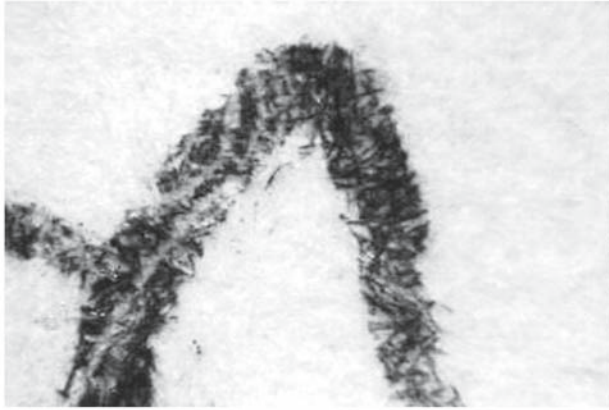


Fig. 21.1. Burr striations made by a ballpoint pen.

of graphite mixed with clay. The mechanical pencil is filled with a stick of graphite, which can be replaced. The term lead or lead pencil is incorrect because the instruments contain no lead.

Pencils come in various degrees of softness. The amount of clay and graphite determines the hardness or softness of the pencil. The more clay present, the harder and lighter the line made by the pencil. Pencils are graded numerically prefaced by H for hard and B for soft. Most common is the number 2 pencil. Colored pencils also contain clay and wax, but the graphite is replaced by pigments and dyes.

The English made the first pencils in the mid-1500s. The Germans were the first to enclose the graphite in wood about 1650. In 1795, Nicolas Jacques Conte of France developed a pencil-making process that is still used today. He discovered he could mix ground graphite with clay, and harden it by heating it to a high temperature.

William Monroe of Concord, MA sold the first American-made pencils to a Boston hardware dealer in 1812. Today the United States is the world's leading manufacturer of pencils.

OTHER WRITING INSTRUMENTS

Stick charcoal is popular among artists. It is easy to apply and can produce delicate lines as well as broad heavy strokes. Charcoal is made from carbonized wood. It can easily be pulverized into powder. Charcoal does not penetrate paper. In fact, the major disadvantage of charcoal is its tendency to smear and smudge the paper. It does not adhere well.

Chalk is composed of a mixture of dry pigments and binders. There are many combinations used in chalk manufacturing today. Crayons consist of wax and pigments. These waxes adhere to the surface of paper and are difficult or impossible to remove.

INK

Ink is a liquid solution containing dyes and/or pigments used to make visible marks on a writing surface. Ink is manufactured for pens, ribbons for typewriters and printers, stamp pads, and commercial printer's ink. Each use requires a different type of ink with different properties.

The first inks may have been colored berries mixed with water. The first known ink came from the cuttlefish, a member of the octopus family that secretes a brown liquid when frightened. India or Indian ink was the first manufactured ink, made by mixing soot (carbon) and gelatin from donkey skins. Musk was added to dispel the odor. This was used by the Egyptians as far back as 2500 BC. Today's Indian ink contains shellac as a waterproofing agent.

Ink was subsequently made from nutgalls from oak trees. The secretions from the tree were mixed with ferrous sulphate to form iron gallate. Gum arabic was added to maintain the suspension. Color was sometimes added to the ink. Indigo, logwood, and aniline dyes were the most common agents used. The colors made the ink visible immediately, and as the colors dried and the iron gallate oxidized there remained a rusty brown color, seen on preserved ancient documents.

Today's ink consists of a coloring agent (dyes or pigments), a solvent to make it fluid, and a fixing agent to maintain its consistency.

At present there are basically three types of ink on the market. One is water-based and dissolves in water. This ink is mixed with dyes and used in roller ball pens. Another is alcohol-based and is dissolved by alcohol. The third is oil-based, which dissolves in oil; it is used in ballpoint pens. Oil-based ink is more viscous (thicker) than other inks.

Ink is colored by dyes, pigments, or carbon black. Ink dye is a colored material that dissolves in water or alcohol. Pigments are particles that do not dissolve. They are suspended in the ink. Carbon black is soot that cannot be dissolved and cannot be removed from clothing or paper. It is used to make permanent ink.

Stamp pad inks generally consist of dyes, glycerin, and other ingredients. They must stay liquid on the pad but dry quickly on paper.

Number machines and check protectors use an oil-based ink. Oil-based ink should never be used with rubber stamps because it dissolves the rubber.

Drawing inks contain dye, water, shellac, and solvents in a homogeneous fluid. They may be opaque or semi-opaque. Sometimes pigments are substituted for dyes. Pigments will not fade and are therefore considered permanent. They are used in gel pens.

UNUSUAL WRITING FLUIDS

Document examiners may need to analyze documents that were marked with an unusual writing instrument. Lipstick on a mirror is one example. A stylus or other sharp instrument may be used to scratch a message onto a metal surface. Blood has also been used to leave notes. White Out, nail polish, and other chemicals are sometimes used.

Body fluids may be used in place of ink. These may be difficult to decipher because they are not visible without treatment. Fruit juice such as lemon juice has been used as invisible ink. Heating these liquids make them visible.

Spray paint is popular with graffiti artists. Because writing is a well-developed habit, characteristics are revealed with spray paint. Letter shapes will be similar to written letter forms. The arrangement of the writing tends to remain the same. Graffiti artists usually start writing at eye level, enabling one to determine the approximate height of the writer.

Whatever the fluid used to create writing, you should be able to draw conclusions about the writing on a document.

CASE STUDY: ALTERED MEDICAL RECORD

Background

A nurse was injured by a psychiatric patient and went for treatment to the emergency room of the same hospital for which she worked. The hospital accused her of faking the injury, and she was dismissed from her job. She filed a complaint against the hospital, stating the medical report had been altered to reflect lack of evidence of injury. A document examiner was hired to examine the records.

Question

How would you identify an altered medical record?

Answer

Look for signs of overwriting or crowded writing to indicate an insertion. A different ink or groove from a pen could indicate a different writing instrument. Damage to the paper would reflect an alteration to the record.

Outcome

The nurse who made the entries into the medical record testified that she had entered all of the material into the record at one time without pausing. The document examiner was able to demonstrate that two different shades of ink reflected two different pens used to make the entries.

Questions

1. What are writing instruments? Give a variety of examples.
2. What is adhesion?
3. What writing instruments use adhesion?
4. What is absorption?
5. What is ink?
6. What is used to make Indian ink?
7. What are three types of ink used in pens today?
8. How is pencil writing produced?

Chapter 22

Seals, Stamps, and Paper

INTRODUCTION

Document examiners must examine all materials related to documents, including seals, envelopes, stamps, fasteners, bindings, adhesives, and labels.

SEALS

Seals were used as a means of identification in the Middle Ages because many people were illiterate and could not authenticate documents with their signatures. Seals were used in conjunction with signatures, as well. Official documents were “sealed” with the appropriate insignia.

When people began sending letters, they folded the letter into four parts and wrote on the inside pages. The back page was used for the address. The paper was sealed with sealing wax, which was melted and poured onto the paper. An engraved seal was sometimes pressed into the melted wax. The wax was made of beeswax, turpentine, and pigment, usually vermilion, which is bright red, although other colors were used as well.

Wafers were introduced as an alternate means of fastening a letter in the mid-1700s. These wafers consisted of flour mixed with water, gum, and coloring matter. They were moistened and applied to the inside of the paper. Wafers were also used for seal impressions on deeds and other important documents. Modern documents are sealed with glossy paper seals cut into circles that are gummed on the back side and embossed with a corporate seal.

ENVELOPES

Ancient documents were covered to protect them from harm and to ensure privacy. Often the same type of material used to imprint information was also used to enclose a document. Clay tablets were covered with a thin layer of

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clay that was crimped shut. Parchment was wrapped in parchment and paper was used to cover paper.

Envelopes were introduced in England and the United States around 1840. Postage stamps also came into use during this period and were generally hand-canceled. The clasp envelope was patented in 1879. The first envelopes were fastened with wax or wafers. Gummed envelopes replaced the earlier fasteners.

Envelopes can be distinguished by their shapes as well as their colors. The cut of the envelope varies with different models. Some gummed envelopes contain sticky tape that does not need to be wet to seal the envelope.

Envelopes containing questioned documents should be examined thoroughly for clues to their identity. Postal inspectors use palm prints to identify the author of envelopes. Other subtle clues to identity may be present on an envelope, such as the arrangement of the address on the envelope, the return address, the cancellation, and/or the stamp.

Envelopes should also be examined to determine if they were opened and resealed. Documents that were steamed open will appear wavy on the steamed edges. Contents should be compared with postmarks to see if the document fits into the envelope and was in the envelope when it was stamped.

STAMPS

Postage stamps can be used to assist in dating a document. The document examiner can research the date a stamp first went on the market. The amount of postage on an envelope can also date it based on the cost of postage needed to mail the document.

Documentary stamps found on documents can provide clues to the authenticity or age of the documents. It may be necessary to research the type of documentary stamps that are found on documents because the wrong type of stamp may be used to create a counterfeit document.

Rubber stamps are used for business and art. Businesses use stamps wherever a single message or design must be used repeatedly such as “Confidential,” or “Paid In Full.” Businesses also use date stamps, signature stamps, and identification stamps.

EMBOSSERS

Notaries place their seals on documents that they notarize. They may use a rubber stamp seal or an embossing seal. Each state sets its own policies for notary stamps. Notaries are required to obtain suitable identification of the signer whose signature is being notarized. Notaries are expected to maintain a ledger containing an additional signature of the signers whose signatures they witness.

FASTENERS

Various methods have been used to hold pieces of paper together, from paste and glue to paper clips and staples. One of the simplest methods is to crimp paper using a device designed for that purpose. Bank pins or straight pins were used in the 1800s. Wire staples were introduced around 1875 and paper clips in 1900.

Staples leave a pair of tiny holes in documents. A comparison of the staple holes can reveal a page substitution when a sheet of paper does not contain the same number or the same location of staple holes.

BINDINGS

Documents may be bound with grommets, spindles, adhesive clips, and spring clasps, many of which leave holes or indentations in the paper when removed. An examination of all marks and holes on a document should be conducted, especially when substitution is suspected.

Documents may be spiral bound, glued, or held together with narrow spines. Pads of paper may have removable sheets that are perforated. Perforations can be matched to identify the source of pages torn from a pad. Pages torn from a glued pad can also be matched by the torn edges. Sometimes some of the glue adheres to the pages that are removed.

ADHESIVES

Paste and glue have been used to affix material to documents or to glue pages together since papyrus was in use. A simple paste made with flour and water has been used on paper since ancient times. Glue made from animal parts has been in use for a long time as well.

Adhesives can be distinguished by fluorescence with ultraviolet light. Adhesive used on postage stamps fluoresce blue-white, gelatin-based adhesives appear yellow, and gum arabic adhesives do not fluoresce at all.

Transparent cellulose adhesive tape was first marketed in the 1930s. Adhesive tapes have improved in quality over the years and currently come in a variety of sizes and uses. Non-sticky adhesive tape currently on the market allows tape to be easily removed from paper and reused. Other types of tape such as masking tape are used to seal packages and envelopes.

Specialty items are used in conjunction with paper. Gummed reinforcements used to strengthen holes in paper are made of circular tape with a hole in the center. Post-it notes were first manufactured in 1980 by the 3M Company and are now available in many different sizes and shapes. These notes

adhere to paper and are easily removed, leaving no residue on the paper. Post-it flags and arrows in various colors and different sizes are now available for use on documents.

LABELS

Labels found on documents may give clues to the identity of the documents. The composition of labels may assist in dating documents. The labels on the *Hitler Diaries* were manufactured after Hitler's death. Whiteners in the labels were not in use until the 1950s.

When studying documents in order to make a determination of their authenticity or their spuriousness, it is necessary to examine the entire document and anything that is affixed to the document. Only when everything has been studied and compared can an accurate opinion be given about the documents in question.

CASE STUDY: ALTERED SUBPOENA

Background

An attorney failed to appear in court after he was issued a subpoena. His subpoena contained a different date than the scheduled court appearance. The typist testified that she added a label to the subpoena with the correct date. The court accused the lawyer of altering the tape.

Question

Can you prove the attorney did not alter the subpoena?

Answer

Duplicate the scenario. Obtain similar paper labels and remove the label from the paper. Labels will leave evidence of their removal. They usually tear the paper and cannot be successfully removed.

Outcome

The document examiner demonstrated that removal of the label would have damaged the document. There was no damage to the document.

Questions

1. Why were seals used in the Middle Ages?
2. What is a wafer, and of what does it consist?
3. When were envelopes first used?
4. What types of fasteners are used to hold pieces of paper together?
5. How can adhesives be distinguished?

Chapter 23

Typewriters and Printers

INTRODUCTION

Document examiners are being asked to make determinations concerning documents produced on modern office equipment. There are many types of problems that can be solved concerning documents that have been typed or printed.

TYPEWRITERS

Although the basic idea for the typewriter was first patented in 1714, the first practical typewriter was not invented until 1867 by Charles Latham Sholes. Remington began commercially manufacturing Shole's typewriter in 1873. The early machines consisted of type bars connected to the keys of the typewriter. When the key was pressed, the type bar struck a ribbon to produce a letter. The original keyboard contained uppercase letters in the QWERTYUIOP pattern. Subsequent keyboards added lowercase letters with a shift key to toggle between uppercase and lowercase letters. Punctuation was included on the keys as well.

The manual typewriter consisted of a series of mechanical linkages from the key to the type bar that threw the letter against the ribbon and the paper. The force exerted by the typist controlled the impact of the key against the ribbon and the paper. If a type bar was damaged and went askew, both the capital and lowercase letter were affected. If two type bars struck each other, both letters might be thrown askew. It is necessary to distinguish between two bars that collided and a defect in one or both type bars. This can be determined by the consistencies on the misalignment on a defective key.

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

An example of PICA type found on typewriters
An example of ELITE type found on typewriters.

Fig. 23.1. Example of Pica and Elite Type found on typewriters.

Different typefaces were used by typewriter manufacturers that help in the identification of the particular model of typewriter. Although it is not necessary or practical to maintain a library of all the typewriters that have been manufactured, some information about the various types is useful.

The first typewriters used pica or elite spacing. Pica places 10 characters to the inch on a line, and elite places 12 to the inch (Fig. 23.1). The lines of typing are arranged to be 0.165 inches apart, or 6 lines per inch.

The electric typewriter introduced in the 1930s was also a type bar design. Electric typewriters required a light touch to the keys to activate them. This made it more difficult to identify an individual typist by the way the keys were pressed.

Proportional spacing typewriters were first developed in the 1940s and 1950s. IBM manufactured the first proportional spacing typewriter known as the Executive. Proportional typing is designed around the size of the individual letters because letters vary in width. Units were used to size letters. Narrow letters are *i*, *e*, *f*, *j*, and *t*, which occupy two units. Most of the letters take up three units, and *w* and *m* require four or five units. Capital letters were also spaced accordingly. Proportional spacing resembles printing.

In 1961, IBM introduced the Selectric typewriter, which used a type ball to place letters onto a document. The type ball or element, as it is sometimes called, fits onto the typewriter and can easily be interchanged with other model typewriters. This style became so popular that it was used by all the typewriter manufacturers and replaced the type bar.

The surface of the type ball is divided into two hemispheres. All the lowercase letters can be found on one hemisphere and the capital letters occupy the other. The typefaces are arranged in horizontal and vertical rows. The element rests on the center position of the top row.

Three types of movement take place to operate the type ball. First the ball must rotate to the proper column. It must tilt so that the proper row is centered. Then the ball is moved forward to strike the ribbon and print the character onto the paper after which the ball returns to its resting place. All this takes place in less than a second.

The next development in the typewriter was the daisy wheel printer, which uses a plastic element that is shaped like a wheel with each spoke containing a different character. The wheel swings to the correct character to be typed, and the spoke hits the ribbon against the paper. Some early printers use daisy wheels.

WORD PROCESSORS

The most modern typewriter design is the electronic memory typewriter, or word processor. Electronic memory machines store the keystrokes either on a magnetic tape or disk or solid-state chip. Many display the type on a small video screen. The material to be typed is keyed in and stored. It can be retrieved as desired. It can be printed after it is edited.

These typewriters have no mechanical linkage between the type key and the printing of the characters. The typing is accomplished and controlled electronically. Letter spacing, letter selection, line spacing, and ribbon action are controlled by microprocessors. Movement is accomplished by solenoids and electric motors.

Few defects develop in these machines, so that it may not be possible to identify a specific machine. These systems use either a daisy wheel or a type ball. These elements are interchangeable and can be quickly replaced. Various font styles are available.

COMPUTERS AND PRINTERS

Computers have replaced typewriters in modern offices. Today's documents are typed on a computer, mistakes are corrected, and the documents are printed using word processing software possibly on one of several printers connected to the system. The first printers resembled typewriters and used daisy wheels and dot matrix systems.

The dot matrix has a series of small pins that press against the ribbon and stamp the paper. The design of the letter indicates which pins to press against the ribbon. The original 9-pin has been replaced by the 24-pin, which can input 360 dots per inch. These have been replaced with more dots per inch producing letters that are high quality.

The nine-pin dot matrix uses either a series of three rows of three dots each or one row of nine dots. The 24-pin printers have a series of 6 rows containing 4 pins each or 2 rows of 12, offset for finer quality. A microscopic examination will show the round edges from the individual dots.

Modern printers are revolutionary. Inkjet and laser printers have taken over the market. Inkjet printers spray the ink onto the paper configuring the

letter designs in a way similar to the dot-matrix designs. The sprayed ink may run slightly, blurring the rough edges of the dots. Some inkjet printers leave small spatters of ink along the printed line. Inkjets have developed to produce high-quality resolution.

The laser printer is the newest technology in the printing field. A light source such as a laser exposes a photosensitive drum in a pattern of tiny dots to form an image. Negatively charged toner clings to the positively charged, sensitized areas of the drum. The toner is transferred to the paper that has been given a positive charge. The toner is fused to the paper by heat and pressure. The quality of the laser printer is superior to other printing methods and is constantly being improved. A laser print can be identified by the crisp straight edges of the copy.

Color printers, especially inkjet, are becoming more affordable and more popular. These printers distribute a series of different color dots onto the paper. These dots can be clearly seen under magnification. Color copiers use a similar method to create photocopies in color.

STANDARDS

Typewriter standards are collected in the same manner as handwriting exemplars. Typewriter standards can be divided into two categories. The first involves material written in the normal course of business. The second is prepared standards typed for the purpose of comparison with the known specimen.

When comparing documents to determine which typewriter or printer was used to create the document, gather as much known material as possible for comparison purposes. The more standards you have, the more accurate your opinion will be. Try to gather material dated around the same time as the questioned documents were executed.

When taking standards from a typewriter type at least three or four pages of material for comparison purposes. More is better. Duplicate the questioned material to be compared whenever possible.

IDENTIFICATION

Identifying a specific typewriter from typed material is similar to identifying handwriting. There are two basic considerations needed to establish identity. First, the typeface (the size and the design of the letters and numbers must be the same). Second, the defects must match.

Most typewriter identification is made from the work produced by the typewriter. The type on the type bars tends to wear unevenly as it is used. Some of the letters go askew. Serifs break and circles are filled with ink. The letters

may twist or misalign. Therefore a visual examination of all the characteristics will be useful. Study every individual letter carefully for compatibility. Look for printing defects.

Mechanical defects will produce individual imperfections that help to identify a typewriter. The rubber platen gets old and hard. Continuous striking of the keys can cause unevenness to develop on the platen that will affect the print alignment. The ribbon may be defective and cause only a portion of the letter to be typed. Insufficient carriage movement will cause incorrect spacing between letters.

The mechanical defects caused by the defective parts can be reduced to a combination of five kinds of problems: faulty horizontal alignment; vertical misalignment; slant or slope; tilt, "off its feet" or footing; and damaged type.

It is possible to determine if the typist struck two keys simultaneously on a manual typewriter because both keys will go askew. An examination of the rest of the document will not show any misalignment of these letters when they appear elsewhere on the document.

In some instances where a manual typewriter was used, it may be possible to identify the typist. An inexperienced typist will have more letters askew, especially where one letter has not cleared the platen before the next letter is struck. The arrangement of the letters on typewriters was designed to slow the typist, to prevent two keys from striking simultaneously.

The type bar machine alignment affects only the single letter, both upper- and lowercase, and the type ball alignment affects all the letters in a row or a column. Alignment problems can occur with type balls, but they are usually very slight. Most common is a rotating misalignment causing a horizontal defect. Look for slightly inconsistent alignment when examining documents typed with a type ball.

Typeface damage is rare on type balls, but you can sometimes spot a document typed on one by the presence of light, diagonal, hairline strokes appearing on some of the letters. Another characteristic of type balls is the uniformity of the typed letters. However, type balls do wear down.

There are 22 characters in a row on the IBM Selectric Typewriter, and each of these will be affected by slight misalignment of the element. There are four columns in each sector. Letters in a column will align similarly to the left or right. Other typewriter manufacturers position their letters differently.

The following chart (Fig. 23.2) shows the positions of the letters on the IBM Selectric type ball. The Remington and Silver Reed use the same positions.

The ball rests in the center position at the *z*. The numbers show the number of columns to the right or left that the ball must move in order to print the letters of that column.

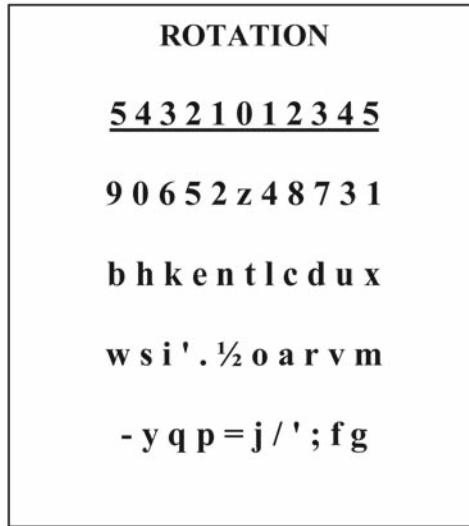


Fig. 23.2. The order in which the letters and numbers are found on a type ball.

Occasionally, a ball-type machine will develop a slight defect in spacing. The most common defect is a consistent unit spacing that varies slightly from 0.1 inches with pica and 0.12 inches with elite spacing. This results in all letters on the left-hand side of a page aligning differently from those in the middle or on the right-hand side.

Daisy wheels are made of plastic and have a relatively short life span. They are flexible so consistent misalignment is not likely. The daisy wheel will not function if a letter breaks. Breakage of individual letters is not as common on the type ball as on the type bar.

DISTINGUISHING BETWEEN TYPEWRITERS AND PRINTERS

It is not always possible to differentiate between a typewritten document and one generated on a computer-driven printer. However, there are some indications that may assist the document examiner in making this determination based on the method in which documents are produced (*see* Table 23.1).

Computer-generated documents contain some features that cannot easily be produced on typewriters. For example, documents generated on a computer can have a flush right margin, also called right justified. Flush right margins are possible because the computer can adjust the spacing. It is extremely difficult for the typist to adjust the spacing manually on a typewriter.

Table 23.1.
Differences Between Typewriters and Printers

	Typewriters	Printers
Fonts	Single font	Multiple fonts
Font sizes	One size	Varied sizes
Method of imprint	Impact, typefaces	Dot matrix, Inkjet, or laser
Enhancements	Bold, underline	Italics, double underline
Margins—top and bottom	Inconsistent	Consistent
Margins—side	Right margins uneven	Right justified
Page numbers	Location may vary	Consistent
Mechanical defects	May be present	Not present
Corrections	Lifted off or White Out	No corrections present

Computers can mix fonts and character size on a document. The type ball must be changed on a typewriter to change the font. Special enhancements can be produced by a computer such as italics, double-underline, and redline, as illustrated in the section, “Fonts.” Centering of titles, the numbering of pages, and flush-right entries are consistent in their placement in computer-generated documents. Headers are often carried from page to page. Each page of a multi-paged document will generally contain the same number of lines.

Modern printers are usually dot matrix, inkjet, or laser printers, and typewriters are impact printers with daisy wheels or type balls. Most printers do not show signs of misalignment or damaged typefaces. Corrections are made before a copy is typed on a printer so there is no correction tape or white out on a printed document.

Typewritten documents can be identified by their lack of uniformity when compared with computer-generated documents. The margins, spacing, and centering may vary. Right margins will be ragged. Close examination may also reveal corrections. The indentation from the corrected letter will show on the paper even though it has been covered with White Out or lifted off with a sticky tape.

Be careful when comparing printers connected to computers not to confuse two similar printers because they are the same model or the same type of printer. It is not always possible to identify a particular printer. Similar fonts are found on multiple machines, and individual machines can produce varied fonts. Most fonts are scalable so that sizes vary. The computer operator can change letter and line spacing and other alignment features at will. There must be some identifying characteristic to distinguish the printer from all other printers by the same manufacturer.

QUESTIONS TO ASK ABOUT TYPEWRITERS

- What kind of typewriter was used?
- Is it a manual, electric, or electronic memory typewriter?
- What type element was it (type ball, daisy wheel, or type bar)?
- What is the spacing (pica, elite, proportional, or other)?
- What kind of ribbon was used?
- Was each page typed continuously without the paper being removed and reinserted into the typewriter?
- If removed and reinserted how many times, and what was written each time?
- Is the date of the document consistent with the age of the typewriter and the ribbon?
- Are there corrections and how were they made (White Out, correction ribbon, or lifted off)?
- Is the spacing uniform?
- Is there a carbon copy, and is it identical?

FONTS AND SPECIAL FEATURES

If a typist wanted to enhance text he or she could create a bold effect by striking a key twice to make it stand out. Today we give the computer the command to bold our text and it does it automatically. Typewriters only had one size of print. Today's office equipment can go from 2 to 1000 points with the push of a button. Downloadable fonts make it possible to keep a variety of fonts in storage and to create a variety of sizes and styles.

What are some of the more common fonts available? The text of this course is being printed in Times, which is one of the most frequently used texts because it is easy to read. Standard size is 12 points, although the fonts can be reduced in size to 6 points.. Fonts can be scaled to any size desired (Fig. 23.3) and can also be converted to various styles (Fig. 23.4).

All these fonts and more can be stored with a word processor. Modern computers are capable of using these and many more fonts simultaneously. Font packages vary but many people use the same fonts, making it impossible to identify an individual computer from the fonts it uses.

These are other word enhancers as well. One can also combine letters:
æ Æ.

RIBBONS

Typewriter ribbons assist in the identification of the source of documents.

Ribbons for typewriters and printers are sometimes interchangeable. The two main families of ribbons are fabric ribbons and film ribbons. The ink is

TIMES	7 POINTS
TIMES	10 POINTS
TIMES	12 POINTS
TIMES	14 POINTS
TIMES	16 POINTS
TIMES	20 POINTS
TIMES	24 POINTS
TIMES	30 POINTS
TIMES	36 POINTS

36 POINTS = 1/2 INCH.

Fig. 23.3. Various size fonts that modern computers can produce.

This is Times New Roman in Italics.

SMALL CAPS CAN BE UTILIZED.

Shadow creates effects.

Fig. 23.4. Various font enhancements that can be produced on a computer.

transferred to the document by the impact of the key. Single-strike ribbons transfer all the ink onto the paper at one time, and multi-strike ribbons can be used over again. Some fabric ribbons can be re-inked. Some ribbons are half red and half black, and some are half ink and half correction tape.

Multi-strike fabric ribbons were originally made from cotton and silk but are now manufactured from nylon. The ink is an oil-based liquid with pigments and dyestuffs. Enlarged, the impression of the fabric can be seen in the letters. The ink flows into the recessed area where the key struck the paper. This keeps the printing uniform. The lightly colored, ribbed letter impressions from a worn fabric ribbon will reveal more typewriter defects than a new ribbon that leaves heavy deposits of ink that obscure idiosyncrasies.

Single strike impact film ribbons consist of a polymer film coated with pigments, dyes, waxes, and oils. The ink is absorbed into the paper and can be covered with correction tape or correction fluid. Because the ribbon is only used once, the discarded ribbon can be read. Some contain double or triple rows of slightly staggered characters.

IBM introduced the first correctable film ribbon in 1973. The ink contains resins but lacks the dye found in permanent ink. The ink sits on the paper instead of penetrating it and can be lifted with a sticky tape before it sets. It is easily removed immediately after placement but becomes increasingly difficult as it sets. It takes about 24 hours to set completely.

Correcting tapes impress a white coating over the letter to be covered. The typist strikes the incorrect letter, and the white coating adheres to the letter. It is easy to identify the misplaced letter by looking at the letter under magnification because the double impact leaves an indentation of the original letter in the paper.

Multi-strike impact film ribbons consist of a thin film substrate of polyester that is coated with a sponge-like resin layer of ink. Some multi-strike ribbons have a resinous ink coating with a waxy surface.

When the ribbon is struck and compressed, the ink is squeezed onto the paper and then flows back into the squeezed areas. The considerable overlapping of the multi-strike ribbon makes it impossible to read.

Thermal transfer ribbons use heat to melt the ink on the paper. It is a non-impact method in which the ribbon is only used once and could therefore be read. The print head is a dot-matrix pattern.

CORRECTION FLUIDS

In 1951, Bette Nesmith founded a company called Mistake Out, which made a liquid correction fluid using tempera water-based paint. She changed the name of her product to Liquid Paper in 1956 and applied for a trademark. Gillette Company subsequently bought Liquid Paper. Fax Fluid and the Liquid Paper correction fluid were introduced in 1990.

The Eaton Allen Corporation began manufacturing Ko-Rec Type in 1960. Ko-Rec Type came in small squares of paper that contained a powdery substance. When a typewriter error needed to be corrected, the typist placed the correction paper over the paper and struck the typewriter key. Powder from the correction paper adhered to the paper and covered the keystroke. The typist could then type the correct key, and only close scrutiny would reveal the correction of the error.

Eventually the powder was affixed to a tape that was spooled and inserted onto a typewriter. This made it easier to make the correction because the typist did not have to manually hold the correction paper. It was struck in the same manner as the ribbon was struck.

TYPES OF CASES

Thus far, cases involving the comparison of type to identify a particular typewriter have been discussed. What are some of the other kinds of typewriter cases document examiners handle?

Alterations

Alterations on a typed document can be identified through misalignments. Misalignments are caused by reinserting a paper into a typewriter to add material. It is almost impossible to align material correctly. Vertical alignment is easier because typewriters contain paper guides; the edge of the paper sits against the guide. Horizontal alignment is much more difficult, thus slight differences in spacing between lines occurs and can be determined by measuring.

Age

The age of a document may be determined by identifying the make and model of the typewriter on which it was typed. One case involved a document dated 1880 written on a typewriter first manufactured in 1911.

It may be possible to determine the age of a document from the development of defects in a typewriter. As the typewriter is used, it develops additional problems. A comparison of material printed over a period of time can pinpoint the date of a document when compared with known documents.

Reading Under White Out

When only one side of a document contains writing, transmitted light (back lighting) will enable you to read under White Out. Document examiners place the document on a light box to make the writing legible. It can also be photographed while on the light box.

Material under White Out can also be read and recorded by photocopying the document. Place the document onto the photocopier with the blank side of the paper facing down. Turn the lighting to the darkest setting on the copier and copy the document on a sheet of transparent paper. The writing under the white out transfers to the transparency and is easily read. This method preserves a copy of the original writing.

CASE STUDY: SAME TYPEWRITER

Background

A man and his wife died of heart attacks within an hour of each other, and their wills were presented for probate. The wills had been typed on a manual typewriter. A cousin of the deceased was named beneficiary. The son of the deceased protested the wills after he received a typewritten letter from the alleged beneficiary demanding his inheritance.

Question

The document examiner hired to investigate the case went to the courthouse and compared the letter with the original wills. Why was it necessary to compare the original instead of a photocopy of the will?

Answer

A photocopy of typed material may contain distortions. The original typed letters should be compared to identify the idiosyncrasies.

Outcome

The type on all three documents matched, indicating the beneficiary typed the wills. The signatures were also bogus. The beneficiary admitted the fraud and paid the legal fees of the son, who then received his inheritance.

Questions

1. When was the basic idea for a typewriter first patented?
2. What is the difference between elite and pica spacing?
3. How far apart are lines of typing normally arranged?
4. When was the electric typewriter introduced?
5. What is a word processor?
6. What are differences among inkjet, dot matrix, and laser printers?
7. What are typewriter standards?
8. How can a typewriter be identified as having typed a document?
9. In addition to the type bar, name two other types of elements used in modern typewriters.

10. What are the two main types of ribbons?
11. What is the difference between a single strike ribbon and a multi-strike ribbon?
12. What is Liquid Paper?
13. Can a typewritten document be dated? How?
14. What questions should you ask yourself about typewriters?

Chapter 24

Duplicating Methods

HISTORY OF DUPLICATING METHODS

The first duplicating mechanism was an engraved cylinder mounted in a frame that was rolled over soft clay, which was then dried in the sun. Another primitive copying method consisted of rubbing an inscription. The Chinese used ink and absorbent paper to copy inscriptions. Up through the Middle Ages scribes hand-copied documents because no other method of duplication was practical.

James Watt invented a letterpress machine in 1780. Writing was done with specially thickened ink. A sheet of tissue paper was moistened and pressed against the original page, which transferred the ink to the tissue paper. Because of its transparency, the tissue copy could be read through the paper.

The hectograph process invented in 1805 was used until the 1950s. Aniline ink was transferred to a gelatin pad from which small amounts of ink are transferred to a sheet of paper. About 200 copies could be made using this process.

Many types of stencils were used to make duplicates by having ink pass through the openings. One of the most popular was the mimeograph, or stencil duplicator, invented by Thomas Edison in 1876. A stencil was cut by typing without a ribbon or writing with a stylus on a wax-coated fiber sheet leaving porous lines through which ink passes.

Another popular method was the spirit duplicator that used a sheet of paper called a ditto master. This master is specially coated on the back with an ink such as methyl blue. The sheet can be handwritten or typed on the front, producing a reversed master that is attached to a drum. Sheets of paper moistened with a "spirit" solution transfer some of the ink onto the paper, making a copy of the master. Carbon copies were often made of business correspondence when one or two copies of a document would suffice. These processes became obsolete with the advent of the photocopying process.

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

CARBON AND CARBONLESS PAPER

In 1806, Ralph Wedgwood of England patented carbon paper to make duplicates. A mixture of beeswax, lampblack, and grease were combined and coated on paper. In the early 1900s, carnauba wax was used to make carbon paper. Modern carbon paper is coated with a mixture of pigments and waxy, oily substances.

One-time carbon paper consists of tissue paper that is coated on one side. These papers are very thin and tear easily. This type of paper is usually attached as part of a form, such as a credit card receipt. Other carbon paper is more durable and can be reused. This paper comes with a non-curl wax coating on the plain side of the paper. Some carbon paper has a Mylar-film sheet base and is more expensive and durable.

Typewriter carbons are generally black. A carbon paper intended for use with a pencil is usually blue. The advent of the photocopier has eliminated the need for carbon copies in the office environment.

In 1939, the National Cash Register Company obtained the first patent for carbonless paper. National Cash Register carbonless paper came on the market in 1954 and has become a staple on business forms. The carbonless paper is chemically treated. When two pieces of the specially treated paper come in contact and are written on, they will produce an image on the bottom sheets.

RUBBER STAMPS

Charles Goodyear patented the process of vulcanization of rubber in 1844. This process made it possible to cut stamps out of rubber. Although the originator of rubber stamps is unknown, by the turn of the century the use of rubber stamps was common. Modern rubber stamps are made of vulcanized rubber, laser-cut rubber, and light-hardened photopolymer.

Rubber stamps are used more frequently in foreign countries, especially in South America. The application of decorative rubber stamps on greeting cards has enjoyed a resurgence in this country as a craft/hobby. Foreign countries use stamps for official documents. Signature stamps are sometimes used on checks or other legal documents in the United States.

PHOTOCOPIERS

A photocopier is any device that uses light, heat, chemicals, or electrostatic charges to produce copies of text or graphic material. The earliest model was the Photostat.

Photostats appeared on the market in 1909 and are still in use. The Photostat employs a camera that uses photographic paper instead of film to take a picture. Photostat machines were expensive, limiting their use to large companies. Reproductions are made onto light-sensitive paper. The image is developed in chemical solutions similar to a photographic print. Photostats are made by the same process as photographs, although they lose detail as a result of large grain and excessive contrast. They are also subject to tampering that may be difficult to detect.

Several less-expensive reflex methods of duplication were introduced around the 1950s. The reflex copying technique involves the direct transfer of material from the original to a copy. The diffusion transfer process was first introduced in 1949. It was a wet-copy process that did not yield sharp copies. Kodak introduced a similar wet-copy method in 1952 known as Verifax, which used a gelatin transfer process.

In 1950, 3M introduced the first dry copy known as Thermo-fax. The process, called thermography, used heat-sensitive paper that was exposed to infrared radiation.

Chester Carlson, an American physicist, developed the first modern photocopier in 1937, but it did not become available commercially until 1950. Xerography, which means dry writing, has become the most widely used method of making photocopies. Xerography uses electrostatic charges and heat to produce copies on plain paper. The image is composed of pigment particles called toner that are affixed to the paper by heat. The finished copy is similar to that produced by a laser printer.

Color copiers are the newest innovation marketed. They can duplicate many documents including paper money and personal checks. These copiers reproduce color by combining small toner particles of red, blue, and yellow. They do not always reproduce color exactly. Colored copies can be identified by the different color dots that are visible under magnification. However, as technology advances, the individual dots can no longer be seen on photocopies produced on high quality copiers.

Photocopies have replaced carbon copies for many uses. Secretaries regularly make photocopies of their business correspondence and other commercial documents. Contracts are signed and duplicates are distributed to the signers. Copies are inexpensive, easy to make, and are very popular.

Document examiners are often asked to examine photocopies instead of original documents. There are several disadvantages to working with photocopies. One of the most important is based on the fact that copies can be altered so that the alterations are not detectable. Genuine signatures can be copied from one document onto another, leaving no evidence they have been altered.

Photocopies do not show erasures or chemical alteration of a document. Inks cannot be differentiated. Line sequence cannot be determined. Direction of the writing stroke cannot be identified.

Photocopies do not always reproduce the exact size of the original document. They usually alter the document about 1%. Transparency paper stretches when it is heated so that transparencies are not reproduced to the correct size but are slightly enlarged.

Photocopies do not reproduce details as well as photographs and therefore may not reveal all of subtleties of a writer. Multi-generation photocopies continue to lose details as each copy is made from the succeeding copy. Therefore, document examiners should always give a qualified opinion when working with photocopies, "subject to examination of the original."

Photocopies pick up trashmarks from nicks on the drum or dirt on the glass of the photocopier. These trashmarks may obscure important details or be mistaken for diacritics or other irregularities. These trashmarks can also be used to date a document and to identify a cut and paste.

Trashmarks caused by a nick or mark on the drum will appear on paper in the same vertical position and will be repeated at regular intervals based on the diameter of the drum. Each time the drum returns to the nick, it appears on the paper as a dark spot. It will appear several times on each sheet of paper. This mark remains until the drum is repaired or replaced.

Trashmarks caused by dirt on the glass will appear once on each sheet of paper. When one sheet is placed over another, these trashmarks will align. These marks are transitory and change whenever the glass is cleaned.

SCANNERS

Scanners are the newest duplicating tool used by business and industry. A scanner copies a document into a "pict file," which is a digital representation of a picture. When a scanner passes over the document, the computer converts the image into a series of numbers that describe the color density for each part of the image. The image can be reproduced using a printer attached to the computer system. Copies can be printed in black and white or color.

DIFFERENTIATING TYPES OF MACHINE COPIES

Documents that are scanned or photocopied can be differentiated from the original under magnification. Color laser printers and color photocopiers fuse beads of red, blue, and yellow together to produce combinations that make up different colors. Black and white photocopies can be distinguished from originals by the toner particles on copies versus ink on original documents.

The only visual differences between scanned documents and photocopies are better detail on scanned copies and no trashmarks on the scanned copies. Scanned documents printed on a dot-matrix printer or an inkjet printer can be identified by the printing method. Scanned documents printed on a laser printer are more difficult to distinguish from photocopies because the methods are so similar. However, laser copies are usually crisper and more detailed than photocopies. They can be distinguished from photocopies by the toner and lack of trashmarks.

FACSIMILE MACHINE

The concept of the facsimile (fax) machine was developed by Alexander Bain, a Scottish clock maker, in 1842. Bain transmitted a drawing over the wire using a device composed of pendulums that created a brown stain as they swung over chemically treated paper. In 1848, Frederick Bakewell used a cylinder and screw mechanism to transmit data. This device is the prototype of our modern facsimile machines.

The first commercial fax system was developed in France by Giovanni Caselli in 1865. He connected Paris with several other French cities. By the turn of the century, fax machines had improved drastically. Arthur Korn developed a photoelectric scanning system for transmitting and reproducing a photocopy. In 1907, Dr. Korn established the first facsimile system between London, Paris, and Berlin. The Associated Press began distributing photos and text in 1934.

Gradually, business turned to fax machines as a method of transmitting data quickly and inexpensively. As technology advanced and prices dropped, fax machines became standard office equipment. Modern fax machines use plain paper, unlike the earlier models that required specially treated paper. Standards were established in 1980 making it possible for fax machines to communicate more easily. By early 1990s, millions of fax machines found their way into offices around the country.

How does the facsimile machine operate? The machine consists of three basic elements: the scanner, the modem, and the printer. The scanner translates the material on the document into electronic data. It literally transcribes the location of black and white on the page. The modem modulates the electronic data so that it can be transmitted over the telephone. The receiving modem translates the electronic data and demodulates it so that the printer can make a facsimile of the original document.

Technology continues to make advances in the quality of the data that are transmitted. Early machines left a stepping appearance on diagonal lines.

This causes some distortion of the original document. Modern machines have a finer adjustment so that the staggered diagonal lines are no longer present.

The original fax machine used coated thermal paper that is similar to the first copier paper. This paper is sensitive to light and heat. The copy on these papers will disappear over time. It is difficult to retrieve messages from faded faxes.

It is possible to identify the fax machine from which a document has been sent by the transmittal terminal identification (TTI) line. TTI, consisting of the date and time the fax is sent, the phone number from which it is sent, and the page number, is programmed into the system so that information about the sender appears at the top of the document. Additional information can be programmed into the machine.

CASE STUDY: WAS IT FAXED?

Background

An attorney testified in court that he faxed a letter from office A to office B. A document examiner inspected an enlarged multi-generation photocopy of the document and opined that it had not been faxed because he did not see jagged lines in the writing. The States Attorney considered prosecuting the attorney for perjury. The attorney hired a document examiner to examine the questioned document. He delivered the letter and both fax machines to the document examiner's office.

Question

How would you resolve this issue?

Answer

Duplicate the scenario. Fax a duplicate letter from one machine to the other and enlarge the text on a photocopier. Make several copies from copies to get a multi-generation copy.

OUTCOME

The document examiner faxed a similar letter from one fax machine to the other. He then enlarged the letter and made several generations of photocopies. An examination of the test document showed that most of the jagged lines were gone. The duplicating process had eradicated them. On receipt of the document examiner's report, the States Attorney dropped the case against the attorney.

Questions

1. What comprises modern day carbon paper?
2. Who invented the first commercial fax machine? When?
3. How does a fax machine operate?
4. What does TTI stand for?
5. What kind of information can be obtained from a TTI line?
6. List some situations in which it is better to see an original than a photocopy.
7. What are trashmarks?
8. What is a pict file?

Chapter 25

Desktop Publishing

INTRODUCTION

A computer, a scanner, and a color printer, together with a good software package, can be used to duplicate many different kinds of documents. The cost of modern computer equipment puts forgery and counterfeiting in the range of many would-be crooks and opportunists. For example, magnetic ink printers, which originally sold for \$400,000, were reduced to about \$400, and now one only has to purchase magnetic ink cartridges.

What can be forged on a modern home computer system? Business records, letters of recommendation, expense account receipts, diplomas, and phony letterheads used in business transactions are among the types of documents being fabricated. Many types of bank records, including cashier's checks, certified checks, letters of credit, and similar financial instruments, are falsified. Other documents, such as property records, insurance claims, passports, birth records, and college transcripts, are subject to being counterfeited on home computers.

White collar criminals are scanning signatures into computers and printing them on contracts, wills, and negotiable instruments for various purposes. Without magnification, the signatures appear to be genuine, penned signatures, and as printing methods improve, it is becoming more difficult to identify computer-generated signatures.

The personal computer becomes a powerful publishing tool when coupled with the right software and a high-resolution printer. It can produce and store logos as well as type in all sizes and styles. With bank safety paper purchased at a stationery store, anyone can create counterfeit checks that cannot be distinguished from legitimate ones.

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In addition, many companies have begun printing their business documents, including checks, on their computers. Genuine documents can no longer be distinguished from spurious ones when the same method is used to create both kinds of documents.

Forged bank documents cost the banking industry billions of dollars a year. Total check fraud losses ran \$5.5 billion in 2003 according to the American Bankers Association for banks and financial institutions and \$4.3 billion in 2001. Although imitations are not always perfect forgeries, they avoid detection long enough for con artists to deposit bogus checks into fictitious accounts and collect against them.

What is required to fabricate a check that passes through the banking system as a genuine check? The forger needs a model of a genuine check to create a copy. Refund checks, dividend checks, and stolen payroll and government checks all make good models. Business checks from a large company take longer to detect, giving the forger time to disappear before the forgery is discovered.

The computer operator scans the document into a pict file. The operator uses graphics commands to magnify the image and clean up any fuzzy edges. Any unwanted information is erased, such as the name of the payee, the amount, and the check number and replaced using a word processor.

The operator matches the font to the original font on the check and runs safety paper through a magnetic printer to print the check routing number across the bottom of the check. It is run through a second time to add the name and logo of the bank. Next the forger prints the name, amount, and date using the word processing system with a laser printer. If the check is numbered in red ink, the forger stamps it with an automatic numbering stamp.

The forger uses a paper cutter to cut straight across the edges of the checks. If thorough, the forger will cut one side with a paper perforator or perforates it with a knife. After forging the names of the signer, the forger deposits the check into a fictitious account, which he or she opened using an alias, and waits for the bank to release the money. The forger makes withdrawals from the fictitious account before the check bounces.

If the forger did not use magnetic ink, the bank retypes the numbers and affixes a corrective magnetic strip to the bottom of the check. By the time a company reconciles its account, the thief has retrieved the money and disappeared.

One of the biggest problems facing the banking industry today is the quick-release law on deposited checks. Banks are obligated to release funds on business checks within a shorter period of time than it takes to discover a fraudulent check. The thief opens an account under an assumed name and

deposits bogus checks into the account. He or she withdraws the money and is gone before the bank has discovered the fraud.

DETECTING COMPUTER-GENERATED FORGERIES

How does a document examiner spot a computer forgery? It is usually easy when using a genuine check for comparison. The examiner first checks out the alignment to see if any of the print is misaligned. To determine if it is a laser copy, he or she makes a sharp fold over some of the type and scrapes the edge. If it flakes, it may be toner from a laser printer instead of ink.

The check should be held up to the light to see if the routing number across the bottom of the check reflects light. A routing number imprinted with magnetic ink usually will not reflect light. Magnetic ink is opaque. If the ink on the bottom of the check is shiny, it is not magnetic ink.

Next the document examiner looks for perforations along at least one side of the check. Many counterfeiters neglect to perforate one side of the check or do not make the perforations even.

If the images on the check are too sharp, it could indicate a forgery. The forger may have cleaned up the edges of the printing too much. The print on normal checks is not as sharp. Sometimes the perpetrator will hand-write the payee name as well as the signature. Check the signatures, including the endorsement, on the back of the check for similar writing.

The first desktop forgery case investigated by the Secret Service involved a man posing as an employee of the Dutch consulate. He defrauded a Boston Bank of \$20,000. The employee forged letterheads of the Digital Equipment Corporation using a phony name and title. He created phony cashier's checks from banks like First American and Chase Manhattan by transferring the emblems from the banks onto blank check paper. The forger bought computers with bogus checks and sold the computers for cash in the Caribbean area. He was convicted and sent to Federal prison.

CASE STUDY: SIGNATURE SIMULATION

Background

A man presented a Promissory Note for \$50,000 to a company for payment. The company had no record of such a note and questioned the signatures. The document examiner was asked to examine the originals. The two questioned signatures on the note appeared to be almost identical.

Question

What is significant about two identical signatures?

Answer

No one signs their name exactly the same way twice. Two identical signatures indicate that at least one of the signatures is a copy of the other or that both signatures are copies of a model signature.

Outcome

A transparency was made of the signatures, and when superimposed the signatures matched exactly. Inspection of the original documents revealed they were computer-generated signatures. The signatures were printed on a color copier in blue ink. The edge of the ink contained dots of red and blue ink that revealed its origin.

Questions

1. What hardware is needed to create desktop forgeries?
2. What can be forged on a home computer system?
3. How does a forger fabricate a check?
4. How does a document examiner spot a computer forgery?
5. How can a document examiner determine if a check contains magnetic ink?
6. Why does a document examiner look for perforations on a check?
7. Why should the signature on the front of the check be compared with the endorsement on the back of the check?
8. How can color copies be identified?
9. Discuss the first desktop forgery case investigated by the Secret Service.
10. How can a typewritten document be distinguished from a computer-generated document?

Chapter 26

The Discovery Process

DISCOVERY

Both parties want to know as much as possible about a case before they go to court. In a lawsuit, information is shared through the process of discovery. Discovery consists of pretrial devices to obtain information about the case from the opposing party. Discovery takes several forms, including interrogatories and depositions. A party to an action may be required to answer interrogatories, which are a series of questions from the opposing party requiring written responses under oath. A deposition is a procedure in which an attorney asks oral questions of the other party or witnesses.

SUBPOENA

A subpoena is a summons to appear in court or deposition. Subpoenas are issued to witnesses to ensure they appear to testify. A witness who deliberately ignores a subpoena can be held in contempt of court. The judge can issue a warrant for the arrest of someone who disregards a subpoena.

An expert witness is entitled to be paid for the time spent testifying in deposition or court. In most cases, the attorney who subpoenas an expert must compensate him or her unless other arrangements are made, such as the client paying for travel expenses. The expert witness can request payment in advance. The expert's client pays for any preparation for deposition.

Subpoenas are mailed or served by a process server. When mailed, they are usually certified with return receipt requested to verify that the witness has received the subpoena. In criminal cases the sheriff usually delivers the subpoena. Private process servers handle civil cases.

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Occasionally a witness is subpoenaed unnecessarily, usually in error. The witness should try to resolve this with the attorney. If the witness is unable to do so, he or she may file a motion in court to quash a subpoena.

SUBPOENA DUCES TECUM

A subpoena duces tecum is a court order for a witness to present specific documents relating to the case at hand for inspection either at a deposition or a trial. Expert witnesses are generally required to bring their complete files to a deposition.

DEPOSITIONS

A deposition is an out-of-court hearing of a witness, under oath, posed by the opposing counsel for the purpose of discovering what the witness knows about the lawsuit. A deposition is similar to a court hearing, but it is less formal. There is no judge present. Depositions are frequently conducted in the conference room of one of the attorneys' offices. The questions and answers are recorded by a court reporter.

The primary purpose of a deposition of an expert witness is to determine what the expert's testimony is going to cover when the case goes to court. In addition to collecting information, the opposing counsel is evaluating the strengths and weaknesses of the witness. He or she is looking for any vulnerability the witness may have that can be used to discredit the witness during the trial. The opposing counsel will also look for discrepancies between deposition and court testimony.

According to the Federal Rules of Civil Procedure, "Parties may obtain discovery regarding any matter, not privileged, which is relevant to the subject matter involved in the pending action." Depositions can consist of a request for documents or a request for admissions about some fact of the case, as well as taking a witness's oral testimony.

A request for production of documents covers all methods of documentation or recording devices including information that may be stored in one's computer or on tape. Documents include writings, drawings, graphs, tables, charts, and photographs. It can also include reports, letters of opinion, and the notes a document examiner makes when working on a case.

Sometimes an attorney will schedule a deposition for his or her client's expert when the witness cannot appear in person for a trial. In this type of deposition, the client's attorney will question the expert first, and then the opposing attorney will have an opportunity to cross-examine the witness.

Videotaped depositions are becoming more popular in place of live testimony. The videotapes can be edited and the excerpts presented in court. The

camera remains pointed at the witness during the entire testimony. The attorneys can be heard asking questions, but they are not seen on camera.

An expert witness should meet with the client's attorney prior to giving testimony in a deposition. The purpose of the meeting is to discuss the strengths and weaknesses of the case so there are no surprises when the expert testifies. Any exhibits to be used in the case should be prepared in advance and taken to the deposition.

On completing the deposition, the witness is given an opportunity to read the deposition and make any corrections on an errata sheet. It is advisable to read depositions because court reporters sometimes have difficulty with technical material, and it gives the witness an opportunity to correct any errors the court reporter made. Court reporters do a good job of transcribing the expert witness's testimony but sometimes have trouble with technical terms.

The witness is usually given a copy of the deposition in order to review the testimony and refresh his or her recollection before giving testimony in court. The witness should review the deposition prior to going to court.

EXPERT WITNESSES

An expert witness is anyone who is qualified by actual experience or careful study that has enabled him or her to form definite opinions representing a division of science, a branch of art, or a department of trade about which persons having no particular training or special study will not be capable of forming accurate opinions or deducting correct conclusions.¹ The judge decides who qualifies as an expert.

AUTOMATIC DISCLOSURE OF EXPERT WITNESSES

Federal Rules of Civil Procedure require automatic disclosure of the substance of the proposed expert witness's testimony, including the identity of all experts who may testify at trial with their written reports containing all their opinions and the basis for these opinions. These reports must be written and signed by the expert and must include their exhibits for court as well as the source considered by the expert to support his or her opinions.

The qualifications of experts must also be revealed, as well as a list of all other cases in which the expert has testified in court or deposition in the past 4 years, and a list of the publications authored within the preceding 10 years. Compensation to be paid to the expert must be divulged as well.

¹ *American Jurisprudence, Proof of Facts, Book 17.*

All the documents related to a case are subject to examination by the opposing party. This includes notes made by document examiners when studying a case, drafts of reports, and correspondence with the attorney.

Each state court will have its own rules and regulations that may differ from the Federal, but many courts have adopted the Federal Rules.

EVIDENCE

Evidence consists of all the means by which the alleged fact is submitted to scrutiny in order to determine the truth. Evidence includes the opinion of an expert witness whose conclusions can assist in the discovery of fact.

RULES OF EVIDENCE

The rules of evidence require the production of the original evidence unless a sufficient explanation is given for the failure to produce the original, such as the loss or destruction of the original document. The courts will accept a copy of a document as best evidence if the original is no longer available.

Evidence must be material and relevant. To be material, the facts must relate to the issue of the case in such a way as to inform the court of the truth of the matter at hand. To be relevant, part of the issue of the case must be of sufficient substance to have an effect on the decision of the judge and/or jury.

DEMONSTRATIVE EVIDENCE

A witness may use exhibits, charts, transparencies, and other visual aids to enhance his or her testimony. These visual aids are considered demonstrative evidence. They must be accurate reproductions of the original.

Scanned documents are accepted in court when used as demonstrative evidence to support a witness's testimony. The original should always be present to verify the copy is an accurate reproduction that has not been altered.

QUESTIONS

1. What is discovery?
2. What are some of the forms of discovery?
3. What is a deposition?
4. What is the primary purpose of a deposition?
5. What is a subpoena?
6. What is a subpoena duces tecum?
7. What is an expert witness?

8. What is evidence?
9. What is demonstrative evidence?
10. List some examples of demonstrative evidence.

Chapter 27

The Litigation Process

THE COURTS

The court is responsible for hearing the merits of cases without prejudice. Court cases are either civil or criminal on the state or federal level. Civil cases are those in which an individual, business, or an agency of the government seeks damages or relief from another. They often involve a dispute over a contract or agreement and request a monetary settlement. Criminal action is one brought by the state or federal government against an individual charged with a crime.

The judge presides over the court. He rules on points of law pertaining to trial procedure and on the admissibility of evidence. If there is no jury, the judge becomes the trier-of-fact who will make the decision as to the outcome of the case. A case tried by a judge is called a bench trial.

A jury is a group of peers chosen to examine the matters of fact in a court case and to decide the outcome of the case. The jury consists of 6, 8, or 12 people with 1, 2, or 3 alternate jurors. They are sworn to decide the truth on examination of the evidence. They will be the triers-of-fact in jury cases.

The court clerk administers the oath to the jury and to the witnesses. The court reporter records all the proceedings in the courtroom. Proceedings may be taped or transcribed by a court stenographer.

PREPARATION

A pretrial conference with the client's attorney is essential preparation for a court case. Cases are lost because of lack of proper pretrial preparation.

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The attorney must know the expert's opinion and understand how he or she came to that opinion so the attorney can plan a strategy.

A pretrial conference will also give the witness an opportunity to discuss any problems anticipated. The attorney must understand the strengths and weaknesses of the case in order to overcome any problems that could occur during cross-examination. The attorney may be able to thwart potential problems in direct testimony or rebut them through redirect thereby preventing negative impressions from developing.

An expert witness needs to prepare a list of questions to help qualify him or her in court. These questions are designed to highlight the areas of expertise. These should emphasize the expert's education, apprenticeships, seminars attended, and books read. Any teaching and/or lecturing, books and/or articles written and published, and any other accomplishments that highlight the expertise of the witness should be included.

An expert may be disqualified by lack of sufficient or proper preparation of a case. Experts need to prepare exhibits to graphically illustrate their findings. They need to review their notes, read any deposition they gave in the case, and look for any inconsistencies that need to be explained. They must be prepared to present a testimony effectively to the triers-of-fact through direct testimony and to defend it during cross-examination.

The opposing attorney is going to try to impeach witnesses through cross-examination of the witness's testimony. The expert needs to anticipate the cross-examiner's questions and prepare suitable answers.

SEQUESTERING THE WITNESS

If the lawyer advises the court that he or she is calling for the rule on witnesses, all the witnesses will be sequestered during the trial. Sequestered witnesses are banished from the courtroom and must wait outside until they are called to testify. This prevents collaboration of testimony. Witnesses waiting to testify must not discuss the case with any other witnesses who may also be waiting to testify. The rule on witnesses does not apply to experts in some jurisdictions.

PRESENTING TESTIMONY

A witness is testifying the moment he or she walks into a courtroom. Dress, demeanor, and attitude are under scrutiny before taking the witness stand. The witness's attire should show respect for the court.

A witness is expected to act in a dignified and professional manner at all times. If the witness is not perceived as conforming to proper conduct, his or her credibility will be destroyed.

QUALIFYING IN COURT

Before an expert witness is allowed to testify, qualifications must be presented to the court by answering questions posed by the attorney to support the claim that he or she is qualified in an area that will assist the trier-of-fact in interpreting the evidence before the court. The judge will decide if the expert has the necessary technical knowledge or skill and is qualified. The attorney will question the witness about his or her curriculum vitae to elicit information describing training, experience, and skill in the field of expertise. The expert should have supplied the attorney with a list of qualifying questions before going to court.

The opposing attorney cross-examines the expert to try to prove that the expert is not qualified. Sometimes the opposing attorney will stipulate that an expert is qualified to prevent the expert's background from being entered into the court record. If the opposing attorney objects to the expert being qualified, the judge will rule.

DIRECT TESTIMONY

After the witness has been qualified, his or her client's attorney will ask questions about the case. Attorneys generally begin by asking an expert to describe how he or she analyzes handwriting in a case. After the expert has had an opportunity to explain the methodology, the attorney then asks what was done in this particular case. The attorney sometimes starts by asking what the expert was asked to determine.

The attorney will ask the expert if he or she has come to a conclusion within a reasonable degree of scientific or professional certainty. A witness's testimony will not be accepted if the witness does not have a reasonable degree of certainty.

The next question is, "What is your opinion?" On giving the opinion, the expert will be asked to explain to the court how he or she came to this opinion in this case. The attorney will then introduce any exhibits that the witness has prepared.

The expert is expected to explain his or her opinion to the trier-of-fact, using the exhibits to support this opinion. The attorney may ask additional questions if it is felt the witness has overlooked a point. Once the direct testimony is completed, the opposing attorney has an opportunity to cross-examine the witness.

CROSS-EXAMINATION

The principal purpose of cross-examination is to impeach the witness so that the judge or jury disregards the testimony. The opposing attorney uses cross-examination to try to locate any weak points in a witness's testimony.

The law permits substantial latitude in cross-examination, especially of expert witnesses.

The cross-examining attorney is going to look for any contradictions in statements between deposition and direct testimony in court. The simplest and most frequently used mode of impeachment consists of proving prior inconsistencies in statements made by the witness. The lawyer is required to show the statement to the witness to refresh his or her memory before asking for an explanation. The expert can ask to see the deposition testimony if the material is not offered. If material is taken out of context, the witness should read the entire passage.

If an inconsistent statement was verbal, the cross-examiner will direct the witness's attention to the time, place, and circumstance of the prior inconsistent statement. The attorney then asks the witness if he or she remembers making the contradictory statement.

An expert witness should thoroughly review any previous testimony he or she has given, especially in deposition, before testifying. This will refresh the witness's memory and enable him or her to anticipate any problem areas.

Well-developed answers during cross-examination may strengthen the expert's testimony instead of discrediting it.

REDIRECT

After the cross-examining attorney has finished questioning the witness, the witness may be asked questions by his or her client's attorney to clarify any misconceptions that have arisen. Redirect testimony is used to rehabilitate a witness by allowing for an explanation of his or her answers.

REBUTTAL

A witness may be called as a rebuttal witness after other witnesses have completed their testimony. The witness is usually called to contradict statements made by other witnesses.

COURT RECORD

A record of the court proceedings is usually made in court cases. This record may be recorded on a tape recorder or by a court stenographer. This record is reviewed in appeal's court in cases that are appealed.

THE DISPUTE-RESOLUTION PROCESS

The dispute-resolution process includes court trials and hearings, arbitrations, mediation, or other ways in which disputes between individuals and entities are resolved.

A trial is a judicial examination of issues between parties, whether they are issues of law or of fact, before a court that has jurisdiction over the cause.

A hearing is a proceeding wherein evidence is taken for the purpose of determining an issue of fact and reaching a decision on the basis of that evidence. It usually takes place before magistrates clothed with judicial functions and sitting without jury at any stage of the proceeding subsequent to its inception.

Arbitration is the organized process outside of a courtroom of submitting controversies to persons chosen by the parties bringing them for the purpose of resolving disputes between persons or entities. Their decisions are binding.

Mediation is a voluntary, non-binding process of resolving disputes outside of a court setting. A third party acts as a link between the parties in controversy.

Negotiation is a method of dispute resolution where either the parties themselves or the representatives of each party attempt to settle conflicts without involving the courts and without the aid of a third party.

People in dispute may use any of these processes. Witnesses may be subpoenaed to testify at any of these various types of hearings. Although trials are governed by established procedures and court rules, other forms of dispute resolution are not as formal, and rules regarding the giving of testimony will vary.

QUESTIONS

1. Name the two types of court cases.
2. What is the purpose of a pretrial conference?
3. What does sequestering the witness mean?
4. When does a witness begin testifying?
5. What must a witness do before giving a testimony in direct examination?
6. What is the purpose of cross-examination?
7. What is redirect?
8. What is a rebuttal witness?
9. What is the dispute-resolution process? What does it include?
10. What is a trial?
11. What is an arbitration hearing?
12. What is mediation?
13. What is negotiation?

Chapter 28

Demonstrative Evidence

INTRODUCTION

Demonstrative evidence consists of exhibits that support an expert's opinion. Properly designed, they graphically portray the reasons for the expert's opinion. Models, diagrams, charts, photographs, videos, maps, transparencies, and slides can be used as demonstrative evidence.

Studies show that jurors retain facts longer, maintain attention, and understand information better when it is presented both verbally and visually. Properly formulated and designed visual exhibits are among the materials most easily understood and best remembered by jurors.

Most handwriting cases can benefit from demonstrative evidence. The reason for an expert's opinions should be demonstrated. Most testimony can be enhanced by visual aids. What should be demonstrated?

1. Information that is complex.
2. Important points that need to be emphasized.
3. Side-by-side comparisons of questioned and known signatures.

REQUIREMENTS

The exhibits must be generated by the expert or under the expert's supervision. They should enhance your verbal testimony and the important points that you want to emphasize.

The judge will rule on the admissibility of exhibits. The exhibits must be relevant and material to the case, that is, they must have a connection to the case and they must be significant. They must assist the trier-of-fact in understanding the document examiner's testimony.

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TYPES OF EXHIBITS

Traditionally, document examiners made enlarged photographs and mounted them on a piece of cardboard. This exhibit was placed on an easel in front of the jury. With luck, the members of the jury sitting closest to the exhibit might be able to see the handwriting characteristics that the examiner illustrated. The jurors in the back row may be able to see the handwriting, but they would not be able to see the subtle similarities or differences that are important in handwriting cases.

Some cases lend themselves to courtroom demonstrations using a blackboard or closed circuit television. These demonstrations should be reserved for important points that need to be emphasized. Photographs should be made of the demonstrative evidence so it may be entered into the court record.

PHOTOGRAPHS AND PHOTOCOPIES

Fine details can be better demonstrated in enlarged photographs in jury books, which are notebooks the jurors use to follow the expert's testimony.

Photographs may be marked in advance with colored pens or arrows, or they may be covered with clear plastic Mylar overlays that highlight important points. The expert should always provide unmarked photographs in case the judge disallows the marked photographs.

The simplest exhibit is a photocopy. Photocopies can be enlarged from 1 to 1000%. They are inexpensive and easy to obtain. Photocopies lose detail when enlarged too much. Lines separate and begin to break apart leaving gaps. Photocopies are ideal when they do not have to be enlarged more than 400 to 500%.

Photocopies are becoming the first choice of many examiners for making exhibits. Care must be taken to accurately portray the evidence since photocopies can be easily distorted and altered. Photocopies can be produced more quickly and less expensively than photographs. They are especially useful for creating exhibits for side-by-side comparisons.

Some problems cannot be illustrated with photocopies. For example, it is not possible to determine line sequence from photocopies. The direction of the writing line usually cannot be ascertained from a photocopy. Line value is reduced and details are obscured on multi-generation photocopies.

It is important to work with the earliest generation photocopy available and to make copies from the earliest generation so that the evidence can be clearly demonstrated. Subtle details may be lost when copies are made from copies.

Color photocopies are easily obtained and may prove useful in many cases. When documents have different color background and/or ink, the colored copies help to identify the source documents.

Photocopies can be made from photographs. Photocopies made from enlarged photographs will show more detail than photocopies made from photocopies.

SCANNERS

An alternate method of creating exhibits is now available. Scanners attached to computers enable document examiners to scan their documents into their computers, enlarge them, rearrange them, label them, and print them in one operation. This method is easy but time-consuming. Results are dramatic when the documents are printed on photographic paper.

DIGITAL CAMERAS

Digital cameras are popular for photographing documents and producing exhibits. An image can be imported into a computer and placed into an exhibit in a similar manner to a scanned document. The exhibit can be printed on photographic paper.

COMPARISON CHARTS

Side-by-side comparison charts can be made from letters or words cut from photocopies or photographs or electronically. Sometimes a questioned signature is placed at the top of the page with the known signatures underneath. Explanations of the features illustrated can be added to the exhibits or listed on a separate sheet and attached to the exhibit.

Some exhibits benefit from positioning the letters and words in the same arrangement as the questioned document. This is especially useful when the original material is misaligned.

PRESENTATION OF EXHIBITS

Once the photographs, photocopies, or scanned documents are selected as exhibits, the expert must decide what method to use to display his or her exhibits. Exhibit displays may be hand-held enlargements, transparencies for overhead projectors, slides, or large charts on easels. There are advantages and disadvantages to each type of exhibit.

EXHIBIT BOOKS

Photographs and photocopies can be organized into booklets. They can be spiral-bound into a booklet when using photocopies. Copier services and office supply stores can provide spiral binding. A plastic cover and a cover

page add a professional touch. Various types of binders for reports are available from stationery stores.

If the number of exhibits is very large, a loose-leaf binder can be used to hold exhibits. Dividers can be placed in the binders to make it easier to locate documents. There are generally pockets in these binders that can be used to hold transparencies or a small measuring device, if needed.

The major disadvantage to hand-held exhibits is that the triers-of-fact may not be able to follow the witness. They may have difficulty finding their place. It is important for the witness to make sure the judge or jurors are looking at the proper exhibit. The witness should hold up the book toward the jury and tell them the page number so they can find their place.

TRANSPARENCIES

Transparencies can be made of any exhibits. These can be distributed with hand-held exhibits, or they can be used with an overhead projector. Transparencies are especially useful when demonstrating tracing or cut and paste. A laser pointer can be used to pinpoint important details.

POWER POINT

Power Point presentations are made from computer images. Experts can use Power Point demonstrations in court to enhance their testimony. Power Point is a computer software program that makes it easy to use exhibits. All the exhibits can be stored in the computer and easily retrieved during testimony.

CHARTS

Charts can be made by enlarging documents or comparisons and mounting them on foam board or tag board. Charts are usually placed on an easel near the jury and are frequently left there throughout the trial. The witness can point to important areas for the jury. The chief disadvantage is that all of the jurors may not be able to see the details from a distance and large charts are awkward and difficult to carry.

PREPARING EXHIBITS

There are some basic rules to follow when making exhibits, regardless of the type of exhibit that is made. First, a copy of all the source documents should be included with the exhibit. All exhibits should be clearly marked to indicate the source of each letter or word used for comparison.

Documents can be numbered sequentially using Q for questioned (Q-1, Q-2) and K for known (K-1, K-2). If there are many documents and some can be grouped, such as a group of checks, you may want to number them with a letter for the subset (Q-1A, Q-1B). Use a method that makes it easy to refer to the documents involved (Fig. 28.1)

Each word or letter on your comparison charts should indicate its source. For example, if you use a word from Q-1, page 1, line 5, mark your chart Q-1, Page 1, Line 5. Anyone can instantly locate the word in context in the original document. Your exhibits could be rejected if you do not identify your sources.

Keep your exhibits simple. Use one idea per page or per chart. You may mark your exhibits to highlight a point that you want to make. Be sure to have an unmarked copy with you. The marking of an exhibit should be professional. Mark only a few characteristics. Too many marks on the exhibit will cause confusion.

People remember 10% of what they hear, 50% of what they see, and 90% of what they are involved in. If the members of a jury can follow your testimony with exhibits, they will understand your testimony better. And if you can get them actively involved in the case, they will remember significantly more.

Your exhibit books should contain a table of contents with each page numbered and titled for easy location. Copies of the documents are included so that the jury can refer to the source. You cannot go into the deliberating room with the jury to explain your exhibits. They must be self-explanatory.

DEMONSTRATIONS

Some situations benefit from live demonstrations by the expert witness. The form of a letter can be emphasized by illustrating the letter on a blackboard or easel. A demonstration by an expert can be shown on a closed-circuit television with the jury watching a television screen while the expert shows the details from the witness box. Juries enjoy demonstrations that are straightforward and easy to understand.

Live demonstrations need back-up exhibits to enter into the court record. If the expert is illustrating a point in court, it is better to use a permanent method of maintaining the exhibit. For example, a blackboard is easily erased and the demonstration is gone. A large sheet of paper is more permanent and can be placed in the court record.

IN THE COURTROOM

The expert witness must maintain control of the exhibits at all times. You should organize them and mark them for easy retrieval. Jury books should


















QUESTIONED	KNOWN
 Q-1  Q-1	 K1-L16
 Q-1  Q-4	 K1-L15
 Q-4	 K1-16
 Q-4	 K1-L6
 Q-3	 K1-L16  K-L16
 Q-3	 K1-L11
 Q-3	 K1-L6

Fig. 28.1. An exhibit showing questioned and known letters and numbers placed sequentially to make comparison easier.

contain a table of contents. The pages should be numbered. All exhibits should be properly labeled for easy identification. Properly prepared exhibits will enhance an expert's testimony and should be kept before the trier-of-fact after the expert has left the witness stand.

Equipment should be set up during a break in the proceedings. Equipment must be easily set up and suitable for the courtroom. It can be taken down during a break in the proceedings.

A witness is testifying as soon as he or she enters the courthouse. The impression a witness makes before and after taking the witness stand can be as important as the actual testimony that is given.

Properly prepared exhibits will enhance the expert witness's testimony. Exhibits continue to testify for the witness after the witness completes the testimony and leaves the courtroom. Most cases benefit from demonstrative evidence.

QUESTIONS

1. Why should an expert use exhibits?
2. What should be demonstrated?
3. What are the advantages of photographs as exhibits?
4. What is the simplest type of exhibit?
5. What types of problems cannot be illustrated with photocopies?
6. Describe some types of comparison charts.
7. What are some of the ways that exhibits can be presented in court?

Chapter 29

Court Cases

INTRODUCTION

Document examiners should be familiar with court cases affecting expert witnesses and handwriting issues. The Federal Rules of Civil Procedure list the criteria for expert witnesses.

ADMISSION OF EXPERT TESTIMONY

Federal Rule 702

If scientific, technical or other specialized knowledge will assist the trier-of-fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training or education may testify thereto in the form of an opinion or otherwise, if the testimony is based upon sufficient facts or data, the testimony is the product of reliable principles and methods, and the witness has applied the principles and methods reliably to the facts of the case.

Federal Rule 703

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied on by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.

Before 1993, the Frye Rule was the guideline for admitting expert testimony. Under *Frye v. United States*, the court would admit expert testimony

From: *Forensic Document Examination: Principles and Practice*
By: K. M. Koppenhaver © Humana Press Inc., Totowa, NJ

deduced from recognized scientific principles. These principles had to have gained general acceptance by the scientific community.

Daubert v. Merrell Dow Pharmaceuticals changed the threshold for expert testimony. The factors that must be considered in determining admissibility of scientific evidence under *Daubert* include:

- Whether the theory can or has been tested.
- Whether the theory has been subjected to peer review in publication.
- The known or potential rate of error.
- The extent of acceptance in the relevant scientific community.
- Compliance with the hearsay exception.
- Balance of probative value versus prejudicial effect.
- Reliable (grounded on scientific methods and procedures supported by appropriate validation).
- Relevant (sufficiently tied to the facts of the case to be helpful to the jury).

In determining whether an expert's declaration meets the requirement of reliability, the court will consider such factors as:

- The expert's testimony grows out of pre-litigation research (the most persuasive method).
- The expert's (post-litigation) research has been subjected to scientific scrutiny through peer review and publication in scientific journals.
- A precise explanation of how the experts reached their conclusions in sufficient detail to allow the district court to determine reliability of the research (e.g., by pointing to some objective source or scientific journal to show they followed a method practiced by at least a recognized minority of scientists in their field).

CITATIONS PREVENTING EXPERTS FROM TESTIFYING

Attorneys sometimes file motions in limine to prevent a document examiner from qualifying in court as an expert. These motions are frequently related to the requirements of *Daubert*. Attorneys may object on the basis that the expert does not have the required training or expertise in the field of document examination. This argument is frequently used against graphologists who go into court as document examiners.

Some attorneys challenge the field of handwriting identification, saying there is no proof that a document examiner can identify handwriting or that handwriting analysis is a valid field of science. They claim there is a lack of validation studies to support the ability of an expert to identify handwriting.

Although a few courts have not allowed document examiners to express an opinion, in most cases handwriting identification is recognized as a valid skill and document examiners who have been trained are recognized as capable of rendering an opinion regarding the identification of handwriting.

REQUEST WRITING

Many cases require request writing samples. In *Gilbert v. California* in 1967, the Supreme Court determined that request writing exemplars are identifying characteristics not protected by the Fifth Amendment. There is no constitutional protection for what a person routinely and knowingly exposes to the public.

Although some courts have supported the Fourth Amendment protection of privacy regarding handwriting exemplars, most have not, and currently defendants are required to provide handwriting samples. Defendants have been found in contempt of court for refusing to provide samples and were sentenced to jail time as a result.

Courts have stated that the refusal to comply with court-ordered exemplars infers that the defendant is guilty. Disguised exemplars are also indications of guilt, and handwriting examiners are allowed to testify that handwriting is disguised.

There are many other court citations relating to handwriting and to expert witnesses with new decisions being made by various courts. Document examiners need to keep abreast of the latest developments in the field of document examination.

QUESTIONS

1. According to Federal Rule 703, what qualifications does an expert witness need in Federal court?
2. What factors must be considered in admitting scientific evidence?
3. Why might an attorney file a motion in limine?
4. What criteria are considered for an expert's testimony to be admitted in court?
5. Can a defendant be forced to give handwriting samples?

Appendix A

Fundamental Truths About Handwriting

1. The act of writing is a skill learned through repetition until it becomes a habit.
2. Handwriting requires the concerted effort of the brain, muscles, and nerves.
3. No two people write exactly alike.
4. Individual characteristics that are unique to a particular writer exist in every person's handwriting, distinguishing it from every other handwriting.
5. There is natural variation in everyone's handwriting.
6. No one can exactly duplicate anything he or she has written.
7. No one can write better than his or her skill level.
8. People adopt writing styles.
9. People stylize their writing, deviating from the method they were taught.
10. Many writing habits are subconscious and therefore cannot be changed by the writer.
11. A writer can be identified by his or her subconscious habits.
12. A person's normal form of writing is based on mental images of learned letter designs.
13. A person's handwriting changes over the course of his or her lifetime.
14. Substance abuse affects handwriting.
15. Some illnesses, trauma, and emotions may result in changes in handwriting.
16. It is not possible to determine what caused a change in the handwriting from studying the handwriting characteristics.
17. If the writer places the pen on the paper before starting to write, the lines will have blunt initial strokes.
18. If the writer stops the pen before lifting it from the paper, the writer will leave a blunt ending on the words.
19. If the writer has the pen in motion when beginning and ending writing, the initial and terminal strokes will be tapered or faded.

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20. When a writer changes the size of his or her writing, the proportions between uppercase and lowercase letters generally remain the same.
21. The amount of pressure that a writer uses to push and pull the pen through the strokes of writing will be seen in the variations of the pressure patterns.
22. Most people create heavier strokes when the pen is descending and lighter strokes when the pen is being pushed away from the writer.
23. The writing surface affects the depth of pressure.

Appendix B

Principles of Handwriting Identification

1. Identification requires differentiating the natural variation of a writer from another writer.
2. Writing can be identified as belonging to an individual when there are sufficient common characteristics of writing habits and no basic structural differences.
3. Any major structural difference in writing is sufficient to prove that the writing being compared does not belong to the same writer.
4. One distinctive characteristic is not sufficient to identify a writer.
5. Handprinting and numerals can be compared and identified like handwriting can be.
6. Imitated writing intentionally bears resemblance to the writing from which it is being copied.
7. Imitated writing is usually drawn, not written.
8. Drawn writing generally lacks pressure variations.
9. Imitation tends to conform closely to a fixed form and does not display the unconscious abandon that produces natural variation in genuine writing.
10. Exact duplicates of original signatures can only be obtained by copying the original signature usually by cutting and pasting it manually or electronically.
11. A tracing may have less detail than the original from which it is traced.
12. A tracing may deviate from the original owing to slippage of the tracing paper or the deliberate moving of the paper to distort the copy.
13. No one can duplicate all of the intricate subconscious writing habits of another in an extended writing sample.
14. Some people are highly skilled in imitating other's hand writing.
15. Freehand simulations by a skilled writer can be difficult to detect because obvious signs of forgery may not be evident.
16. Obvious signs of forgery include patched writing, hesitation as revealed by ink blobs, pauses in the writing, tremor causing poor line quality, and erasures.

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17. Presence of any of the signs of forgery does not suffice to indicate that the document in question is not genuine because any of the signs could be part of the writer's normal habits.
18. Blunt initial and/or terminal strokes can indicate forgery, but the presence of blunt strokes is not proof of forgery.
19. Determination of lack of genuineness depends on multiple factors, that is, more than a single indicator.
20. Individual characteristics in writing are deviations from class characteristics and are valuable in determining the identity of the writer.
21. The more diverse and unusual the accumulation of mutual characteristics and individual handwriting habits, the more positive the identification of the writer.
22. Forgers make mistakes.
23. Forgers tend to copy the pictorial effect of the writing, but they overlook the idiosyncrasies and subtle habits of the writer.
24. It is impossible to maintain a successful simulation of a lengthy document. The more written, the more the writing reverts back to the natural characteristics of the writer because concentration wanes.
25. In comparison of handwriting, it is necessary to compare line quality, pressure patterns, letter forms, initial and terminal strokes, connecting strokes, diacritics, t-bars, punctuation, spacing, proportions, idiosyncrasies, slant, alignment, and any hooks or ticks on letter forms.
26. Some characteristics that are not taught in any penmanship system have become class characteristics because many writers share them. An example would be a Greek epsilon (ϵ).
27. Family members frequently share handwriting characteristics.
28. There can be striking resemblances between two individual's handwritings.
29. It is not possible to identify a writer if there is a lack of sufficient materials for comparison.
30. A writer can intentionally alter or distort the appearance of his or her normal writing.
31. Some characteristics of the writer will be evident even when a writer alters or distorts his or her handwriting.
32. The average writer cannot maintain the intense concentration needed to maintain a disguise through extended writing samples. The more he or she writes, the more the writing reverts back to his or her natural characteristics.
33. Numerals and punctuation are rarely disguised.
34. Disguise is rarely consistent.

Appendix C

Twentieth-Century Handwriting Systems

- Lyon LH. *Applied Penmanship*.
Stone, Smalley, Cooke. *Basic Handwriting*.
Noble. *Better Handwriting for Everyone*. Noble & Noble Publishers Inc.; 1962.
Sapp G. *Business Alphabet*.
Hausam, Eppler, Whittaker, Moses. *Children's Handwriting Guides*.
Boone. *Colonial Writing Elements*. Spache Series.
Freeman FN. *Correlated Handwriting*.
Courtiss SA, Shaw LS. *Courtiss Handwriting*.
Creamer. *Creamer Practical Writing*.
Thruher. *D'Nealian Handwriting Method*.
Pwers JF. *Economy System or Economy Method*.
Kirk JG, Freeman FN. *Functional Handwriting*.
Hill, Savage. *Handwriting Made Easy*.
Cavanaugh, Myers. *Handwriting for Expression*.
Hawaii English Program
How We Write by Harlow Publishing Company
Veal, Davidson. *I Learn to Write*. Seale and Company.
Townsend R. *Imaginary Line Writing*. The Steck Company.
Kittle R. *Kittle Method*. Topeka, KS.
Stone, Smalley. *Manuscript Basic Handwriting*.
Lister EC. *Muscular Movement Writing*.
Billington, Shaffelbach. *Our Handwriting*. Wagner Publishing.
Palmer AT. *Palmer Method of Business Writing*.
Wagner H. *Peterson Directed Handwriting*.
Peterson JO. *Plainer Penmanship*.
Goodfellow RC. *Practical Movement Handwriting*.
Graves MB. *Progressive Handwriting Guidance*.

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Rinehart. *Rinehart Functional Handwriting System*.
Smithdeal GM. *Smithdeal's Practical and Progressive Writing*.
Spencer PR. *Spencerian*.
Tamblyn. *Tamblyn System of Business Handwriting*.
Teaching Handwriting. Board of Education New York.
Peed EG. *The Write-Well Handwriting*.
Kelly E, Morriss E. *Writing and Composition*.
Locker WC. *Your Own Writing*.
Zaner CP, Bloser EW. *Zaner and Bloser*.

Appendix D

Alphabets Based on the Roman Alphabet

GERMANIC ALPHABETS

English Alphabet

United States
Canada
The British Isles
Australia
New Zealand
South Africa

German Alphabet

Liechtenstein
Switzerland (part of)
Austria
Belgium (part of)
Germany

Dutch Alphabet

The Netherlands
Belgium (part of)

Danish Alphabet

Denmark

Norwegian Alphabet

Norway

Swedish Alphabet

Sweden

Finnish Alphabet

Finland

Icelandic Alphabet

Iceland

Afrikaans

South Africa

ROMANCE LANGUAGES

French Alphabet

France
Monaco
Switzerland (part of)

Italian Alphabet

Italy
Switzerland (part of)

Portuguese Alphabet

Portugal
Brazil

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Romanian Alphabet

Romania

Spanish Alphabet

Spain

SOUTH AMERICAN COUNTRIES:

Argentina

Bolivia

Chile

Colombia

Ecuador

Paraguay

Peru

Uruguay

Venezuela

CENTRAL AMERICAN COUNTRIES

Mexico

Costa Rica

El Salvador

Honduras

Nicaragua

Panama

Parts of the caribbean

***NON-GERMANIC ROMAN
ALPHABETS******Celtic Alphabet***

Ireland

BASED ON THE GREEK ALPHABET***Cyrillic Alphabet***

Bulgaria

Russia

Ukrainian

Baltic countries

Lithuania

Latvia

Mongolia

Greek Alphabet

Greece

Turkey (Arabic)

Cyprus (Cyrillic)

Crete (Roman)

NON-GREEK ALPHABETS***Albanian Alphabet***

Turko-Arabic

Armenian Alphabet

Armenia

Middle East

Hebrew Alphabet

Israel

SLAVIC ALPHABET

Czechoslovakia

Hungary

Poland

Yugoslavia

NON-ALPHABET WRITING***Indian Writing
and/or Sanskrit***¹

Afghanistan

India

Pakistan

Tibet

Bangladesh

Nepal

Sri Lanka

¹ Many different local alphabets are used.

ORIENTAL WRITING SYSTEMS

Chinese Writing System

Pinyin Zimu

Japanese Writing System

Kanamarjiri

Korean Alphabet

Han'gul

Thai (Siamese)

Thailand

Burma

Kampuchea (Cambodia)

Laos

Northern Vietnam

Arabian Writing System

MIDDLE EAST

Iran

Iraq

Jordan

Kuwait

Lebanon

Saudi Arabia

Syria

Turkey

AFRICA

Algeria

Egypt

The Sudan

Nigeria

Kenya

Botswana

Zambia

Zimbabwe

Plus other countries in Africa

except South Africa and Ethiopia

Ethiopian Alphabet

Ethiopia

Other Alphabets

Cherokee

Hawaiian

Appendix E

101 Places to Search for Documents

1. Account books
2. Affidavits
3. Assignments
4. Autographs
5. Automobile insurance papers
6. Automobile license papers (MVA)
7. Automobile title papers (MVA)
8. Bank deposit slips
9. Bank safe deposit entry slips
10. Bank savings withdrawal slips
11. Bank signature cards
12. Bank statements, receipts for
13. Bible entries
14. Bills of sale
15. Bonds
16. Books, signatures of owners
17. Building after hours registers
18. Business license applications
19. Charity pledges
20. Check book stubs
21. Checks including endorsements
22. Church pledges
23. Convention registrations
24. Contracts
25. Cooking recipes
26. Corporation papers
27. Criminal records
28. Credit applications
29. Credit cards and charge slips
30. Deeds
31. Deeds of trust
32. Depositions
33. Diaries
34. Divorce papers
35. Dog license applications
36. Drafts
37. Drive-it-yourself applications
38. Driver's licenses and applications
39. Druggists' poison registers
40. Employment application
41. Envelopes, addresses
42. Fishing licenses
43. Funeral attendance registers
44. Gas service application
45. Gate records at defense plants
46. Greeting cards
47. Hospital papers
48. Hotel and motel guest registers
49. Hunting licenses
50. Identification papers
51. Inventories
52. Leases, real property

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53. Letters, personal and business
54. Library card applications
55. Light company applications
56. Life insurance papers
57. Loan papers
58. Mail orders
59. Manuscripts
60. Marriage license papers
61. Medicare cards and papers
62. Membership cards: social, occupation
63. Memoranda of all kinds
64. Military papers
65. Mortgage papers
66. Newspaper/magazine subscriptions
67. Occupational writing
68. Package receipts
69. Parent's signatures on report cards
70. Partnership papers
71. Passports
72. Pawn tickets
73. Payroll receipts
74. Pension applications
75. Permit applications
76. Petitions, referendum, etc.
77. Photograph albums
78. Pleadings, civil and criminal
79. Postal cards
80. Probate court papers
81. Promissory notes
82. Property damage reports
83. Receipts for rent
84. Registered mail return receipts
85. Releases
86. Rental contracts for equipment
87. Reports
88. Sales slips
89. School and college papers
90. Social security cards and papers
91. Sport and game score cards
92. Stock certificates, endorsements
93. Surety bonds application
94. Tax returns and estimates
95. Telephone service applications
96. Time sheets
97. Traffic tickets
98. Voting registration records
99. Water company service applications
100. Wills
101. Workman's compensation papers

Appendix F

Important Dates

- 1714 Henry Mills devised the typing machine. He received a Royal Letters Patent from Queen Anne.
- 1808 Pellagrino Turri invented the first known typing machine.
- 1829 William Burt was first the American to receive a patent for a letter press machine, the precursor of our typewriters.
- 1841 Alexander Bain received a patent for the invention of the typewriter ribbon.
- 1843 Charles Thurber received a patent for a writing appliance.
- 1867 Christopher Sholes and Carlos Glidden developed a machine called a typewriter. It was the first practical commercial machine.
- 1870 First check protector developed.
- 1872 Edison patented an electrically driven typewriter.
- 1873 The Remington Company assembled the first production model of the typewriter.
- 1876 Mark Twain was the first author to write his book on a typewriter. He used a Remington.
- 1881 Lucien Crandall developed the second typewriter to be manufactured in the United States. This was the precursor of our single-element typewriter.
- 1891 Sir Arthur Conan Doyle wrote about typewriter identification in his Sherlock Holmes story, "A Case Of Identity."
- 1893 First typewriting case to go to court, *Levy v. Rust*, 49 Atl. 1017 (New Jersey).
- 1915 First modern check writers manufactured.
- 1937 Patent for dot matrix printhead consisting of 30 wires.
- 1944 IBM introduced the first proportional typewriter.
- 1961 IBM introduced the Selectric 1 Typewriter with the "golf-ball" typehead.
- 1962 Polyester Carbon Ribbon introduced by IBM.

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- 1965 Inkjet printer patented by Paillard of Sweden.
- 1970 Dot matrix printers introduced.
- 1973 First laser printer introduced.
- 1973 IBM Correctable Lift-off tape introduced.
- 1974 First daisywheel printer with 45 cps.
- 1977 First daisywheel word processor comes on the market.
- 1977 Thimble printer introduced.
- 1978 IBM introduced electronic typewriter with element of 96 characters.
- 1982 Computers used nine-pin dot matrix printer. Graphics printer introduced.
- 1983 IBM PC Color printer introduced.
- 1984 Laser first available to public.

LIQUID PAPER

- 1951 Bette Nesmith invented Mistake Out, tempera waterbase paint.
- 1956 Name changed from Mistake Out to Liquid Paper.
- 1960 Ko-Rec-Type introduced by Eaton Allen Corp.
- 1965 Wite Out

POST-IT NOTES

- 1980 3M first nationally marketed Post-It notepad.
- 1983 New size 2 × 3 in five colors.
- 1983 Started labeling the backside of each paper with 3M logo.
- 1985 Logo changed to Post-It notes.
- 1989 Post-It tape flags.

CARBON PAPER

- 1806 Ralph Wedgewood invented carbon paper using beeswax, lampblack, and grease.
- 1900 Carbon paper first coated with carnauba wax from Brazil.
- 1939 First patent for carbonless process by National Cash Register.
- 1954 National Cash Register introduced carbonless paper to the public.

Appendix G

Qualifying Questions

Adapt these questions to your specific qualifications.

1. What is your profession?
2. What type of college degree do you have?
3. What specialized training have you had?
4. What type of proficiency testing have you taken?
5. What is your rate of accuracy?
6. What professional organizations of document examiners are you affiliated with?
7. What books have you read on document examination?
8. How long have you been working as a professional handwriting expert?
9. What books or articles have you written in the field of questioned documents?
10. What seminars have you participated in?
11. How many cases have you handled?
12. How many times have you testified in court and deposition?
13. In what courts have you had occasion to testify concerning questioned documents?
14. Have you testified in this court before?

If certified, add questions about certification:

1. By whom were you certified?
2. What requirements did you meet in order to be certified?
3. How often must you be recertified?

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Appendix H

Recommended Reading

HIGHLY RECOMMENDED READING

- Bradford RR, Ralph B. *Introduction to Handwriting Examination and Identification*, Nelson-Hall: Chicago, IL, 1992. Includes “Who’s Who” of document examiners, check classification system, check protectors and fingerprints.
- Harrison W. *Suspect Documents*. Nelson-Hall: Chicago, 1981. This book is a reprint of the 1958 edition published by Praeger, New York, NY. Excellent study on disguised writing.
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- Huber R and Headrick AM. *Handwriting Identification, Facts and Fundamentals*. CRC Press: Boca Raton, LA, 1999.
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Glossary A

Handwriting Terms

Abecedarian: the *a, b, c* names given to the letters of our alphabet.

Absorption: method by which paper soaks liquid ink into its fibers.

Abrasion: method used to erase ink or graphite from the writing surface.

Adhesion: method of transferring material from a writing instrument onto the paper, such as graphite from pencils.

Accidental: abnormal stroke caused by the writer being jolted or bumped when writing, or a similarly occurring accident.

Alignment: arrangement of writing on a line.

Allograph: a writing or signature done by an individual for one incapable of executing his or her own, or the type of letter being executed, or style of letters such as printed or cursive.

Ampersand: symbol used as an abbreviation for the word “and.”

Angle: an abrupt change of direction of the writing stroke.

Annotations: notes in the margin.

Arcade: arch-like strokes in writing.

Arch: an arcade form in the body of a letter.

Arrangement: the method of placement of words on documents, such as checks, letters, and envelopes.

Ascenders: strokes of letters that ascend above the middle zone of the lowercase letters, as in *b, d, f, h, k, l,* and *t*.

Ataxic movements: poorly controlled movements resulting from lack of motor control.

Bars: arms or limbs of letters used in the construction of certain letters, such as t-bars and crossbars on *H* and *A*.

Baseline: the ruled or imaginary line on which letters rest.

Blob: an ink spot resulting from the pen resting on the paper momentarily before beginning or continuing the writing act.

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Block letters: uppercase printed letters.

Blunt strokes: untapered strokes as a result of pen being placed on paper before movement begins or left on the paper until the writing ends.

Body of a letter: main part of the letter without lead-in or terminal strokes or diacritics.

Boustrophedonic: writing that goes from right to left, turns around at the end of the line and returns from left to right.

Bradygraphica: slow writing.

Buckle: indentation on down stroke of printed *R* and written *K*.

Chirographer: a writer.

Chirographic: relating to handwriting.

Chirography: art of writing, handwriting.

Class characteristics: handwriting characteristics that are common to a group of people who have been taught a particular system of penmanship.

Connecting strokes: strokes that join letters together in cursive writing, also called ligatures.

Consciously written: written with an awareness of the act of writing on the part of the writer, close attention has been paid to the act of writing.

Cross mark: mark made by a person unable to write his or her signature.

Cuneiform: a form of writing predating the alphabet, so named because the strokes are wedge-shaped.

Cursive movements: connectors for letter forms, also called ligatures.

Descenders: parts of letters that descend below the baseline, as in *f*, *g*, *j*, *p*, and *y*.

Deviations: in genuine writing, the normal variations in the writing of an individual; in forged writing, the differences from the known writing.

Diacritic: an accent mark used over letters found in foreign alphabet systems that changes pronunciation.

Disguised writing: writing with an attempt to conceal the writer's identity by changing characteristics of writing.

Divergence: deviation from the copybook standards.

Document: anything of substance that bears writing in ink or pencil. It may be typed, printed, or even a copy of another document.

Electronic recording method of accounting (ERMA): the magnetic routing number at the bottom of a check.

Elements: the constituent parts of letters and figures.

Embellishment: ornamentation not necessary to the design of letters of the alphabet.

Epigraphy: the recording of ancient languages on stone, clay, metal, bone, ivory, or similar material. It is also the study of written matter recorded on hard or durable material.

Exemplar: known handwriting sample used for comparison with a suspect document to determine authenticity, also called a standard.

Eyelet: a small loop used in the formation of letters.

Familial characteristics: those handwriting characteristics shared by members of a family.

Feathered strokes: serrated lines on letters.

Filiform script: cursive writing that trails into a line without distinguishable letter forms, resembling a thread or filament, also called thready writing.

Flourish: embellishment of letters by decorative strokes.

Flowback: result of one line of ink crossing another where the ink runs back over the line.

Fluency: (or fluidity) smooth flow of the writing line.

Foot: the part of the letter that rests on the baseline, also called base of the letter.

Form: the shape of the letters.

Freehand: written without guidance; a freehand forgery is one in which the forger copies the letters without tracing them.

Garland: *u*-shaped strokes of writing used primarily to connect letters in a word.

Glob of ink: *see* blob.

Goop or gooping: phenomenon caused by ballpoint pens when they go around a curve in writing. The ink collects on the housing of the ball of the pen and is dispersed onto the paper in an excessive amount at that point on the writing line.

Graphic maturity: level reached when all movement is made from the habituated neuromuscular patterns.

Grapheme: letter of the alphabet.

Graphology: the science of determining personality from handwriting characteristics.

Handwriting system: copybook method of writing; penmanship system taught.

Headline: the imaginary line to which the average tops of the small letters reach.

Hiatus: space or breaks between letters in a word.

Hieroglyphics: word-syllabic writing system developed by the Egyptians around 3000 BC; it consists of pictographs or ideograms to represent words.

Holograph or hologram: handwritten document prepared entirely in the handwriting of the person who signs it.

Hook: a small curve made as part of a letter, frequently involuntary.

Horizontal alignment: the arrangement of the letters in relation to the baseline of writing.

Horizontal bar: a stroke made parallel to the baseline as part of the letter as in *A*, *E*, *F*, *H*, and *T*.

Ideographs: ways of expressing ideas using pictures.

Individual characteristic: a characteristic in handwriting that deviates from the standard method of writing as taught in penmanship systems.

Initial strokes of writing: first or beginning strokes.

Inscriptive movements: movements that create the letter formations.

Intersection: the point where two lines cross each other.

Italic: slanted writing based on the Roman system of writing.

Junction: meeting of two lines that do not cross.

Labored writing: writing produced with difficulty or strain.

Ligatures: connecting strokes between letters in cursive writing.

Line quality: visible record of the line showing the skill level of the writer by its smoothness or irregularity.

Line value: another name for line quality.

Logographs: (or word writing) expresses ideas by using signs for words.

Logosyllabic: (or word-syllabograms) syllabic signs that composed words, enabling the Sumerians to express ideas and abstract words, as well as proper nouns.

Loop: two opposite curves united at one end in a turn and at the other in an intersection.

Some of the cursive letters are composed of either upper loops or lower loops except for the letter *f*, which contains both an upper and lower loop.

Lower loop: loop of a letter that descends below the baseline and returns to it, as in *f*, *g*, *j*, *p*, and *y*.

Lower zone: area below the baseline containing letters with loops that descend below the baseline in cursive writing.

Manuscript writing: another name for hand printing.

Margins: area between the edges of the paper and the written text.

Master pattern: all the writing habits of an individual writer, range of writing.

Medial letters: letters located in the center of a word.

Metagraphics: symbols understood even though they have no conventional counterpart in speech; e.g., footprints to illustrate walking, sawing wood for snoring. Punctuation marks are metagraphic.

Middle zone: area immediately above the baseline containing the lowercase letters that do not have ascenders.

Model signature: genuine signature used to copy or trace a forged signature.

Movement: method in which the writing instrument is moved across the paper. Movement can be finger, hand, and/or wrist movement or full-arm movement.

Oval: body of the small circle letters.

Paleography: methods of recording ancient languages on papyrus, paper, and wax, also the study of ancient writing.

Palimpsest: refers to legal, historic documents that contain writing over an erasure.

Paragraphics: *see* metagraphics.

Paraph: *see* rubric.

Patching: retouching strokes of writing, usually by a forger who wants to improve the appearance of the writing.

Pen lifts: unnatural places where the pen is lifted from the paper.

Pen position: the position the pen is held during the act of writing.

Pen pressure: force with which the pen is in contact with the paper.

Penmanship: the art of writing letters of the alphabet and words according to specified rules regarding form, proportion, and joining of particular strokes and letters.

Petroglyphs: rock inscriptions made during the Stone Age and the Bronze Age.

Pictographs: symbols representing objects.

Pressure: the grip of the writer on the writing instrument and the force of the writer while pressing the writing instrument against the paper.

Proportion: relationship in height and width of the letters in relation to each other particularly uppercase and lowercase and looped and non-looped letters.

Punctuation: marks used in writing to separate ideas such as phrases and sentences. These include periods, dashes, brackets, parentheses, colons, semi-colons, commas, hyphens, apostrophes, and quotation marks.

Questioned document: any document or item in which an issue has been raised; synonymous with disputed document.

Range of writing: normal variations found in an individual's handwriting.

Rebus writing: writing where a sign stands for a phonetic combination.

Reticles in optics: refer to very fine measuring lines in the focus of optical instruments. Some magnifiers and microscopes have them built in, others do not.

Rhythm: refers to the even return to the baseline by a writer.

Rongorongo: a pictorial script of Easter Island.

Rubric: a flourish under or after a name written as a signature. Ancient meaning was a red ornamental letter at the head of a division of a manuscript.

Sans serif: literally "without lines," any type face that does not have a serif.

Serif: additional line at the top and bottom of letters or at end of curves on type styles having nothing to do with the basic letter formation.

Signature: the writing of a person's name by that person to enter into a contract or to identify the signer.

Simplified letter forms: letter forms without ornamentation or extraneous strokes. Letters reduced to their most basic forms.

Similarities: resemblances between like letter forms.

Simulation: imitation of the writing of another person.

Skill level: the ability or competence of a writer.

Slant: angle of writing in relationship to the baseline, also called slope.

Spacing: distance between letters, words, and lines of writing.

Spoliation: the destruction or alteration of a document by a person not authorized to do so.

Spur: short, straight writing stroke in a letter.

Spurious writing: nongenuine writing. A spurious signature is a nonauthentic signature of a person. Forged writing is spurious.

Staff: shank or stem, basic downstroke of a letter.

Standards: known writing samples of a writer; also typewriter characters from a specific machine. Also called exemplars.

Stem: the down stroke of lowercase letters.

Terminal spur: hook at the end of a word.

Terminal stroke: final or ending stroke of a letter or word.

Thready writing: *see* filiform.

Tics or ticks: short, straight lines not consciously made that form an angle with a letter but are not part of the form of the letter, usually found at the beginning or end of the letter form.

Titlle: the smallest part, an *i*-dot.

Tops of letters: crest, tip, or apex. A curved top can be called a crown as well as an arch.

Topline: The imaginary line to which the average tops of the looped letters reach.

Trace: to copy by following lines of a model.

Tremor: shaky or corrugated lines caused by slow writing either as a result of difficulty in writing or an attempt to forge.

Truncate: banker's terminology for not returning canceled checks to customers.

Tyvek: a Dupont product that is a tough, tear-resistant paper used primarily in envelopes.

Upper extenders: those extensions on letters that rise above the middle zone of writing.

Upper zone: the area above the middle zone of writing that contains the extenders of upper zone letters, as in *b, d, f, h, k, l,* and *t*.

Variations: natural changes in letter forms in a person's genuine writing.

Watermark: identifying mark placed on paper by a dandyroll during the manufacturing process.

Writing: the act of communicating through placing letters and words on paper in one's own hand.

Zones of writing: areas of writing. There are three zones, upper, middle, and lower zones.

Glossary B

Legal Terms

Adverse witness: a witness who is hostile toward the party who summoned this witness to court.

Affidavit: a written statement of facts given voluntarily under oath.

Alteration: any change that affects the rights of interested parties because it entails a change of meaning.

Arbitration: submission of a disputed matter to an impartial panel for settlement.

Arraignment: a criminal court proceeding in which the defendant is advised of the charges against him or her, at which time the defendant may plead guilty and have bail set.

Bailiff: court personnel whose job it is to maintain order in the court.

Chain of custody: maintaining control and accountability for evidence. Chain of custody also can be referred to as chain of possession.

Complainant: one who files charges.

Cross-examination: questioning of a witness by the opposing attorney after direct examination.

Court exhibit: *see* exhibit.

Defendant: person against whom an action is brought in court.

Deposition: an out-of-court statement of a witness under oath, scheduled by the opposing counsel for the purpose of discovery and recorded by a court reporter.

Direct examination: questioning of a witness conducted by the attorney who summoned the witness.

Discovery: method of obtaining information of a case prior to going to trial.

Document: anything of substance that bears writing in ink or pencil. It may be typed, printed, or even a copy of another document.

Documentary evidence: evidence supplied by documents or other forms of written communications.

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- Embezzlement:** misappropriation of material goods by a person trusted with this property.
- Encashment:** the cashing of a check.
- Endorsement:** a signature on the back of a check that makes the item negotiable.
- Evidence:** proof of facts.
- Exclusionary rule:** *see* sequester.
- Exemplar:** known handwriting sample used for comparison with a suspect document to determine authenticity
- Exhibit:** a document presented to a court during a trial, hearing, or a deposition, as proof of facts, and which, on being accepted, is marked for identification and made a part of the case.
- Expert:** one who is knowledgeable in a specialized field, whose knowledge having been obtained from education or experience.
- Expert witness:** one who is qualified by experience or study enabling him or her to form definite opinions representing a division of science, branch of art, or department of trade.
- Fact:** a thing done, an action performed, or an incident transpiring, reality of events or things the actual occurrence of existence of which is to be determined by evidence.
- Felony:** an offense punishable by death or confinement for more than 1 year in a federal or state prison.
- Forensic:** pertaining to a court of law or a public debate.
- Forensic science:** the application of scientific techniques to detect and prosecute crime.
- Forgery:** fraudulent making or altering of a document
- Fraud:** act intending to deprive another of his or her goods.
- Guaranty:** an undertaking to be legally responsible for the payment of a debt or other legal obligation of another.
- Hearsay:** information that the witness in a trial has no personal or direct knowledge about, reporting words of another person.
- Holograph:** handwritten document prepared entirely in the handwriting of the person who signs it.
- Holographer:** one who studies handwriting
- Holographic will:** a will prepared entirely in the handwriting of the person whose signature it bears.
- Holography:** science of handwriting analysis
- Hostile witness:** *see* adverse witness
- Impeach:** to attack the credibility of a witness, challenging the witness's testimony.
- Interrogatories:** questions to be answered by the opposing party in a lawsuit for the purpose of discovery.
- Jury:** a group of people chosen to declare the truth in matters brought into court, the trier-of-fact.

- Kiting:** the "floating" of checks and deposits between two or more accounts, which gives false representation of funds.
- Larceny:** unlawful taking of property with intent to defraud the rightful owner. The difference between petty larceny and grand larceny is the amount.
- Lay witness:** one having knowledge of a situation or incident through observation or involvement.
- Letter of opinion:** letter stating the conclusion of an examination of questioned documents by an expert.
- Maker:** the drawer or person who makes and signs a check.
- Misdemeanor:** infraction or transgression of the law.
- Modus operandi (MO):** the manner or mode of operating or working, usually applied to the unconscious routine of doing anything from habit. Law enforcement agencies use MOs to solve crimes.
- Motion:** formal request made to a judge pertaining to an issue in a lawsuit.
- Notary public:** an officer licensed by a secretary of state to attest to or certify documents and to perform other acts in an official capacity for the convenience and security of the business-transacting public.
- Objection:** protest of an improper question or statement by the opposing attorney.
- Opinion:** conclusion of an expert witness.
- Payor:** the maker or drawer who orders the payment of a check or draft.
- Payee:** the person to whom payment of a check or draft is to be made.
- Perjury:** the act of deliberately making a false statement while under oath.
- Petition:** an application in writing for an order of the court.
- Plaintiff:** party initiating a court action or a lawsuit.
- Plea Bargain:** deal between litigants with the judge's approval.
- Power of Attorney:** an instrument authorizing another to act in his or her behalf, often given to enable another to sign documents.
- Qualification:** condition that must be met in order to obtain a specific privilege, document examiners must qualify as experts in order to express opinions in court.
- Questioned document:** *see* disputed document.
- Rebuttal:** introduction of evidence to refute testimony of a witness.
- Redirect-examination:** questioning of witness by his or her attorney after cross-examination.
- Retainer:** payment of a sum of money to employ a professional.
- Sequester:** to exclude witnesses from the courtroom during testimony to prevent collaboration of testimony, also called the exclusionary rule.
- Skilled witness:** a person who possesses special knowledge and experience in a technical field.
- Stereoscopic microscope:** a binocular microscope used for three-dimensional viewing.

Stipulation: agreement made in court by both parties pertaining to the authenticity of certain facts or the expertise of an expert witness.

Subpoena: an order by the court to appear and/or produce documents for a legal proceeding such as deposition or court appearance.

Subpoena duces tecum: an order by the court to produce documents.

Trier-of-fact: person authorized to decide the facts of a dispute in a court of law, jury in jury trial, or judge when there is no jury.

Undue influence: persuasion by overpowering a person's will and causing the person to do something he or she does not want to do.

Utter a forged instrument: the crime of passing a false or worthless instrument, such as a check or counterfeit security, with intent to defraud or injure the recipient.

Verdict: decision of the jury or judge made to the court.

Witness: one who testifies to what he or she sees, hears, or knows.

Writ: any type of court order.

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Index

- Abrasion, 77, 143, 146, 175
Absorption, 189, 195
Accidental(s), 24, 34, 134
Acetate sheets, 148
Acetone, 148
Act of writing, 9
Additions. *See* alterations
Adherence to the Rules of Penmanship, 128
Adhesion, 195
Adhesives, 77, 203, 205
Admissibility
of evidence, 239
of exhibits, 245
of expert testimony, 254
Admission of Expert Testimony, 253
Affidavit, 51, 140, 141
Age of a document, 217
Alcohol, 34, 80, 91
Alignment, 19, 20, 106, 165, 176, 211, 213, 217, 231
Alphabet(s), 2, 3, 4, 15
Alterations, 43, 61, 62, 75, 76, 117, 147, 148, 153, 154, 159, 174, 187, 188, 217, 223
Alterations of Document, 143
Altered letter forms, 159
Ambidextrous, 160
American Bankers Association, 177, 188, 230
Ames on Forgery, 49
Ames, Daniel, 49
Angles, 22, 38, 103
Anonymous letters, 157, 163
Apprenticeship, 54
Arabic numerals, 43
Arbitration, 242, 243
Arcades, 100, 103
Arrangement, 19, 20, 105, 200, 204
Arrighi, Ludivico degli, 2, 4
Automatic Disclosure of Expert Witnesses, 235
Autopen, 51, 125
Background information, 80
Backward writing, 118, 119
Bain, Alexander, 225
Ballpoint, 146
ink, 144, 196
pen ink, 145
pen(s), 29, 117, 121, 150, 151, 196, 197, 198, 199
Bank routing numbers, 178
Barrett, Michael, 52, 53
Baseline, 2, 10, 11, 15, 16, 19, 20, 21, 33, 43, 45, 97, 98, 100, 106, 107, 165
Bench trial, 239
Bennett, James Gordon, 4
Binders, 199, 248
Bindings, 203, 205

- Blackmail, 63, 157, 163
- Blindness, 28, 32
- Blobs of ink, 116, 119, 121, 169
- Block letters, 159, 160, 167
- Bloser
 - Elmer W, 5
- Bloser, Elmer W, 5
- Bloser, Elmer W, 12
- Blunt Beginnings and Endings, 126
- Bond paper, 186
- Bradford, Ralph, 44
- Brain writing, 161
- Burr striations, 119, 197, 198
- Bush, George W., 53
- Cabanne, Robert A., 51
- Calipers, 71, 189
- Calligraphers, 22
- Camera equipment, 71
- Cameras
 - digital, 71, 247
- Capital letters. See letters
- Capital Letters, 38
- Carbon, 57, 151, 199
 - black, 199
 - copies, 80, 140, 181, 182, 214, 221, 223
 - paper, 57, 119, 222
 - typewriter, 222
- Carbon and carbonless paper, 222
- Carbonless paper, 187, 222
- Care and Handling of Documents, 75, 76
- Carlson, Chester, 223
- Case Study
 - Altered Medical Record, 200
 - Altered Number Case, 45
 - Altered Subpoena, 206
 - Baseline Variation, 24
 - Case of Tremor, 130
 - Checks, 74
 - Contract in Dispute, 111
 - Disguised Signature, 172
 - Drunk Driving Case, 35
 - Famous Signatures, 54
 - Hold-Up Note, 88
 - Insurance Fraud, 5
 - Intersecting Lines, 66
 - Is your signature valid if?, 59
 - Payroll Checks, 183
 - Same Typewriter, 218
 - Sequential Writing, 81
 - Signature Simulation, 231
 - Substance Abuse, 95
 - Substitutions, 155
 - Sufficient Exemplars, 142
 - Threatening Letter, 166
 - Was It Faxed?, 226
 - Watermarks on Paper, 193
 - Weighing the Evidence, 136
- Cases, 61, 72, 110, 129, 153, 191, 233, 235, 251
 - anonymous writing, 159
 - check, 44
 - civil, 140
 - court, 48, 80, 239, 242, 253
 - criminal, 47
 - document, 43, 98, 140
 - embezzlement, 44
 - famous forgery, 51
 - forgery, 56, 105
 - fraud, 182
 - handwriting, 42, 245, 246
 - indented writing, 64
 - merits of, 239
 - of identification of numbers, 43
 - original document, 73
 - types of, 63, 217
- Cave drawings, 1
- Certified
 - check, 173
 - return receipt, 233
- Chain of custody, 78
- Chalk, 29, 63, 195, 199
- Chambers, Whittaker, 50
- Change of Size, 158
- Change of slant, 158

- Characteristics, 10, 20, 24, 31, 41, 42, 88, 97, 101, 164
 - class, 3, 12, 14, 40, 94
 - familial, 13, 168
 - handwriting, 30, 113, 140, 158
 - identifying, 95, 255
 - individual, 3, 13, 14, 22, 23, 35, 94, 165
 - of disguise, 167
 - of disguise and simulation, 171
 - of handwriting, 44, 91, 93, 133
 - of simulation, 167
 - of writing, 33, 34, 71, 161, 162, 168
 - subconscious, 105, 171
 - unique, 7
 - unusual, 98
 - writing, 31
- Characteristics of Handwriting, 14
- Charcoal, 195, 198
- Charts, 236, 245, 247, 248
- Check
 - micro printed, 176
 - numbers, 179
- Check and Credit Card Fraud, 173
- Check fraud, 182
- Check numbering system, 176
- Check protectors, 58, 180, 181, 183, 199
- Check routing number, 230
- Check safety paper, 175
- Check writers, 180
- Checks, 43, 44, 49, 51, 55, 56, 58, 59, 74, 174, 175, 176, 177, 178, 180, 181, 183, 187, 230, 231
 - counterfeit, 44, 59, 176, 183, 188, 229
- Checkwriter, 58
- Checkwriter Standards File, 183
- Chemical eradication, 77, 145
- Chemical erasure fluids, 146
- Citations Preventing Experts from Testifying, 254
- City Prefixes, 177
- Classifications of forgeries, 58
- Clay tablets, 1, 195
- Close similarity or Exact Identity, 121
- Collecting standards, 88
- Color copiers, 175, 188, 223
- Color printer(s), 210, 229
- Colored filters, 149
- Comparator, 70, 73
- Comparison charts, 247, 249
- Computer, 58, 59, 60, 72, 73, 79, 92, 120, 155, 173, 174, 209, 212, 214, 215, 224, 229, 247, 248
 - forgery, 231
 - hackers, 62
 - images, 248
- Computer generated copies, 140
- Computers, 188, 209, 213, 214
- Computers and printers, 209
- Connecting strokes. *See* strokes
- Connecting Strokes, 103
- Conscious attention to the act of writing, 169
- Conscious Attention to the Act of Writing, 128
- Conservators, 193
- Copies, 140
- Copybook, 4
- Correcting tapes, 216
- Correction
 - fluids, 216
 - paper, 217
 - pens, 147
- Corrugations, 169
- Cosey, Joseph, 51
- Cost of fraud, 61, 62
- Counterfeit credit cards, 182
- Counterfeiters, 173
- Counterfeiting, 65, 175, 176, 182, 229
- Court, 48, 49, 56, 76, 78, 79, 81, 83, 84, 88, 92, 140, 149, 233, 234, 235, 236, 240, 241, 248, 249, 254, 255
 - record, 249
 - reporters, 235
 - testimony, 234

- Court cases
 - Daubert v Merrell Dow, 254
 - Frye v United States, 253
 - Gilbert v California, 255
 - Homer v Wallis, 48
 - Suave v Dawson, 48
- Court Record, 242
- Courtroom, 251
- Courts, 239
- Crayons, 195, 199
- Credit card
 - abuse, 181
 - fraud, 62, 181
 - numbers, 181
 - receipt, 222
- Credit cards, 63, 181, 182
- Criminal tremor, 35
- Cross-examination, 240, 241, 242
- Curriculum vitae, 140, 241
- Cursive writing, 8, 22
- Cut and paste, 59, 81, 93, 153, 154, 224, 248
- D'Nealian, 5, 12
- Daisy wheels, 209, 212
- Dandy roll, 186
- Dandy roll factory, 66, 191
- Date stamps, 58, 173
- Dates, 44
- Dean, Henry, 4
- Degree of probability, 134, 135
- Demonstrations
 - courtroom, 246, 248, 249
- Demonstrative evidence, 246
- Demonstrative Evidence, 236, 245
- Department of Immigration, 53
- Deposition, 235
- Depositions, 233, 234
- Desktop publishing, 58
- Desktop Publishing, 229
- Destructive testing, 78, 81
- Detailed examination, 93
- Detecting chemical erasures, 145
- Detecting Computer-Generated
 - Forgeries, 231
- Detecting Fraudulent Documents, 113
- Diagrams, 245
- Dictations, 87
- Differences between typewriters and printers, 213
- Differentiating types of machine copies, 224
- Direct testimony, 240
- Direct testimony, 242
- Direct Testimony, 241
- Direction, 14
- Discovery, 139, 233, 234, 236
- Discovery of fact, 75
- Discovery Process, 233, 235
- Disguise, 10, 15, 23, 24, 45, 58, 64, 85, 86, 87, 94, 158, 159, 161, 162, 163
- Disguise Versus Simulation, 167
- Disguised writing, 93, 157, 162, 167, 168
- Dispute resolution, 243
- Dispute-Resolution Process, 242
- Dissimilar letter construction, 126
- Dissimilarities, 127, 157
- Distinguishing Between Typewriters and Printers, 212
- Ditto master, 221
- Document, 65, 150
 - false, 56
 - fraudulent, 128
 - questioned, 136, 145
- Document cases. *See* cases
- Document examiner, 21, 23, 33, 61, 63, 66, 69, 71, 72, 78, 80, 94, 95
- Document examiners, 7, 28, 29, 44, 49, 50, 51, 52, 53, 54, 56, 62, 64, 65, 70, 73, 76, 79, 81, 84, 85, 97, 106, 134, 140, 141, 236, 254
- Document laboratory, 72
- Documents, 47, 50, 51, 53, 58, 61, 63, 66, 72, 74, 77, 78, 79, 80, 81, 85, 115, 143, 146, 154, 163, 176, 203, 249

- ancient, 199
- care of, 75
- counterfeit, 65, 188, 204
- damaged, 193
- examination of, 72
- forged, 59
- holistic, 129
- obliterated, 73
- original, 71, 76, 77, 84
- questioned, 61, 84, 91
- typewritten, 213
- Documents used in criminal acts, 63
- Dominant hand, 31, 160, 161
- Dot-matrix, 209, 210, 213, 216, 225
- Drafting tools, 71
- Drawn writing, 108, 117, 162
- Drug abuse, 33, 35
- Drug Abuse, 34
- Drug Effects, 33
- Drugs, 33
- Drugs and Medication, 33
- Duplicating devices, 71
- Duplicating methods, 221
- Dyes, 186, 198, 199, 200, 216
- Edison, Thomas, 221
- Electric typewriter, 208
- Electron probe Microanalyzers, 190
- Electronic alterations, 154
- Electronic memory typewriter, 209
- Electronic signatures. *See* signatures
- Electrostatic detection apparatus, 65, 73, 144, 146
- Elements of a crime, 55
- Elimination, 24, 95, 135
- Embellishments, 17, 22, 97, 99, 104, 105
- Embezzlement, 43, 61, 62, 75
- Embossers, 204
- Enlargements, 70, 71, 78, 92, 100, 247
- Envelopes, 44, 77, 78, 187, 203, 204, 205
- Environments
 - protected, 78
- Equipment, 58, 59, 72, 173, 174, 185, 207, 214, 225, 229, 251
 - computer. *See* Computer equipment
 - portable, 73
 - scientific, 69
- Equipping a laboratory, 69
- Eradicator, 145, 174, 175, 176, 188
- Erasures, 69, 75, 116, 121, 143, 144, 148, 169, 175, 224
- Evidence, 48, 56, 59, 69, 75, 76, 77, 78, 79, 80, 83, 84, 88, 93, 110, 135, 136, 140, 144, 145, 153, 223, 236, 239, 241, 243, 245, 246, 251, 253, 254
- Examination of documents, 78
- Exemplars, 34, 52, 83, 84, 85, 88, 91, 92, 93, 94, 135, 136, 140, 160, 163, 210, 255
- Exhibit Books, 247
- Exhibits, 72, 92, 139, 140, 235, 236, 240, 241, 245, 246, 247, 248, 249, 250
- Expert witness, 140, 233, 235, 236, 240, 241, 249, 251
- Expert witnesses, 48, 234, 242, 253
- Expert Witnesses, 235
- Extortion, 63
- Facsimile machines, 76, 225
- Factors affecting handwriting, 94
- Factors That Affect Handwriting, 27
- Factors That Influence Handwriting, 12
- Facts That Assist in Handwriting
 - Identification, 113
- False-making, 47, 55, 56, 60
- Farrar, Bert C., 50
- Fasteners, 79, 203, 204, 205
- Fax machine, 225
- Fax machines, 226, *See* facsimile machines
- Faxed copies, 140
- FBI, 50, 52, 53, 182, 183
- Features of handwriting, 13
- Federal Bureau of Investigation, 50
- Federal Bureau of Investigation
 - Resources, 182

- Federal Reserve Bank, 176
- Federal Reserve District(s), 178, 179
- Federal Rule 702, 253
- Federal Rule 703, 253
- Federal Rules, 236
- Federal Rules in Civil Cases, 140
- Federal Rules of Civil Procedure, 234, 235, 253
- Felt-tip pens, 151
- Fiber tip pens, 150, 197
- Fifth Amendment, 255
- Fireproof file cabinet, 78
- Fireproof safe, 78
- Fluidity, 32, 109
- Fluorescence, 144, 205
- Flynn, William, 52
- Fold, 152
- Folders, 77
 - clear plastic, 77
 - file, 77
 - Mylar, 77
- Fonts, 70, 213, 214, 215
- Fonts and special features, 214
- Forged checks, 44
- Forger, 92, 94, 98, 108, 115, 117, 125, 127, 128, 129, 130, 230, 231
- Forger's Identity, 56
- Forgeries, 51, 52, 59, 116, 129, 230
 - holistic, 130
 - traced, 49
- Forgers, 20, 21, 22, 24, 31, 44, 50, 51, 52, 99, 100, 101, 105, 106, 107, 114, 116, 118, 119, 120, 121, 126, 162, 168, 169, 170, 176, 177, 178, 180
- Forger's identity, 55
- Forgery, 15, 47, 55, 56, 58, 92, 98, 117, 121, 140, 168, 169, 173, 229
 - by typewriter, 50
 - holistic, 58
 - sign of, 109
 - signs of, 93, 116
 - simple, 56, 93, 127, 157
 - simulated, 57
 - traced, 57
 - tremor of, 129
- Forgery case, 49
- Form, 20, 97, 101
- Forms
 - counterfeit, 58
- Foster and Freeman, 73
- Fountain pens, 29, 150, 196
- Fourdrinier, 186
- Fourth Amendment, 255
- Franklin, Benjamin, 4, 196
- Fraud, 31, 53, 61
 - tremor of, 35
- Fugitive ink, 175, 188
- Fundamental differences, 24, 94, 110, 113, 117, 136, 140
- Fundamental divergences, 93, 95
- Garlands, 22, 100, 102, 103
- Gauges, 70, 80
- Gel pens, 200
- Gillot, Joseph, 196
- Gloves
 - cotton, 73, 78
- Goodyear, Charles, 222
- Gooping, 119, 121, 197
- Graffiti, 63, 192
 - artists, 200
- Graffiti or Anonymous Poison Pen Letters, 63
- Grammar, 23, 75, 110
- Graphic expression, 9
- Graphic maturity, 9, 12, 27, 28, 30
- Graphic movement, 32
- Graphite, 143, 152, 195, 197, 198
- Graphologists, 254
- Grid, 59, 70, 148, 154, 186
- Grids, 70
- Grip pressure, 117
- Guided hand, 34
- Habits, 10, 21, 22, 23, 58, 98, 100, 101, 105, 106, 108, 115, 127, 128, 130, 158, 164, 165, 170, 182
 - dating, 44

- inconspicuous, 94
- inconspicuous, 24
- subconscious, 12, 87, 114
- writer's, 17
- writing, 169, *See* writing habits
- Habits of the forger, 127
- Hamilton, Charles, 51
- Handicapped writer, 32
- Handling and protecting documents, 78
- Handprinting, 8, 38, 41, 42, 64, 85, 88, 92, 160
- Handprinting and Numerals, 37
- Handwriting, 3, 4, 5, 7, 8, 9, 10, 12, 16, 27, 28, 30, 34, 35, 41, 42, 85, 91, 92, 93, 100
 - characteristics, 13
 - characteristics of, 98
 - comparison of, 48
 - cursive, 2
 - examination of, 97
 - identification of, 13
 - principles, 7
 - principles of, 49, 94
 - sample, 197
 - samples, 22, 23
 - samples of, 83
 - skill, 31
 - systems, 19
- Handwriting samples, 48
- Harrison, Shirley, 53
- Harrison, Wilson, 158, 159
- Hauptman, Bruno Richard, 50
- Health, 24, 31
- Hearings, 242, 243
- Hectograph process, 221
- Hesitation strokes, 169
- Hieroglyphics, 1
- Hilton, Ordway, 31, 34, 92
- Hiss, Alger, 50
- History
 - of document examination, 50
 - of paper making, 185
- History of Duplicating Methods, 221
- History of Forgery, 47
- History of Numbers, 42
- History of Writing, 1
- Hitler Diaries, 52, 191, 206
- Hitler Diary Case, 92
- Hoffman, Mark, 50
- Hofmann, Mark, 52
- Holistic forgeries, 129
- Hooks, 12, 22, 23, 40, 94, 99, 105
- Howard Hughes' Autobiography, 50, 51
- Howland, Sylvia Ann, 49
- Hughes, Howard, 51
- IBM Selectric Typewriter, 211
- Identification, 210
- Identification of Numbers, 43
- Identification of pens, 197
- Identifying forged documents, 128
- Identifying the forger, 129
- Identifying the writer, 164
- Identity theft, 62, 63
- Ideographs, 1
- In the Courtroom, 249
- Inconsistencies, 163, 170
- Indelible ink, 180
- Indentations, 150
- Indented writing, 64, 73, 75, 146
- Indicators of fraudulent checks, 176
- Individual Characteristics to Look For, 45
- Industrial espionage, 61, 62
- Infrared, 73, 81, 144, 145, 149, 223
- Infrared snooper scope, 73
- Infrared spectrometers, 190
- Initial examination, 92
- Initial stroke, 102
- Initial strokes, 21, 101
- Ink, 29, 44, 47, 57, 58, 65, 73, 74, 81, 121, 143, 145, 146, 147, 149, 150, 151, 152, 175, 185, 187, 188, 195, 196, 197, 199, 200, 216, 230
 - alcohol based, 144
 - ballpoint. *See* ballpoint ink
- Ink cartridges, 196

- Ink chemists, 53
- Ink eradicator, 188
- Ink formula, 52, 77
- Ink jet printer, 72
- Ink or paper expert, 66
- Ink Standards Collection, 183
- Hauptman, Bruno Richard, 50
- Health, 24, 31
- Hearings, 242, 243
- Hectograph process, 221
- Hesitation strokes, 169
- Hieroglyphics, 1
- Hilton, Ordway, 31, 34, 92
- Hiss, Alger, 50
- History
 - of document examination, 50
 - of paper making, 185
- History of Duplicating Methods, 221
- History of Forgery, 47
- History of Numbers, 42
- History of Writing, 1
- Hitler Diaries, 52, 191, 206
- Hitler Diary Case, 92
- Hoffman, Mark, 50
- Hofmann, Mark, 52
- Holistic forgeries, 129
- Hooks, 12, 22, 23, 40, 94, 99, 105
- Howard Hughes' Autobiography, 50, 51
- Howland, Sylvia Ann, 49
- Hughes, Howard, 51
- IBM Selectric Typewriter, 211
- Identification, 210
- Identification of Numbers, 43
- Identification of pens, 197
- Identifying forged documents, 128
- Identifying the forger, 129
- Identifying the writer, 164
- Identity theft, 62, 63
- Ideographs, 1
- In the Courtroom, 249
- Inconsistencies, 163, 170
- Indelible ink, 180
- Indentations, 150
- Indented writing, 64, 73, 75, 146
- Indicators of fraudulent checks, 176
- Individual Characteristics to Look For, 45
- Industrial espionage, 61, 62
- Infrared, 73, 81, 144, 145, 149, 223
- Infrared snooper scope, 73
- Infrared spectrometers, 190
- Initial examination, 92
- Initial stroke, 102
- Initial strokes, 21, 101
- Ink, 29, 44, 47, 57, 58, 65, 73, 74, 81, 121, 143, 145, 146, 147, 149, 150, 151, 152, 175, 185, 187, 188, 195, 196, 197, 199, 200, 216, 230
 - alcohol based, 144
 - ballpoint. *See* ballpoint ink
- Ink cartridges, 196
- Ink chemists, 53
- Ink eradicator, 188
- Ink formula, 52, 77
- Ink jet printer, 72
- Ink or paper expert, 66
- Ink Standards Collection, 183
- Liquid Paper, 147, 216
- Litigation, 61
- Litigation Process, 239
- Lockwood-Post's Directory*, 66, 190
- Loud, John J., 196
- Lowercase letters, 40, *See* letters
- Luminescence, 144
- Machine copies, 224
- Magnetic character coding, 188
- Magnetic ink, 176, 178, 188, 229, 231
- Magnetic number, 177
- Magnetic printer, 230
- Magnetic tape, 209
- Magnifiers, 70
- Making an identification, 94
- Manila envelopes, 77
- Maps, 245
- Margins, 17, 18, 20, 37, 105, 171
- Master pattern, 24, 97, 171

- Master Pattern, 110
- Mathematical probability, 49
- Matley, Marcel, 53
- Measurements, 43
- Measuring devices, 70
- Mechanical defects, 211
- Mechanical factors, 27, 28, 91, 94
- Medial strokes, 22, 103
- Mediation, 242, 243
- Medical malpractice, 61, 62, 75
- Medication, 28, 33, 34
- Mental condition, 31, 92
- Mental disturbance, 27
- Mental handicaps, 91
- Mental Health, 32
- Mental illness, 27, 33
- Mental images, 13, 21
- Method of construction, 21, 24, 41, 94, 97, 100, 101, 113
- Method of disguise, 158, 160, 162
- Methods of construction, 39
- Methods of detecting disguise, 163
- Methods of disguise, 157, 167
- Methods of forging, 56
- Methods of passing forgeries, 176
- Methods of simulation, 168
- Methylene blue, 144
- Meyer, George, 163, 168
- Micro printing, 175, 176
- Micrographia, 34
- Micrometer, 70, 150
- Microscope, 35, 81
 - digital, 73
 - stereoscopic, 69
- Microscopes, 69, 70
 - scanning electron, 190
- Misalignment, 59, 148, 154, 176, 207, 211, 212, 213, 217
- Model Penal Code, 47
- Model signature, 57, 98, 115, 118, 120, 168
- Molineux, Roland B., 49
- Money, counterfeit, 188
- Monroe, William, 198
- Mormon Will, 51
- Motions in limine, 254
- Movement, 9, 14, 15, 97, 161
 - arm, 5
 - habit of, 113
 - wrist, 7, 106
- Movements, 10, 11
- Muscular movement, 34
- Muscular movement of penmanship, 5
- Mylar sleeves, 74
- National Fraudulent Check File, 182
- Natural, 7
- Natural variation, 21, 93, 116, 125, 171
- Negotiable instruments, 58, 75
- Negotiation, 243
- Newsprint, 186
- Ninhydrin, 80, 81
- No signs of forgery, 128
- Nondestructive testing, 145
- Notaries, 204
- Notary seal, 153
- Notary stamps, 204
- Numbers, 8, 42, 43, 44, 45, 62, 85, 87, 165, 174, 178, 179, 180, 182
- Numerals, 37, 42, 43
- Oblique lighting, 144, 145, 146
- Obliterations, 147
- Observations, 23
- Obvious forgeries, 128
- Office equipment, 9, 207, 214, 225
- Opinions, 42, 84, 134, 135, 136, 140, 141, 235, 245, 253
- Optical aids, 69
- Optivisor, 70
- Original documents, 140
- Osborn, Albert, 49, 50, 51, 94, 158
- Other methods of disguise, 161
- Other safety features, 175
- Other Types of Fraud, 61
- Other types of paper, 187
- Other Writing Instruments, 198
- Other writing surfaces, 192

- Page substitution, 150, 205
 Palmer, 12
 Palmer Method, 4, 5, 19
 Palmer penmanship, 99
 Palmer, Austin N., 5
 Paper, 58, 66, 77, 81, 185, 186, 193
 Paper clips, 205
 Paper for printing or writing, 186
 Paper Institute, 190
 Paper money, 188, 223
 Paper problems, 190
 Paper testing, 189
 Papermaking, 185
 Papers, 73
 Papyrus, 185
 Patching, 116
 Patching or retracing, 118
 Pen lifts, 169
 Pen lifts in unnatural places, 121
 Pen scope, 10
 Pencil, 152
 Pencils, 8, 195, 197, 198
 colored, 143
 Penmanship, 4, 5, 30
 Penmanship system, 3, 12
 Penmanship systems, 3, 12, 19
 Pens, 195, 196, 199, 246, *See* type of
 pen such as ballpoint
 steel, 196
 Pentel, 197
 Perforations, 176, 180, 205, 231
 Petroglyphs, 1
 Petrograms, 1
 Phoenicians, 1
 Photocopier, 59, 72, 92, 148, 154, 218,
 222, 223, 224
 Photocopiers, 222
 Photocopies, 53, 72, 76, 78, 81, 84,
 108, 140, 152, 153, 182, 210, 223,
 224, 225, 247, 251
 Photocopy, 59, 73, 79, 84, 147, 152,
 154, 225, 246
 Photocopy toner, 73, 147
 Photographers, 49
 Photographs, 71, 72, 78, 80, 140, 245,
 246, 247
 Photographs and Photocopies, 246
 Photography, 49, 71, 81, 146
 Photostat, 222
 Photostats, 223
 Physical condition, 31
 Physical factors, 7, 91
 Physical handicaps, 28
 Physiology of Writing, 9
 Pictorial effect, 15, 93, 94, 114, 157,
 158, 160, 161, 169, 170
 Piece, Benjamin, 49
 Pigment, 203
 Pigment particles, 223
 Pigments, 186, 198, 199, 200, 216, 222
 Pioneers of Document Examination, 48
 Poison pen letters, 63
 Porous pen point, 197
 Post litem motam, 88
 Postage stamps, 204
 Power point, 248
 Preliminary procedures, 91
 Preparation, 239
 Preparing exhibits, 248
 Preparing reports, 139
 Presentation of Exhibits, 247
 Presenting Testimony, 240
 Pressure, 14, 15, 18, 97
 Pressure patterns, 12, 14, 15, 16, 17, 23,
 24, 29, 37, 69, 94, 98, 100, 108, 113,
 117, 118, 127, 171
 Pretrial conference, 239, 240
 Pretrial preparation, 239
 Principles of Handwriting, 7
 Principles of Identification, 13
 Printer
 daisy wheel, 209
 Printers, 209, 213, 214
 Private process servers, 233
 Problems involving numbers, 44
 Proof of forgery, 56

- Proper lighting, 72
Properties of paper, 188
Proportions, 15, 19, 97, 106, 161, 171
Protective equipment, 73
Protractor, 70, 107
Punctuation, 23, 75, 110, 165
Punctuation marks, 85
Qualifications, 235, 241
Qualifying in court, 254
Qualifying in Court, 241
Qualifying questions, 241
Qualifying Your Opinion, 136
Questioned Documents, 49
Questions to ask about paper, 192
Questions to Ask About Typewriters, 214
Quill pen, 196
Range of the writer, 99
Range of writing, 14, 24, 93, 97, 163
Ransom notes, 50, 63, 157, 162, 163
Rare documents, 52
Rather, Dan, 53
Reading under white out, 217
Reasons for disguise, 162
Rebuttal, 242
Rebuttal witness, 242
Recognizing disguise, 168
Recognizing forgery, 169
Redirect testimony, 242
Reed pen, 195
Remington, 207, 211
Rendell, Kenneth, 51, 53
Request writing, 83, 84, 85, 86, 87, 88, 161, 162, 164, 255
Requirements, 245
Restoration of erased material, 146
Restoring documents, 193
Reticle, 70
Rhythm, 14, 15, 16, 17, 23, 33, 97, 107, 113, 127
Ribbons, 147, 151, 180, 199, 207, 208, 209, 211, 214, 215, 216, 217, 221
Rice Will Case, 49
Rittenhouse, William, 185
Roman numerals, 43
Roundhand, 4
Routing number, 176, 177
Rubber erasers, 143, 197
Rubber stamps, 58, 173, 199, 204, 222
Rubric, 102
Rule on witnesses, 240
Rulers, 70, 71
Rules of Evidence, 236
Safe. *See* fireproof safe
Safety features, 176, 182
Safety paper, 173, 175, 176, 186, 187, 188, 229, 230
Safety Paper Standards File, 183
Saudek, Robert, 27
Scanned documents, 225
Scanner, 229
Scanners, 174, 224, 247
Scanning electron microscope, 190
Seals, 203, 204, 205
Seals, Stamps, and Paper, 203
Secret Service, 53, 182, 188
Security feature, 188
Security features, 188
Self-disguise, 93
Sequence of writing, 75
Sequestering the witness, 240
Sheaffer, W.A., 196
Sholes, Charles Lathem, 207
Side lighting, 65
Side-lighting, 146
Signature, 7, 18, 34, 35, 40, 44, 55, 57, 58, 84, 91, 93
 genuine, 81
 simulated, 56
Signature comparison, 97
Signature identification, 75
Signature stamp, 125
Signatures, 22, 48, 49, 51, 59, 75, 78, 92, 102
 computer-generated, 93
 duplicate, 93

- Signs of disguise, 162
 Signs of forgery, 114, 115
 Signs of fraud, 65
 Simulation, 127, 167, 168
 Size, 19, 97, 106
 Skill level, 23, 30, 92
 Skill of the Writer, 109
 Slant, 14, 15, 97, 107, 158
 Smith, Robert, 53
 Souder, 50
 Souder, William, 50
 Southworth, Albert, 49
 Space, 97, 106, 148, 158, 164
 Spacing, 37, 106, 154, 155, 164, 165, 167
 Spatial arrangement, 37
 Spatial relationships, 14, 19, 97, 105
 Specialized equipment, 72
 Speed, 14, 97, 108, 162, 167
 Speed of writing, 17
 Spelling, 23, 75, 175
 Spencer Dandyroll Factory, 190
 Spencer, Platt Roger, 4
 Spencerian System, 4
 Spoliation., 78
 Spring, Robert, 51
 Squiggles, 114
 Stamps, 176, 203, 204, 205, 230
 Standard Files, 183
 Standard terminology, 134
 Standards of comparison, 48
 Staple holes, 150, 154, 205
 Staples, 205
 State Codes, 178
 Statute of 1913, 48
 Stereoscopic microscope, 69, 151
 Stick charcoal, 198
 Stopping credit card abuse, 181
 Strokes, 104, 105, 106, 108
 connecting, 22
 connecting, 3, 17, 19
 Subpoena, 233, 234
 Subpoena Duces Tecum, 234
 Substance abuse, 28
 Substitutions, 66, 75, 154
 Suicide notes, 33
 Sumerians, 1
 Summons, 233
 Supreme Court, 255
 Sutherland, 61
 Systematic examinations, 91
 Table of contents, 250
 Tear strength, 189
 Techniques of the Forger, 58
 Templates, 70
 Tensile strength, 189
 Terminal strokes, 22, 102, 115, 126
 Testimony, 234, 235, 236, 240, 241, 242
 Testing, 52, 78, 81
The Law of Evidence, 49
 Thin-layer chromatography, 149
 Thockmorton, George, 52
 Thomas, Isaiah, 4
 Thready connections, 22
 Thready lines, 103
 Threats, 157, 163
 Thurber, Donald, 5
 Ticks, 12, 22, 23, 40, 94, 99, 102, 105, 161, 171
 Toner particles, 223, 224
 Traced signatures, 116
 Tracing, 115, 119, 120, 125, 127, 129, 168, 248
 Transmission electron microscopes, 190
 Transmitted light, 119, 144, 146, 147, 217
 Transparencies, 224, 236, 245, 247, 248
 Transporting documents, 77
 Trash marks, 59, 154, 224
 Tremor, 116, 117
 Tremor in Handwriting, 35
 Trials, 242, 243
 Type ball, 208, 211, 212, 213
 Type bar, 207, 208, 210, 211, 212
 Typefaces, 180, 208, 213

- Types of Cases, 217
- Types of disguise, 170
- Types of Exhibits, 246
- Types of freehand simulation, 170
- Typewriter, 148
- Typewriter manufacturers, 208
- Typewriter ribbon, 147
- Typewriter standards, 210
- Typewriter Standards File, 183
- “2” \z “1033”
- Abrasion, 77, 143, 146, 175
- Absorption, 189, 195
- Accidental(s), 24, 34, 134
- Acetate sheets, 148
- Acetone, 148
- Act of writing, 9
- Additions. *See* alterations
- Adherence to the Rules of Penmanship, 128
- Adhesion, 195
- Adhesives, 77, 203, 205
- Admissibility
 - of evidence, 239
 - of exhibits, 245
 - of expert testimony, 254
- Admission of Expert Testimony, 253
- Affidavit, 51, 140, 141
- Age of a document, 217
- Alcohol, 34, 80, 91
- Alignment, 19, 20, 106, 165, 176, 211, 213, 217, 231
- Alphabet(s), 2, 3, 4, 15
- Alterations, 43, 61, 62, 75, 76, 117, 147, 148, 153, 154, 159, 174, 187, 188, 217, 223
- Alterations of Document, 143
- Altered letter forms, 159
- Ambidextrous, 160
- American Bankers Association, 177, 188, 230
- Ames on Forgery*, 49
- Ames, Daniel, 49
- Angles, 22, 38, 103
- Anonymous letters, 157, 163
- Apprenticeship, 54
- Arabic numerals, 43
- Arbitration, 242, 243
- Arcades, 100, 103
- Arrangement, 19, 20, 105, 200, 204
- Arrighi, Ludivico degli, 2, 4
- Automatic Disclosure of Expert Witnesses, 235
- Autopen, 51, 125
- Background information, 80
- Backward writing, 118, 119
- Bain, Alexander, 225
- Ballpoint, 146
 - ink, 144, 196
 - pen ink, 145
 - pen(s), 29, 117, 121, 150, 151, 196, 197, 198, 199
- Bank routing numbers, 178
- Barrett, Michael, 52, 53
- Baseline, 2, 10, 11, 15, 16, 19, 20, 21, 33, 43, 45, 97, 98, 100, 106, 107, 165
- Bench trial, 239
- Bennett, James Gordon, 4
- Binders, 199, 248
- Bindings, 203, 205
- Blackmail, 63, 157, 163
- Blindness, 28, 32
- Blobs of ink, 116, 119, 121, 169
- Block letters, 159, 160, 167
- Bloser
 - Elmer W, 5
- Bloser, Elmer W, 5
- Bloser, Elmer W, 12
- Blunt Beginnings and Endings, 126
- Bond paper, 186
- Bradford, Ralph, 44
- Brain writing, 161
- Burr striations, 119, 197, 198
- Bush, George W., 53
- Cabanne, Robert A., 51
- Calipers, 71, 189

- Calligraphers, 22
- Camera equipment, 71
- Cameras
 - digital, 71, 247
- Capital letters. See letters
- Capital Letters, 38
- Carbon, 57, 151, 199
 - black, 199
 - copies, 80, 140, 181, 182, 214, 221, 223
 - paper, 57, 119, 222
 - typewriter, 222
- Carbon and carbonless paper, 222
- Carbonless paper, 187, 222
- Care and Handling of Documents, 75, 76
- Carlson, Chester, 223
- Case Study
 - Altered Medical Record, 200
 - Altered Number Case, 45
 - Altered Subpoena, 206
 - Baseline Variation, 24
 - Case of Tremor, 130
 - Checks, 74
 - Contract in Dispute, 111
 - Disguised Signature, 172
 - Drunk Driving Case, 35
 - Famous Signatures, 54
 - Hold-Up Note, 88
 - Insurance Fraud, 5
 - Intersecting Lines, 66
 - Is your signature valid if?, 59
 - Payroll Checks, 183
 - Same Typewriter, 218
 - Sequential Writing, 81
 - Signature Simulation, 231
 - Substance Abuse, 95
 - Substitutions, 155
 - Sufficient Exemplars, 142
 - Threatening Letter, 166
 - Was It Faxed?, 226
 - Watermarks on Paper, 193
 - Weighing the Evidence, 136
- Cases, 61, 72, 110, 129, 153, 191, 233, 235, 251
 - anonymous writing, 159
 - check, 44
 - civil, 140
 - court, 48, 80, 239, 242, 253
 - criminal, 47
 - document, 43, 98, 140
 - embezzlement, 44
 - famous forgery, 51
 - forgery, 56, 105
 - fraud, 182
 - handwriting, 42, 245, 246
 - indented writing, 64
 - merits of, 239
 - of identification of numbers, 43
 - original document, 73
 - types of, 63, 217
- Cave drawings, 1
- Certified
 - check, 173
 - return receipt, 233
- Chain of custody, 78
- Chalk, 29, 63, 195, 199
- Chambers, Whittaker, 50
- Change of Size, 158
- Change of slant, 158
- Characteristics, 10, 20, 24, 31, 41, 42, 88, 97, 101, 164
 - class, 3, 12, 14, 40, 94
 - familial, 13, 168
 - handwriting, 30, 113, 140, 158
 - identifying, 95, 255
 - individual, 3, 13, 14, 22, 23, 35, 94, 165
 - of disguise, 167
 - of disguise and simulation, 171
 - of handwriting, 44, 91, 93, 133
 - of simulation, 167
 - of writing, 33, 34, 71, 161, 162, 168
 - subconscious, 105, 171
 - unique, 7
 - unusual, 98
 - writing, 31

- Characteristics of Handwriting, 14
- Charcoal, 195, 198
- Charts, 236, 245, 247, 248
- Check
 - micro printed, 176
 - numbers, 179
- Check and Credit Card Fraud, 173
- Check fraud, 182
- Check numbering system, 176
- Check protectors, 58, 180, 181, 183, 199
- Check routing number, 230
- Check safety paper, 175
- Check writers, 180
- Checks, 43, 44, 49, 51, 55, 56, 58, 59, 74, 174, 175, 176, 177, 178, 180, 181, 183, 187, 230, 231
 - counterfeit, 44, 59, 176, 183, 188, 229
- Checkwriter, 58
- Checkwriter Standards File, 183
- Chemical eradication, 77, 145
- Chemical erasure fluids, 146
- Citations Preventing Experts from Testifying, 254
- City Prefixes, 177
- Classifications of forgeries, 58
- Clay tablets, 1, 195
- Close similarity or Exact Identity, 121
- Collecting standards, 88
- Color copiers, 175, 188, 223
- Color printer(s), 210, 229
- Colored filters, 149
- Comparator, 70, 73
- Comparison charts, 247, 249
- Computer, 58, 59, 60, 72, 73, 79, 92, 120, 155, 173, 174, 209, 212, 214, 215, 224, 229, 247, 248
 - forgery, 231
 - hackers, 62
 - images, 248
- Computer generated copies, 140
- Computers, 188, 209, 213, 214
- Computers and printers, 209
- Connecting strokes. *See* strokes
- Connecting Strokes, 103
- Conscious attention to the act of writing, 169
- Conscious Attention to the Act of Writing, 128
- Conservators, 193
- Copies, 140
- Copybook, 4
- Correcting tapes, 216
- Correction
 - fluids, 216
 - paper, 217
 - pens, 147
- Corrugations, 169
- Cosey, Joseph, 51
- Cost of fraud, 61, 62
- Counterfeit credit cards, 182
- Counterfeiters, 173
- Counterfeiting, 65, 175, 176, 182, 229
- Court, 48, 49, 56, 76, 78, 79, 81, 83, 84, 88, 92, 140, 149, 233, 234, 235, 236, 240, 241, 248, 249, 254, 255
 - record, 249
 - reporters, 235
 - testimony, 234
- Court cases
 - Daubert v Merrell Dow, 254
 - Frye v United States, 253
 - Gilbert v California, 255
 - Homer v Wallis, 48
 - Suave v Dawson, 48
- Court Record, 242
- Courtroom, 251
- Courts, 239
- Crayons, 195, 199
- Credit card
 - abuse, 181
 - fraud, 62, 181
 - numbers, 181
 - receipt, 222
- Credit cards, 63, 181, 182

- Criminal tremor, 35
- Cross-examination, 240, 241, 242
- Curriculum vitae, 140, 241
- Cursive writing, 8, 22
- Cut and paste, 59, 81, 93, 153, 154, 224, 248
- D'Nealian, 5, 12
- Daisy wheels, 209, 212
- Dandy roll, 186
- Dandy roll factory, 66, 191
- Date stamps, 58, 173
- Dates, 44
- Dean, Henry, 4
- Degree of probability, 134, 135
- Demonstrations
 - courtroom, 246, 248, 249
- Demonstrative evidence, 246
- Demonstrative Evidence, 236, 245
- Department of Immigration, 53
- Deposition, 235
- Depositions, 233, 234
- Desktop publishing, 58
- Desktop Publishing, 229
- Destructive testing, 78, 81
- Detailed examination, 93
- Detecting chemical erasures, 145
- Detecting Computer-Generated Forgeries, 231
- Detecting Fraudulent Documents, 113
- Diagrams, 245
- Dictations, 87
- Differences between typewriters and printers, 213
- Differentiating types of machine copies, 224
- Direct testimony, 240
- Direct testimony, 242
- Direct Testimony, 241
- Direction, 14
- Discovery, 139, 233, 234, 236
- Discovery of fact, 75
- Discovery Process, 233, 235
- Disguise, 10, 15, 23, 24, 45, 58, 64, 85, 86, 87, 94, 158, 159, 161, 162, 163
- Disguise Versus Simulation, 167
- Disguised writing, 93, 157, 162, 167, 168
- Dispute resolution, 243
- Dispute-Resolution Process, 242
- Dissimilar letter construction, 126
- Dissimilarities, 127, 157
- Distinguishing Between Typewriters and Printers, 212
- Ditto master, 221
- Document, 65, 150
 - false, 56
 - fraudulent, 128
 - questioned, 136, 145
- Document cases. *See* cases
- Document examiner, 21, 23, 33, 61, 63, 66, 69, 71, 72, 78, 80, 94, 95
- Document examiners, 7, 28, 29, 44, 49, 50, 51, 52, 53, 54, 56, 62, 64, 65, 70, 73, 76, 79, 81, 84, 85, 97, 106, 134, 140, 141, 236, 254
- Document laboratory, 72
- Documents, 47, 50, 51, 53, 58, 61, 63, 66, 72, 74, 77, 78, 79, 80, 81, 85, 115, 143, 146, 154, 163, 176, 203, 249
 - ancient, 199
 - care of, 75
 - counterfeit, 65, 188, 204
 - damaged, 193
 - examination of, 72
 - forged, 59
 - holistic, 129
 - obliterated, 73
 - original, 71, 76, 77, 84
 - questioned, 61, 84, 91
 - typewritten, 213
- Documents used in criminal acts, 63
- Dominant hand, 31, 160, 161
- Dot-matrix, 209, 210, 213, 216, 225
- Drafting tools, 71
- Drawn writing, 108, 117, 162
- Drug abuse, 33, 35
- Drug Abuse, 34

- Drug Effects, 33
- Drugs, 33
- Drugs and Medication, 33
- Duplicating devices, 71
- Duplicating methods, 221
- Dyes, 186, 198, 199, 200, 216
- Edison, Thomas, 221
- Electric typewriter, 208
- Electron probe Microanalyzers, 190
- Electronic alterations, 154
- Electronic memory typewriter, 209
- Electronic signatures. *See* signatures
- Electrostatic detection apparatus, 65, 73, 144, 146
- Elements of a crime, 55
- Elimination, 24, 95, 135
- Embellishments, 17, 22, 97, 99, 104, 105
- Embezzlement, 43, 61, 62, 75
- Embossers, 204
- Enlargements, 70, 71, 78, 92, 100, 247
- Envelopes, 44, 77, 78, 187, 203, 204, 205
- Environments
 - protected, 78
- Equipment, 58, 59, 72, 173, 174, 185, 207, 214, 225, 229, 251
 - computer. *See* Computer equipment
 - portable, 73
 - scientific, 69
- Equipping a laboratory, 69
- Eradicator, 145, 174, 175, 176, 188
- Erasures, 69, 75, 116, 121, 143, 144, 148, 169, 175, 224
- Evidence, 48, 56, 59, 69, 75, 76, 77, 78, 79, 80, 83, 84, 88, 93, 110, 135, 136, 140, 144, 145, 153, 223, 236, 239, 241, 243, 245, 246, 251, 253, 254
- Examination of documents, 78
- Exemplars, 34, 52, 83, 84, 85, 88, 91, 92, 93, 94, 135, 136, 140, 160, 163, 210, 255
- Exhibit Books, 247
- Exhibits, 72, 92, 139, 140, 235, 236, 240, 241, 245, 246, 247, 248, 249, 250
- Expert witness, 140, 233, 235, 236, 240, 241, 249, 251
- Expert witnesses, 48, 234, 242, 253
- Expert Witnesses, 235
- Extortion, 63
- Facsimile machines, 76, 225
- Factors affecting handwriting, 94
- Factors That Affect Handwriting, 27
- Factors That Influence Handwriting, 12
- Facts That Assist in Handwriting
 - Identification, 113
- False making, 47, 55, 56, 60
- Farrar, Bert C., 50
- Fasteners, 79, 203, 204, 205
- Fax machine, 225
- Fax machines, 226, *See* facsimile machines
- Faxed copies, 140
- FBI, 50, 52, 53, 182, 183
- Features of handwriting, 13
- Federal Bureau of Investigation, 50
- Federal Bureau of Investigation
 - Resources, 182
- Federal Reserve Bank, 176
- Federal Reserve District(s), 178, 179
- Federal Rule 702, 253
- Federal Rule 703, 253
- Federal Rules, 236
- Federal Rules in Civil Cases, 140
- Federal Rules of Civil Procedure, 234, 235, 253
- Felt-tip pens, 151
- Fiber tip pens, 150, 197
- Fifth Amendment, 255
- Fireproof file cabinet, 78
- Fireproof safe, 78
- Fluidity, 32, 109
- Fluorescence, 144, 205
- Flynn, William, 52
- Fold, 152
- Folders, 77
 - clear plastic, 77
 - file, 77
 - Mylar, 77

- Fonts, 70, 213, 214, 215
- Fonts and special features, 214
- Forged checks, 44
- Forger, 92, 94, 98, 108, 115, 117, 125, 127, 128, 129, 130, 230, 231
- Forger's Identity, 56
- Forgeries, 51, 52, 59, 116, 129, 230
 - holistic, 130
 - traced, 49
- Forgers, 20, 21, 22, 24, 31, 44, 50, 51, 52, 99, 100, 101, 105, 106, 107, 114, 116, 118, 119, 120, 121, 126, 162, 168, 169, 170, 176, 177, 178, 180
- Forger's identity, 55
- Forgery, 15, 47, 55, 56, 58, 92, 98, 117, 121, 140, 168, 169, 173, 229
 - by typewriter, 50
 - holistic, 58
 - sign of, 109
 - signs of, 93, 116
 - simple, 56, 93, 127, 157
 - simulated, 57
 - traced, 57
 - tremor of, 129
- Forgery case, 49
- Form, 20, 97, 101
- Forms
 - counterfeit, 58
- Foster and Freeman, 73
- Fountain pens, 29, 150, 196
- Fourdrinier, 186
- Fourth Amendment, 255
- Franklin, Benjamin, 4, 196
- Fraud, 31, 53, 61
 - tremor of, 35
- Fugitive ink, 175, 188
- Fundamental differences, 24, 94, 110, 113, 117, 136, 140
- Fundamental divergences, 93, 95
- Garlands, 22, 100, 102, 103
- Gauges, 70, 80
- Gel pens, 200
- Gillot, Joseph, 196
- Gloves
 - cotton, 73, 78
- Goodyear, Charles, 222
- Gooping, 119, 121, 197
- Graffiti, 63, 192
 - artists, 200
- Graffiti or Anonymous Poison Pen Letters, 63
- Grammar, 23, 75, 110
- Graphic expression, 9
- Graphic maturity, 9, 12, 27, 28, 30
- Graphic movement, 32
- Graphite, 143, 152, 195, 197, 198
- Graphologists, 254
- Grid, 59, 70, 148, 154, 186
- Grids, 70
- Grip pressure, 117
- Guided hand, 34
- Habits, 10, 21, 22, 23, 58, 98, 100, 101, 105, 106, 108, 115, 127, 128, 130, 158, 164, 165, 170, 182
 - dating, 44
 - inconspicuous, 94
 - inconspicuous, 24
 - subconscious, 12, 87, 114
 - writer's, 17
 - writing, 169, *See* writing habits
- Habits of the forger, 127
- Hamilton, Charles, 51
- Handicapped writer, 32
- Handling and protecting documents, 78
- Handprinting, 8, 38, 41, 42, 64, 85, 88, 92, 160
- Handprinting and Numerals, 37
- Handwriting, 3, 4, 5, 7, 8, 9, 10, 12, 16, 27, 28, 30, 34, 35, 41, 42, 85, 91, 92, 93, 100
 - characteristics, 13
 - characteristics of, 98
 - comparison of, 48
 - cursive, 2
 - examination of, 97
 - identification of, 13

- principles, 7
- principles of, 49, 94
- sample, 197
- samples, 22, 23
- samples of, 83
- skill, 31
- systems, 19
- Handwriting samples, 48
- Harrison, Shirley, 53
- Harrison, Wilson, 158, 159
- Hauptman, Bruno Richard, 50
- Health, 24, 31
- Hearings, 242, 243
- Hectograph process, 221
- Hesitation strokes, 169
- Hieroglyphics, 1
- Hilton, Ordway, 31, 34, 92
- Hiss, Alger, 50
- History
 - of document examination, 50
 - of paper making, 185
- History of Duplicating Methods, 221
- History of Forgery, 47
- History of Numbers, 42
- History of Writing, 1
- Hitler Diaries, 52, 191, 206
- Hitler Diary Case, 92
- Hoffman, Mark, 50
- Hofmann, Mark, 52
- Holistic forgeries, 129
- Hooks, 12, 22, 23, 40, 94, 99, 105
- Howard Hughes' Autobiography, 50, 51
- Howland, Sylvia Ann, 49
- Hughes, Howard, 51
- IBM Selectric Typewriter, 211
- Identification, 210
- Identification of Numbers, 43
- Identification of pens, 197
- Identifying forged documents, 128
- Identifying the forger, 129
- Identifying the writer, 164
- Identity theft, 62, 63
- Ideographs, 1
- In the Courtroom, 249
- Inconsistencies, 163, 170
- Indelible ink, 180
- Indentations, 150
- Indented writing, 64, 73, 75, 146
- Indicators of fraudulent checks, 176
- Individual Characteristics to Look For, 45
- Industrial espionage, 61, 62
- Infrared, 73, 81, 144, 145, 149, 223
- Infrared snooter scope, 73
- Infrared spectrometers, 190
- Initial examination, 92
- Initial stroke, 102
- Initial strokes, 21, 101
- Ink, 29, 44, 47, 57, 58, 65, 73, 74, 81, 121, 143, 145, 146, 147, 149, 150, 151, 152, 175, 185, 187, 188, 195, 196, 197, 199, 200, 216, 230
 - alcohol based, 144
 - ballpoint. *See* ballpoint ink
- Ink cartridges, 196
- Ink chemists, 53
- Ink eradicator, 188
- Ink formula, 52, 77
- Ink jet printer, 72
- Ink or paper expert, 66
- Ink Standards Collection, 183
- Ink, water-based, 80
- Inkjet, 213
- Inkjet printer, 225
- Inkjet printers, 210
- Insertions, 143, 148, 154
- Insurance fraud, 61, 62
- Intent to defraud, 55, 56
- Interdelineation of lines, 64
- Interrogatories, 233
- Intersecting lines, 100, 119, 150, 151
- Invisible inks, 188
- Involuntary hooks, 171
- Iodine fuming, 81, 146
- Ireland, William Henry, 51
- Irving, Clifford, 51

- Jack the Ripper Diary, 52
- James, Linda, 53
- Jenkins, John, 4
- Judge, 233, 235, 236, 239, 241, 245, 246, 248
 - presiding, 83
- Jurors, 72, 239, 245, 246, 248
- Jury, 71, 83, 236, 239, 241, 246, 248, 249, 254
- Jury books, 249
- Justinian Code, 48
- Key, 110
- Keyboards, 207
- Kinsley, William, 49
- Kodak, 223
- Ko-Rec Type, 217
- Korn, Arthur, 225
- Krometone paper, 152
- Kujau, Konrad, 52
- Labels, 187, 191, 203, 206
- Laser copies, 225
- Laser copy, 231
- Laser pointer, 248
- Laser printer, 72, 210, 223, 225, 230, 231, *See*
- Laser printers, 174, 209, 213, 224
- Laser-cut rubber, 222
- Legal liability, 55, 56
- Letter designs, 20, 21, 23, 97, 98, 99
- Letter form, 17
- Letter forms, 2, 8, 12, 18, 19, 21, 22, 23, 24, 30, 31, 100
- Letter groups, 101
- Letterhead stationery, 188
- Lettering, 37
- Letterpress, 221
- Letters, 85, 102, 107, 160, 164, 169, 176, 180, 207
 - capital, 2, 12, 38, 39, 40, 98
 - lowercase, 2, 38, 40, 41, 98
- Letters of the alphabet, 8, 21, 43, 87
- Ligatures, 3, 22, 103, 104
- Light box, 57, 72, 81, 119, 146, 147, 217
- Lighting, 28, 29, 81, 144, 145, 146, 149, 150, 151, 217
 - conditions, 73
 - oblique, 72
- Lindbergh Kidnapping Case, 50
- Line quality, 14, 16, 17, 24, 37, 94, 97, 113, 127
- Line Quality, 109
- Liquid Paper, 147, 216
- Litigation, 61
- Litigation Process, 239
- Lockwood-Post's Directory*, 66, 190
- Loud, John J., 196
- Lowercase letters, 40, *See* letters
- Luminescence, 144
- Machine copies, 224
- Magnetic character coding, 188
- Magnetic ink, 176, 178, 188, 229, 231
- Magnetic number, 177
- Magnetic printer, 230
- Magnetic tape, 209
- Magnifiers, 70
- Making an identification, 94
- Manila envelopes, 77
- Maps, 245
- Margins, 17, 18, 20, 37, 105, 171
- Master pattern, 24, 97, 171
- Master Pattern, 110
- Mathematical probability, 49
- Matley, Marcel, 53
- Measurements, 43
- Measuring devices, 70
- Mechanical defects, 211
- Mechanical factors, 27, 28, 91, 94
- Medial strokes, 22, 103
- Mediation, 242, 243
- Medical malpractice, 61, 62, 75
- Medication, 28, 33, 34
- Mental condition, 31, 92
- Mental disturbance, 27
- Mental handicaps, 91
- Mental Health, 32

- Mental illness, 27, 33
Mental images, 13, 21
Method of construction, 21, 24, 41, 94, 97, 100, 101, 113
Method of disguise, 158, 160, 162
Methods of construction, 39
Methods of detecting disguise, 163
Methods of disguise, 157, 167
Methods of forging, 56
Methods of passing forgeries, 176
Methods of simulation, 168
Methylene blue, 144
Meyer, George, 163, 168
Micro printing, 175, 176
Micrographia, 34
Micrometer, 70, 150
Microscope, 35, 81
 digital, 73
 stereoscopic, 69
Microscopes, 69, 70
 scanning electron, 190
Misalignment, 59, 148, 154, 176, 207, 211, 212, 213, 217
Model Penal Code, 47
Model signature, 57, 98, 115, 118, 120, 168
Molineux, Roland B., 49
Money, counterfeit, 188
Monroe, William, 198
Mormon Will, 51
Motions in limine, 254
Movement, 9, 14, 15, 97, 161
 arm, 5
 habit of, 113
 wrist, 7, 106
Movements, 10, 11
Muscular movement, 34
Muscular movement of penmanship, 5
Mylar sleeves, 74
National Fraudulent Check File, 182
Natural, 7
Natural variation, 21, 93, 116, 125, 171
Negotiable instruments, 58, 75
Negotiation, 243
Newsprint, 186
Ninhydrin, 80, 81
No signs of forgery, 128
Nondestructive testing, 145
Notaries, 204
Notary seal, 153
Notary stamps, 204
Numbers, 8, 42, 43, 44, 45, 62, 85, 87, 165, 174, 178, 179, 180, 182
Numerals, 37, 42, 43
Oblique lighting, 144, 145, 146
Obliterations, 147
Observations, 23
Obvious forgeries, 128
Office equipment, 9, 207, 214, 225
Opinions, 42, 84, 134, 135, 136, 140, 141, 235, 245, 253
Optical aids, 69
Optivisor, 70
Original documents, 140
Osborn, Albert, 49, 50, 51, 94, 158
Other methods of disguise, 161
Other safety features, 175
Other Types of Fraud, 61
Other types of paper, 187
Other Writing Instruments, 198
Other writing surfaces, 192
Page substitution, 150, 205
Palmer, 12
Palmer Method, 4, 5, 19
Palmer penmanship, 99
Palmer, Austin N., 5
Paper, 58, 66, 77, 81, 185, 186, 193
Paper clips, 205
Paper for printing or writing, 186
Paper Institute, 190
Paper money, 188, 223
Paper problems, 190
Paper testing, 189
Papermaking, 185
Papers, 73
Papyrus, 185

- Patching, 116
 Patching or retracing, 118
 Pen lifts, 169
 Pen lifts in unnatural places, 121
 Pen scope, 10
 Pencil, 152
 Pencils, 8, 195, 197, 198
 colored, 143
 Penmanship, 4, 5, 30
 Penmanship system, 3, 12
 Penmanship systems, 3, 12, 19
 Pens, 195, 196, 199, 246, *See* type of
 pen such as ballpoint
 steel, 196
 Pentel, 197
 Perforations, 176, 180, 205, 231
 Petroglyphs, 1
 Petrograms, 1
 Phoenicians, 1
 Photocopier, 59, 72, 92, 148, 154, 218,
 222, 223, 224
 Photocopiers, 222
 Photocopies, 53, 72, 76, 78, 81, 84,
 108, 140, 152, 153, 182, 210, 223,
 224, 225, 247, 251
 Photocopy, 59, 73, 79, 84, 147, 152,
 154, 225, 246
 Photocopy toner, 73, 147
 Photographers, 49
 Photographs, 71, 72, 78, 80, 140, 245,
 246, 247
 Photographs and Photocopies, 246
 Photography, 49, 71, 81, 146
 Photostat, 222
 Photostats, 223
 Physical condition, 31
 Physical factors, 7, 91
 Physical handicaps, 28
 Physiology of Writing, 9
 Pictorial effect, 15, 93, 94, 114, 157,
 158, 160, 161, 169, 170
 Piece, Benjamin, 49
 Pigment, 203
 Pigment particles, 223
 Pigments, 186, 198, 199, 200, 216, 222
 Pioneers of Document Examination, 48
 Poison pen letters, 63
 Porous pen point, 197
 Post litem motam, 88
 Postage stamps, 204
 Power point, 248
 Preliminary procedures, 91
 Preparation, 239
 Preparing exhibits, 248
 Preparing reports, 139
 Presentation of Exhibits, 247
 Presenting Testimony, 240
 Pressure, 14, 15, 18, 97
 Pressure patterns, 12, 14, 15, 16, 17, 23,
 24, 29, 37, 69, 94, 98, 100, 108, 113,
 117, 118, 127, 171
 Pretrial conference, 239, 240
 Pretrial preparation, 239
 Principles of Handwriting, 7
 Principles of Identification, 13
 Printer
 daisy wheel, 209
 Printers, 209, 213, 214
 Private process servers, 233
 Problems involving numbers, 44
 Proof of forgery, 56
 Proper lighting, 72
 Properties of paper, 188
 Proportions, 15, 19, 97, 106, 161, 171
 Protective equipment, 73
 Protractor, 70, 107
 Punctuation, 23, 75, 110, 165
 Punctuation marks, 85
 Qualifications, 235, 241
 Qualifying in court, 254
 Qualifying in Court, 241
 Qualifying questions, 241
 Qualifying Your Opinion, 136
Questioned Documents, 49
 Questions to ask about paper, 192
 Questions to Ask About Typewriters,

- 214
 Quill pen, 196
 Range of the writer, 99
 Range of writing, 14, 24, 93, 97, 163
 Ransom notes, 50, 63, 157, 162, 163
 Rare documents, 52
 Rather, Dan, 53
 Reading under white out, 217
 Reasons for disguise, 162
 Rebuttal, 242
 Rebuttal witness, 242
 Recognizing disguise, 168
 Recognizing forgery, 169
 Redirect testimony, 242
 Reed pen, 195
 Remington, 207, 211
 Rendell, Kenneth, 51, 53
 Request writing, 83, 84, 85, 86, 87, 88, 161, 162, 164, 255
 Requirements, 245
 Restoration of erased material, 146
 Restoring documents, 193
 Reticle, 70
 Rhythm, 14, 15, 16, 17, 23, 33, 97, 107, 113, 127
 Ribbons, 147, 151, 180, 199, 207, 208, 209, 211, 214, 215, 216, 217, 221
 Rice Will Case, 49
 Rittenhouse, William, 185
 Roman numerals, 43
 Roundhand, 4
 Routing number, 176, 177
 Rubber erasers, 143, 197
 Rubber stamps, 58, 173, 199, 204, 222
 Rubric, 102
 Rule on witnesses, 240
 Rulers, 70, 71
 Rules of Evidence, 236
 Safe. *See* fireproof safe
 Safety features, 176, 182
 Safety paper, 173, 175, 176, 186, 187, 188, 229, 230
 Safety Paper Standards File, 183
 Saudek, Robert, 27
 Scanned documents, 225
 Scanner, 229
 Scanners, 174, 224, 247
 Scanning electron microscope, 190
 Seals, 203, 204, 205
 Seals, Stamps, and Paper, 203
 Secret Service, 53, 182, 188
 Security feature, 188
 Security features, 188
 Self-disguise, 93
 Sequence of writing, 75
 Sequestering the witness, 240
 Sheaffer, W.A., 196
 Sholes, Charles Lathem, 207
 Side lighting, 65
 Side-lighting, 146
 Signature, 7, 18, 34, 35, 40, 44, 55, 57, 58, 84, 91, 93
 genuine, 81
 simulated, 56
 Signature comparison, 97
 Signature identification, 75
 Signature stamp, 125
 Signatures, 22, 48, 49, 51, 59, 75, 78, 92, 102
 computer-generated, 93
 duplicate, 93
 Signs of disguise, 162
 Signs of forgery, 114, 115
 Signs of fraud, 65
 Simulation, 127, 167, 168
 Size, 19, 97, 106
 Skill level, 23, 30, 92
 Skill of the Writer, 109
 Slant, 14, 15, 97, 107, 158
 Smith, Robert, 53
 Souder, 50
 Souder, William, 50
 Southworth, Albert, 49
 Space, 97, 106, 148, 158, 164
 Spacing, 37, 106, 154, 155, 164, 165, 167

- Spatial arrangement, 37
- Spatial relationships, 14, 19, 97, 105
- Specialized equipment, 72
- Speed, 14, 97, 108, 162, 167
- Speed of writing, 17
- Spelling, 23, 75, 175
- Spencer Dandyroll Factory, 190
- Spencer, Platt Roger, 4
- Spencerian System, 4
- Spoliation., 78
- Spring, Robert, 51
- Squiggles, 114
- Stamps, 176, 203, 204, 205, 230
- Standard Files, 183
- Standard terminology, 134
- Standards of comparison, 48
- Staple holes, 150, 154, 205
- Staples, 205
- State Codes, 178
- Statute of 1913, 48
- Stereoscopic microscope, 69, 151
- Stick charcoal, 198
- Stopping credit card abuse, 181
- Strokes, 104, 105, 106, 108
 - connecting, 22
 - connecting, 3, 17, 19
- Subpoena, 233, 234
- Subpoena Duces Tecum, 234
- Substance abuse, 28
- Substitutions, 66, 75, 154
- Suicide notes, 33
- Sumerians, 1
- Summons, 233
- Supreme Court, 255
- Sutherland, 61
- Systematic examinations, 91
- Table of contents, 250
- Tear strength, 189
- Techniques of the Forger, 58
- Templates, 70
- Tensile strength, 189
- Terminal strokes, 22, 102, 115, 126
- Testimony, 234, 235, 236, 240, 241, 242
- Testing, 52, 78, 81
- The Law of Evidence*, 49
- Thin-layer chromatography, 149
- Thockmorton, George, 52
- Thomas, Isaiah, 4
- Thready connections, 22
- Thready lines, 103
- Threats, 157, 163
- Thurber, Donald, 5
- Ticks, 12, 22, 23, 40, 94, 99, 102, 105, 161, 171
- Toner particles, 223, 224
- Traced signatures, 116
- Tracing, 115, 119, 120, 125, 127, 129, 168, 248
- Transmission electron microscopes, 190
- Transmitted light, 119, 144, 146, 147, 217
- Transparencies, 224, 236, 245, 247, 248
- Transporting documents, 77
- Trash marks, 59, 154, 224
- Tremor, 116, 117
- Tremor in Handwriting, 35
- Trials, 242, 243
- Type ball, 208, 211, 212, 213
- Type bar, 207, 208, 210, 211, 212
- Typefaces, 180, 208, 213
- Types of Cases, 217
- Types of disguise, 170
- Types of Exhibits, 246
- Types of freehand simulation, 170
- Typewriter, 148
- Typewriter manufacturers, 208
- Typewriter ribbon, 147
- Typewriter standards, 210
- Typewriter Standards File, 183
- Typewriters, 58, 212, 213, 214
- Typewriters and Printers, 207
- Typewritier characteristics, 211
- Tyrrell, John, 49
- Tytell, Martin, 50
- Tyvek, 187

- Ultraviolet, 145, 149
- Ultraviolet light, 144, 147, 150, 174, 175, 205
- Undue attention to unimportant details, 121
- United States Post Office, 53
- United States Testing Company, 190
- Unusual writing fluids, 200
- Use of space, 105
- Utilization of space, 19, 20, 23
- UV, 81
- UV light, 72
- Vellum, 185, 187
- Video cameras, 73
- Video Spectral Comparator, 73
- Videos, 245
- Videotaped depositions, 234
- Visual aids, 236
- Vulcanized rubber, 222
- Wagner, Leonard, 4
- Waterman, Lewis E., 196
- Watermark, 66, 191
- Watermark File, 183
- Watermarks, 150, 175, 186, 190
- Watt, James, 221
- Wedgewood, Ralph, 222
- Weighing the evidence, 133, 135
- Wellingham-Jones, Patricia, 33
- White-collar crime, 61
- Wigmore, John H., 49
- Will, Emily, 53
- Williamson, Perigreen, 196
- Witnesses, 233, 239, 240, 242, 243, 255
- Word processors, 154, 209
- Writing, 1, 7, 8, 9, 10, 15, 29, 102
 - over folds, 69
- Writing environment, 20
- Writing habits, 12, 13, 37, 58, 98, 114, 115, 129, 158, 165, 167, 168, 170
- Writing instrument, 64
- Writing instruments, 195
- Writing paper, 8, 34
- Writing surface, 16, 29
- Written report, 139, 235
- Xerography, 223
- X-ray spectrometric detectors, 190
- Zaner, Charles P., 5
- Zaner-Bloser, 4
- Zones of writing, 15