

43587

Department
of
the
Treasury



Forensic
Handbook



Preface

This handbook was developed through the efforts of the Treasury Laboratory Coordination and Review Board with the support of the Federal Law Enforcement Training Center.

The handbook has been designed to serve as a quick reference on known procedures for the collection, preservation and transmittal to a forensic laboratory of many types of evidence for examination and analysis. Primarily, it describes basic steps to follow to minimize the omission or contamination of evidence that could be encountered in 10 general crime scenes. This should make the handbook particularly useful to new law enforcement personnel. However, it is not intended to cover all contingencies, to supersede established agency procedures, or to prevent updating of its contents as new forensic procedures are developed.

While the handbook was written primarily for personnel entering particular Treasury law enforcement careers, it is hoped that it will serve all who are dedicated to maintaining law and order.

David R. Macdonald

David R. Macdonald
Assistant Secretary
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MICROFILM

Editorial Comments

First, the Contents, pages 3-6 numerically order by section, categorical grouping and page number the evidentiary information contained in the handbook. The numerical ordering also acts as a common index to locate information on an item within a subcategory of a section. There are five sections as follows:

Section I—Crime Scenes, depicts 10 crime scenes that an investigating officer is likely to encounter. Each illustration focuses on typical evidence found at such scenes. Explanations after each scene summarize other items of evidence that may be uncovered. These items are numerically indexed for further referencing in Sections II; IV.

Section II—Collection & Preservation of Evidence, describes procedures for collecting and preserving 15 categories and 49 subcategories, of evidentiary items found in at least one of the crime scenes.

Section III—Transmittal of Evidence to a Laboratory, describes procedures for forwarding evidentiary exhibits to a forensic laboratory. An example of a typical transmittal letter is included.

Section IV—Laboratory Analysis and Examination Time, describes techniques available at forensic laboratories for evaluating and analyzing evidence. Suggestions as to the information that can be developed by certain analyses and an estimate of the examination time required for these are also included.

Section V—Glossary, explains technical terms and words with which the reader may not be initially familiar.

Secondly, the handbook evolved from the desire of people involved in law enforcement to enhance such activities by the use of consistent procedures in the acquisition and transmittal of evidentiary items for forensic analysis. Without their assistance this handbook would not have been possible. They were as follows:

Bureau of Alcohol, Tobacco & Firearms:

Richard Brunelle

C. Michael Hoffman

Maynard Pro (Retired)

Bureau of Government Financial Operations:

Merle Michael (Retired)

Federal Law Enforcement Training Center:

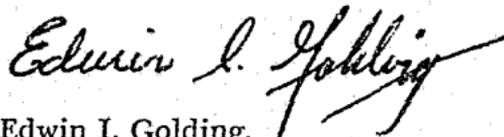
Alice Blumer

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U.S. Park Police:

Earl Housenfluck

Finally, special appreciation is extended to Gail Mesmer who typed the text in preparation for final printing.



Edwin I. Golding,
Assistant to the Director (Technology)
Editor
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NCJRS

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ACQUISITIONS

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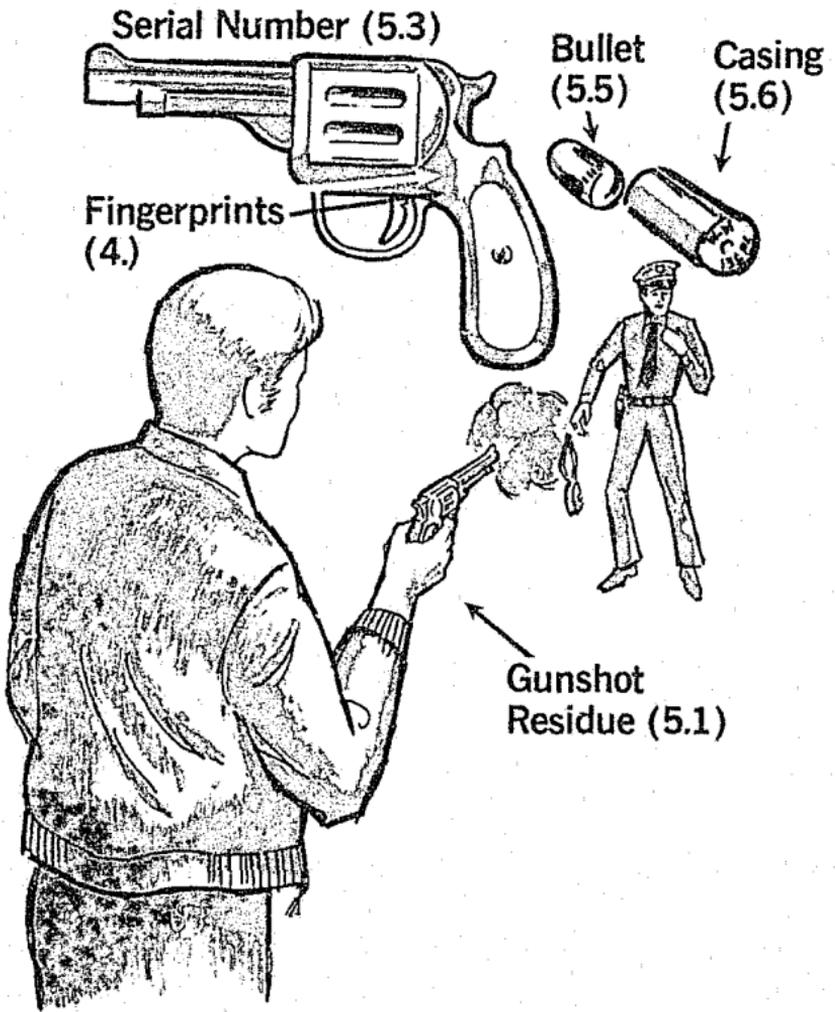
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SECTION 1—CRIME SCENES



ARMED ASSAULT

ARMED ASSAULT

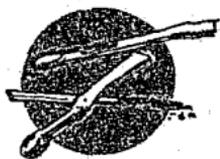
In an armed assault the recovery of the weapon that was used, particularly if it was a firearm, is of primary concern. A firearm may show fingerprints or have some uniqueness because of the presence of a serial number, scratches or other unusual features. Any of these can be used to establish the positive identity of a weapon. When a firearm is involved, do not overlook the provision of the Gun Control Act of 1968 and the possibility that the Bureau of Alcohol, Tobacco and Firearms, U.S. Department of Treasury can trace firearms to the last retail purchaser.

Search the area for projectiles and spent cartridges. Once a projectile is located, try to establish its path or line of fire. When investigating a closed area to establish the path of a projectile to the entry hole and try to establish the point where the assailant stood. Once this point is established, look for physical evidence relating to the assailant such as fingerprints, torn pieces of clothing, and cigarette butts.

Use a gunshot residue test at the crime scene whenever practicable to substantiate whether a person handled or fired a weapon. Collect clothing samples from a suspect; the gunshot residue test can be used on his outer clothing even if he is not apprehended soon enough for such a test to be made on his hands.

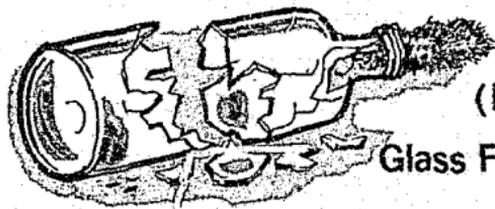
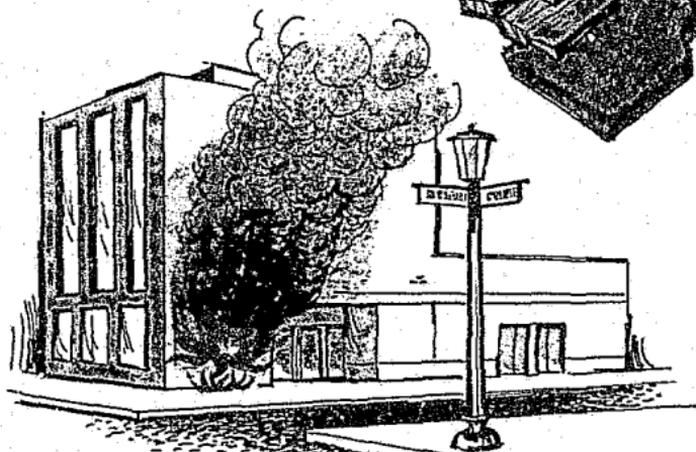
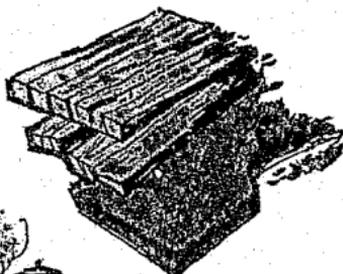
The collection and preservation of evidence usually common to an Armed Assault is described in further detail in the Collection and Preservation Section as follows:

Blood	(1.1)	Hand Guns	(5.2)
Cigarette Butts	(15.1)	Serial Numbers	(5.3)
Clothing	(3.)	Shoulder Weapons	(5.4)
Fingerprints	(4.)	Spent Bullets	(5.5)
Gunshot Residues	(5.1)	Spent Cartridge Cases	(5.6)



Matches torn from
match book (2.1)

Charred samples of wood
or carpet (2.1)



Wick Fragments
(2.1)
(Molotov Cocktail)

Glass Fragments (7.2)

ARSON

ARSON

In an arson investigation, a main objective is to determine the point where the fire started. Physical evidence which is collected there can be an important clue to whether or not the fire was intentionally set.

Once a possible point of origin is located, consider whether the objects seen there are common to the place in which they are found. Check for traces of combustible materials in the debris and check all materials for the odor of petroleum. Look for and collect any ashes and soots that are peculiar in color, any unusual clinkers, and any wet or stained material. Look to see if any of the ordinary fire protection devices in the building have been tampered with or altered. Take notes concerning any significant observations you make.

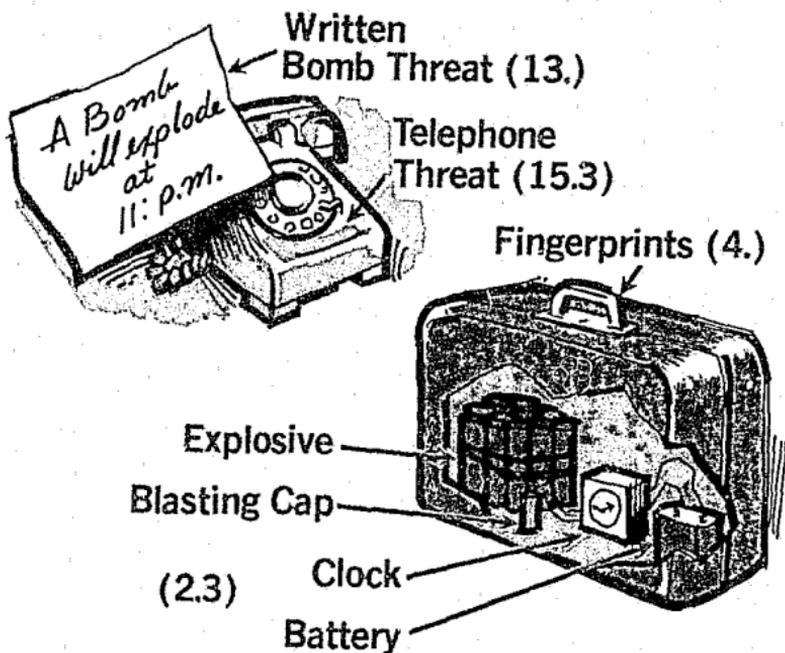
If the fire was set by use of an accelerant, it is likely that the offender either left the container at the crime scene or disposed of it nearby. Consider where there is a probable spot for trash disposal in the area. If a container is not found in the fire debris, it might be in such a place.

Consider where an entry to the building may have been made. Check to see if a door or window was forced open. Look for tool marks and other evidence that the arsonist may have left behind.

Consider possible associative evidence. When investigating the inside of the building, consider whether the arsonist had a particular target in mind. In your investigation, also determine if anything is missing from the scene that could later be identified if found in a suspect's possession.

The collection and preservation of evidence usually common to Arson is described in further detail in the Collection and Preservation Section as follows:

Arson Debris (2.1)	Footprints	(9.1)
Carpet	Gasoline	(10.1)
Fabric	Glass	(7.1) (7.2)
Matches	Metal Fragments	(11.2)
Wood	Tire Marks	(9.2)
Fingerprints (4.)	Tool Marks	(9.3)



Bomb Debris
(22, 23)



BOMBING

BOMBING

In a bombing situation investigative actions depend on whether it is a threatened bombing or an explosion that has already occurred.

When there is a bomb threat, the validity of the threat must be determined as quickly as possible. Call in a team designated to conduct bomb searches of a threatened area. If a suspicious package is located call in an appropriate bomb disposal team. Do not touch—move the people away from the bomb, not the bomb away from the people! When bomb threats have been made by telephone, find out all you can about the caller from the person who received the call. If the threat was made by letter, carefully collect and preserve the letter so that any fingerprints, typewriting, handwriting or the paper itself can be analyzed.

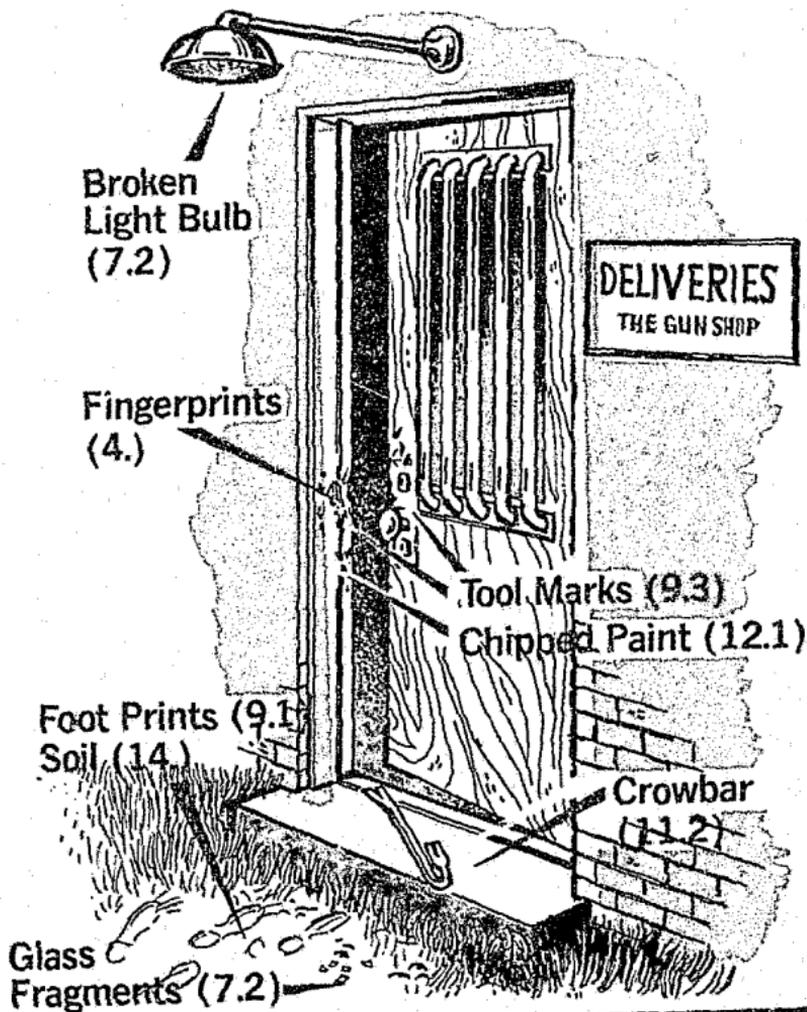
In a post-blast situation, there should first be a search conducted by bomb disposal experts to determine if there is a second bomb set as an entrapment device. Subsequently, try to determine where the seat of the blast or point of detonation is, and what kind of blast effects are displayed. Search outward from the bomb crater in ever-widening circles. Sift, sort, and collect samples of the rubble, keeping in mind that only a few bombs destroy all the components used in their construction. Pieces of wire may bear tool marks; pieces of the timing or triggering mechanism may be traceable to a manufacturer or dealer and pieces of an explosive wrapper may still retain enough of the date-shift-code to permit a trace through existing records to the last known purchaser.

Collect surface debris from the blast seat and use acetone-moistened swabs to test the hands of any suspects. Subse-

quent laboratory analysis can make a detailed identification of residues.

Collection and preservation of evidence usually common to a Bombing is described in further detail in the Collection and Preservation Section as noted below:

Explosive Debris	(2.3)	Fabrics	(3.)
Explosive Substances		Fingerprints	(4.)
and Devices	(2.3)	Metal Fragments	(11.2)
Battery Parts		Paper	(13.)
Blasting Caps		Tool Marks	(9.3)
Clock Parts		Voiceprints	(15.3)
Wire			



BREAKING AND ENTERING

BREAKING AND ENTERING

When investigating a scene of a breaking and entering offense, consider how the crime was perpetrated and collect evidence accordingly. Consider how the suspect entered the premises. Check the doors and windows. If entry was made through a door by prying, look for and collect tool marks. If the door has a metal doorknob, look for and collect fingerprints. If entry was through a shattered window, collect the glass fragments. Do not handle the glass directly; fingerprints might be present. Look for clothing fibers which might have caught on the jagged glass, or blood deposited on the glass by a perpetrator who was cut by it.

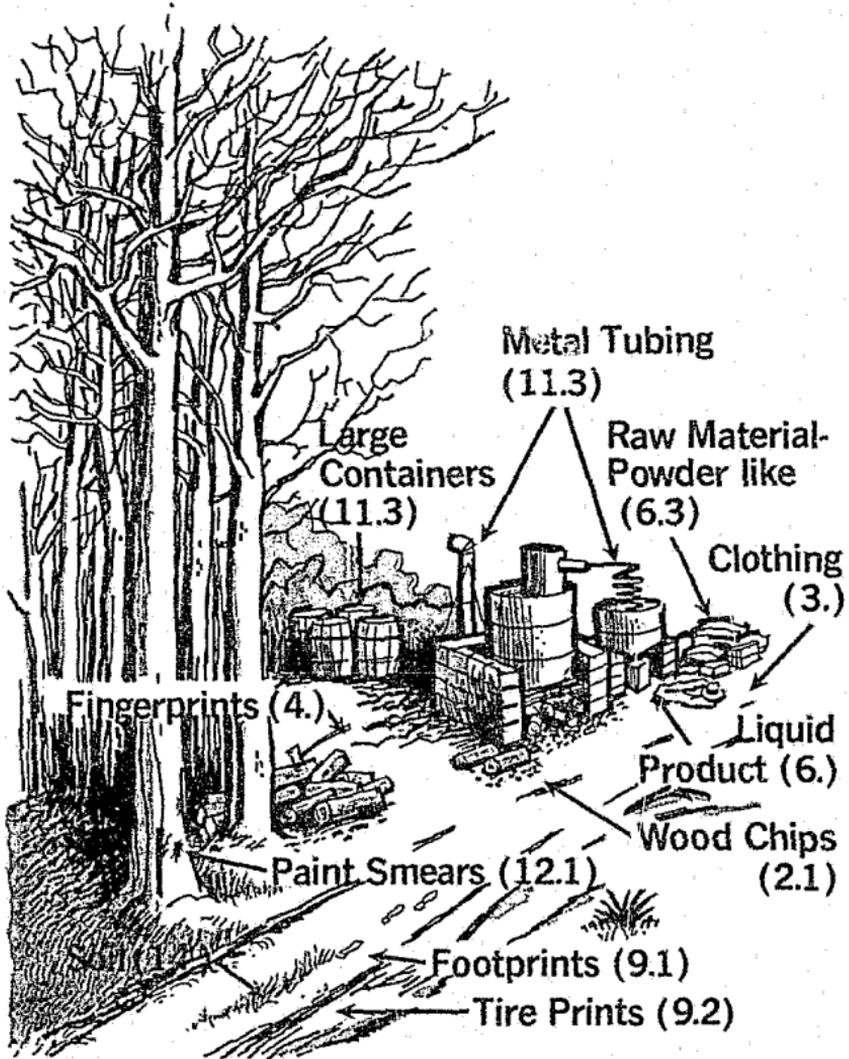
Consider how the perpetrator might have approached or left the premises. Soft ground or soil outside might contain tire tracks. The soil may be carried inside revealing additional footprints and evidence of entry.

Consider what surfaces in the room might have been touched by the perpetrator. Fingerprints might appear on a table under a window where entry took place, on a metal filing cabinet which was left ajar, or on any object that might have been held by the perpetrator.

Collect articles which might be considered out of place. For example, collect any half-used packs of matches or cigarette butts lying on the floor as possible evidence. Look for articles of clothing, a hat or handkerchief, which are in an unusual place in or near where the offense occurred.

The collection and preservation of evidence usually common to Breaking and Entering is described in further detail in the Collection and Preservation Section as follows:

Blood	(1.1)	Hair	(8.)
Cigarette Butts	(15.1)	Metal Filings	(11.1)
Clothing	(3.)	Paint Chips	(12.1)
Fabrics	(3.)	Soil	(14.)
Fingerprints	(4.)	Tools	(11.3)
Footprints	(9.1)	Tool Marks	(9.3)
Glass	(7.)		



CLANDESTINE OPERATION

CLANDESTINE OPERATION

The clandestine operation, particularly one conducted outdoors, presents a great source of physical evidence. Whether the operation is an illicit distillery, a counterfeiting plant, or a narcotics laboratory, the raw materials or ingredients which go into making the final product are important items of physical evidence. They can often be traced to a supplier and to a purchaser. Look for and collect samples of all substances which you consider to be raw materials or ingredients.

Consider the approach to the violation site as a source of evidence. Tire tracks, footprints, and paint fragments embedded on trees all offer reliable sources of comparative evidence.

Important items of evidence at the violation site are soil samples. Often these samples can be tied to samples found later on a suspect's shoes or clothing, on his vehicle or in his house. Take several samples from widening concentric circles starting from the center of the crime scene.

Since the illegal clandestine operation takes time to set up and run, many things are handled and used to construct operating systems. The discovery and collection of a wide variety of evidence is possible. Look for traces of hair, body fluids, clothing, unique eating utensils, tools, etc., which may be linked to a suspect.

The collection and preservation of evidence usually common to a Clandestine Operation is described in further detail in the Collection and Preservation Section as follows:

Alcohol	(10.1)	Oil	(10.2)
Clothing	(3.)	Paint Chips or Smears	(12.1)
Fingerprints	(4.)	Paper	(13.1)
Footprints	(9.1)	Raw Materials	(6.)
Fuel	(10.1)	Soil	(14.)
Gasoline	(10.1)	Tire Impressions	(9.2)
Glass	(7.)	Tools	(11.2)
Plastic	(8.)	Tool Marks	(9.3)
Metal	(11.)	Wood Chips	(2.1)



Solder
(11.2)



Tool Mark
(9.3)

Fingerprints
(4.)

Tool
(11.2)



Paper
(13.3)

Ink
(13.)



COUNTERFEITING

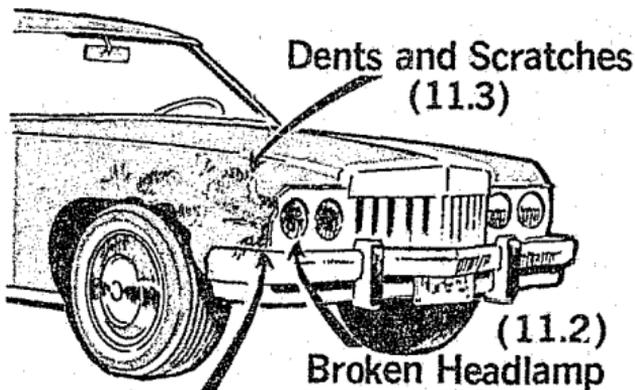
COUNTERFEITING

Counterfeiting as a specialized form of forgery is associated with the false production of something of value such as currency (paper or metal) or negotiable instruments (checks or bonds). In a questioned document situation, collect samples of items such as currency and inks that can be used for comparative analysis at the laboratory to prove or disprove the authenticity of the item being analyzed.

If a clandestine counterfeiting operation is uncovered, consider what possible means and instruments are needed to produce a counterfeit. Look for and collect tools and other paraphernalia used in the operation. Also, consider what evidence might link suspects to other illicit commercial activities and enterprises. Look for possibly forged or stolen credit cards, driver licenses, letters of credit, blank bank checks and possible burglary proceeds.

The collection and preservation of evidence usually common to this crime scene is described in further detail in the Collection and Preservation Section as follows:

Dies	(11.2)
Fingerprints	(4.)
Ink	(10.2) (13.)
Paper	(13.)
Solder	(11.2)
Tools	(11.2)
Tool Marks	(9.3)



Fibers, Blood
(1.1)

Tire Prints (9.2)



HIT AND RUN

HIT-AND-RUN

After a hit-and-run incident, physical evidence strewn about or found on the victim or on the offender's vehicle may be the only means of linking a suspect to the crime scene.

Consider first what possible evidence could have been left on the scene. Broken glass, chrome fragments, decorative metals, or paint chips may have been dislodged on impact. Search the area surrounding the accident and the victim's clothing for traces of this evidence. Also collect mud, dirt, and vegetable matter uncommon to the area; it could have been dislodged from the vehicle. Look for tire impressions or footprints left on the scene.

Consider what physical evidence might have been transferred from the area on the vehicle surfaces. Collect samples such as mud, dirt and vegetable matter common to the area to serve as comparison standards in analysis of samples found on the suspect vehicle. Collect clothing fibers, blood-stains, etc., that can subsequently be used to identify a suspect vehicle as the actual vehicle that caused the impact.

If a suspect vehicle is found abandoned, consider what personal articles, papers, fingerprints, hair, and fibers can be collected and used to establish the identity of the driver.

The collection and preservation of evidence usually common to this crime scene is described in further detail in the Collection and Preservation Section as follows:

Blood	(1.1)	Hair	(8.)
Clothing	(3.)	Metal	(11.)
Fabrics	(3.)	Mud	(14.3)
Fibers	(8.3)	Paint	(12.)
Glass	(7.)	Tire Impressions	(9.2)
Grease	(10.2)		

Paraphernalia

Syringe, Spoon,
etc. (15.4)

Pills, (6.3)
Plant Material (6.2)

Powder in Plastic Bag
or Capsule (6.3)

Paper
Wrappings
(13.)

Drinking
Glass
(Fingerprints)
(4.)

Handgun
(5.2)

NARCOTICS VIOLATION

NARCOTICS VIOLATION

Sometimes evidence of a narcotics violation, such as a syringe, paper wrappings, heroin powder, and marijuana cigarettes, is discovered in plain view and collected during the investigation of an unrelated offense. In the majority of cases, however, narcotics evidence is obtained through direct purchase by undercover officers or as a result of planned narcotics raids and extensive searches.

When searching for and collecting evidence in a room, first look for the more typical hiding places such as in drawers, books, shoeboxes, mattresses or behind picture frames. Then look for the less obvious hiding places such as in light fixtures, heating ducts, secret panels, tape cartridges, etc. While searching, keep in mind that any hiding place may contain fingerprints.

Most narcotics violators, other than distributors, resort to theft to finance their purchases. During your search, be on the lookout for stolen property.

If the suspect is unknown, fingerprints may be the only evidence available for suspect identification. Before leaving the crime scene, whether it is an automobile or a room, consider all the places that the violator is likely to have touched. Check all these areas for fingerprints.

The collection and preservation of evidence usually common to this crime scene is described in further detail in the Collection and Preservation Section as follows:

Drug Paraphernalia	(6.)	Plant Material	(6.2)
Fingerprints	(4.)	Powders or Solids	(6.3)
Liquids	(6.1)	Spoon	(15.4)
Paper	(13.)	Syringe	(15.4)
		Tablets/Capsules	(6.4)



Promissory Note

No. 42 New York N.Y. 11-22, 1971

Six Months after date 1 promise to pay

To the order of John J. Doe \$ 3000.00

Three Thousand and 00/100 Dollars

at Manufacture Hancock Corporation

Value Received Man J. Doe

Due 5-22-74

Intact Document (13.3)

Handwriting

Altered Typewriting

Paper Watermark

Ink

QUESTIONED DOCUMENTS

QUESTIONED DOCUMENTS

Since the physical evidence involving questioned documents is generally derived from the documents themselves, careful handling of such documents is imperative.

Stolen checks and bonds bearing false signatures comprise the largest percentage of fraudulent documents. When you receive a report of theft or non-receipt of a negotiable instrument, contact the payee or owner, obtain handwriting samples from him for laboratory examination, and question him for information about anyone he believes might have had access to the subject document. Obtain and submit to a laboratory handwriting samples from any suspects.

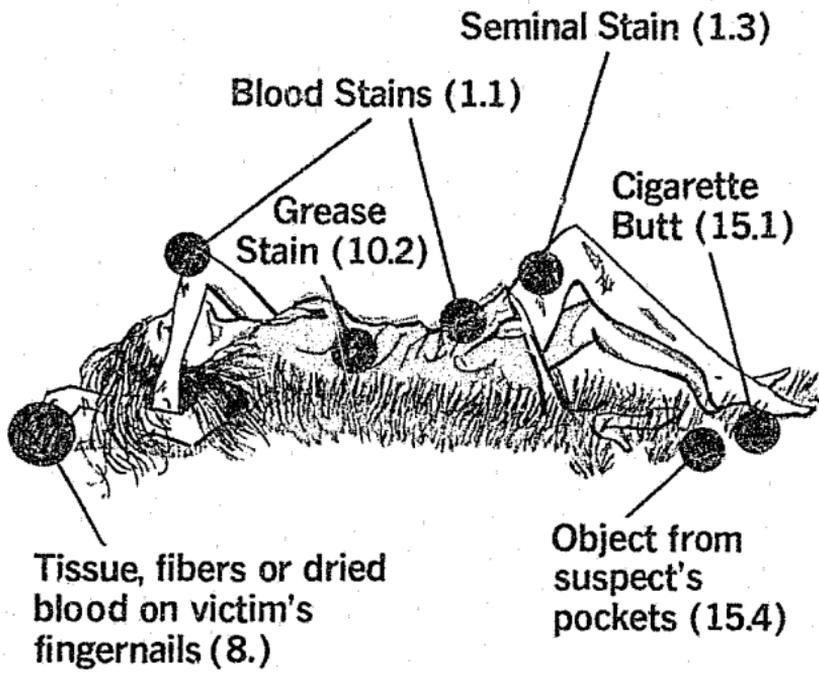
Promisory notes, commercial checks, wills, income tax returns, and other legal documents may also be fraudulent. Forward any documents in question to a laboratory for an authenticity check of items in question. If you can obtain them, include samples of handwriting, typewriting fonts and writing instruments.

When investigating document authenticity, consider whether any of the following circumstances are present:

- a signature which appears to be unnatural;
- paper which does not seem to be of the type customarily used for such documents;
- apparent differences in the types of ink used for such documents;
- use of more than one style of typewriting; or
- a questionable date of preparation.

The collection and preservation of evidence usually common to Questioned Documents is described in further detail in the Collection and Preservation Section as follows:

Fingerprints	(13.)	Typewriting	(13.)
Handwriting	(13.)	Watermarks	(13.)
Ink	(13.)	Writing	
Paper	(13.)	Instruments	(15.5)



RAPE/HOMICIDE

RAPE/HOMICIDE

Usually in these types of criminal assaults, the victim attempts to defend herself and a struggle ensues. During the struggle, the victim often pulls the assailant's hair, scratches his face, and tears his cloths. Consider what kind of evidence might be on the victim, on her clothing, and at the crime scene as a result of a struggle. Collect any bits of tissue, dried blood and cloth fibers which may be on or underneath the victim's fingernails. Collect the victim's clothing; this may contain seminal stains, bloodstains and other evidence. Look in the area for articles of evidence dropped from the assailant's pockets or torn from his clothes.

If the victim is found dead, consider what type of weapon might have been used. Search the area for an item such as a knife, rope, wire, or brick that the assailant might have used and discarded as he fled the scene.

Consider how the assailant and his victim reached the crime scene. If the victim was forced to walk or was dragged in a wooded area, there may be footprints on the ground. Collect these. If the assailant used a vehicle to bring the victim to the area, search for any possible parking spots where tire impressions and footprints may also be found and collected.

The collection and preservation of evidence usually common to a Rape/Homicide is described in further detail in the Collection and Preservation Section as noted below:

Blood	(1.1)	Saliva	(1.2)
Fabrics	(3.)	Seminal Stains	(1.3)
Fiber	(8.)	Small Objects	(15.4)
Fingerprints	(4.)	Sweat	(1.4)
Footprints	(9.1)	Tire Tracks	(9.2)
Grease	(10.2)	Tools Used as	
Hair	(8.)	Weapons	(11.3)
		Urine	(1.5)

**SECTION II: COLLECTION AND
PRESERVATION**

COLLECTION AND PRESERVATION

1. BODY FLUIDS

Introduction. Body fluid stains are valuable evidence. They can be used to associate a suspect with the crime or eliminate him from consideration. For instance, the presence of seminal stains is confirmation that a sexual act has occurred. The following describes procedures for collecting and preserving blood, saliva, semen, and urine as well as comparison standards where applicable and possible.

1.1 BLOOD

When materials stained with blood can be sent to the laboratory:

- Air dry the stained material on a piece of clean paper placed in a draft-free area.
- Place the dried material in a paper bag, label with your initials, the date, and an exhibit number and seal the bag. Any debris which falls from the material onto the paper during the drying process should also be placed in a separate paper envelope, labelled and sealed.
- If you must fold the material, protect the stained area with a piece of paper.
- Wrap each blood-stained item separately.

DO NOT PACKAGE ITEMS WHEN THEY ARE STILL MOIST. ALLOW THEM TO DRY THOROUGHLY.

- *Collect a comparison standard.*

When items stained with blood cannot be sent to the laboratory:

- Scrape the dried blood onto a clean piece of paper, using a clean knife or razor blade. Wipe clean the packaging matter from new razor blades prior to use.
- Similarly, scrape the non-stained area immediately surrounding the stained area onto another piece of paper.
- Fold each paper, firmly securing the scrapings, and place each paper in an envelope.
- Label both envelopes with your initials, the date and an exhibit number and seal them.
- Package and preserve the razor blade.
- *Collect a comparison standard.*

When quantities of blood are available:

- Place 10 cc (or whatever quantity available) of moist blood in glass vial.
- Add an equal volume of isotonic saline solution (0.9% sodium chloride) to the vial.
- Seal vial and label with your initials, the date and an exhibit number.

—or—

- Soak up the moist blood with a gauze pad.
- Air dry the gauze pad.
- Place gauze pad in a paper envelope, seal it and label envelope with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Blood

Obtain the standard by having a medical examiner or other qualified person collect 5cc of blood from the victim and all suspects. Make sure an anticoagulant

has been added to these samples. Label each of the vials with the donor's name, the physician's name, and other relevant information.

1.2 Saliva

- Air dry the stained material on a piece of clean paper placed in a draft-free area.
 - Place the dried material in a paper bag, label the bag with your initials, the date and an exhibit number, and seal it.
 - If you must fold the material, protect the stained area with a piece of paper.
 - Wrap each stained area separately.
- DO NOT PACKAGE ITEMS WHEN THEY ARE STILL MOIST. ALLOW THEM TO DRY THOROUGHLY.*
- *Collect a comparison standard.*

Comparison standard—Saliva

Swab, or have the suspect swab, the inside of his mouth with two clean, single-ended cotton swabs. Air dry the swabs and place in a paper envelope. Seal and label the envelope with your initials, the date and an exhibit number. In a similar manner, obtain samples from the victim.

1.3 Semen

- Air dry the stained material on a piece of clean paper placed in a draft-free area.
- Place the dried material in a paper bag, label the bag with your initials, the date and an exhibit number, and seal it.

- If you must fold the material, protect the stained area with a piece of paper.

- Wrap each stained item separately.

DO NOT PACKAGE ITEMS WHEN THEY ARE STILL MOIST. ALLOW THEM TO DRY THOROUGHLY.

- Swab, or have the suspect swab the inside of his mouth with two clean single-ended cotton swabs.

- Air dry the swabs and place in a paper envelope, label the envelope with your initials, the date, an exhibit number and seal it. In a similar manner, obtain samples from the victim.

1.4 Sweat

- Follow all the procedures outlined in 1.3.

1.5 Urine

- Follow all the procedures outlined in 1.3.

2. EXPLOSIVES AND INCENDIARIES

Introduction. Evidence in bomb and arson cases is difficult to find because of its small size, the presence of a large amount of debris, and because potentially useful evidence is often washed away when a fire is extinguished. For this reason, great care must be used in the collection and preservation of such evidence. The following describes procedures for collecting and preserving arson and explosive debris such as glass, wood, fabrics, foreign objects, flammable fluids as well as comparison standards where applicable and possible.

2.1 Arson Debris

Glass:

- If it appears that a Molotov Cocktail type device was used, collect the glass fragments and dust them for fingerprints.
- Place the glass fragments in a sealable metal container (i.e., an empty coffee can with a plastic lid) and label with your initials, the date, and an exhibit number.

—or—

- Place the fragments in two self-sealing plastic bags, one within the other, and label the outer bag with your initials, the date and an exhibit number.
- Seal the container tightly so that any vapors present cannot escape.

Wood and Fabrics:

- Collect and package wood, carpeting, cloth or other absorbent materials found near the origin of the fire which appear to contain traces of the accelerant or incendiary material. Use the same procedures described above for glass.

Suspected Flammable Liquids:

- Place one ounce (or whatever quantity available) of suspected flammable liquid in a small glass bottle with a tight-fitting cap.
- Seal the container and label with your initials, the date and an exhibit number.

Foreign Objects:

- Place burnt matches, wire or other object appar-

ently foreign to the scene in separate plastic or paper envelopes.

- Seal the package and label with your initials, the date and an exhibit number.

- *Collect a comparison standard.*

Comparison standard—Arson Debris

Collect carpet, wood and other absorbent materials located close to the suspected origin of the fire. Use the packaging procedure described above for glass.

2.2 Explosive Debris

- Locate the blast seat and remove the first $\frac{1}{2}$ " of soil or debris from the crater.

- Place the sample in a self-sealing plastic bag and label the bag with your initials, the date and an exhibit number.

DO NOT ALLOW SHARP-EDGED OBJECTS TO PIERCE SIDES OF BAG. IF SHARP-EDGED OBJECTS ARE PRESENT, PLACE IN A METAL CONTAINER.

- Place objects thought to have been in close proximity to blast in self-sealing plastic bags and label. Soft materials such as cloth, rubber and other readily penetrated materials are good collectors of explosive residues. Collect and preserve them. Sharp objects should be packaged in metal containers.

- Place metal fragments from the explosive device in a self-sealing plastic bag and label with your initials, the date and an exhibit number. When packaging wire or other objects with tool marks, protect the items by wrapping them in tissue paper secured with

tape. Sharp objects should be packaged in metal containers.

- If you find a suspected dynamite wrapper, place it in a sealable glass container and label with your initials, the date and an exhibit number. If a glass container is not available, use a plastic bag for packaging. However, *DO NOT PACK IT IN THE EVIDENCE BOX NEAR MATERIALS TAKEN FROM A SUSPECT.*

2.3 Explosive Substances and Devices

- Collect evidence from deactivated devices. *DO NOT ATTEMPT TO DEACTIVATE ANY EXPLOSIVE DEVICE YOURSELF UNLESS YOU HAVE BEEN TRAINED TO PERFORM THAT SPECIFIC FUNCTION.*

- Process smooth surfaces of the device for latent fingerprints.

- Place tape, paper wrappings or other materials which may bear latent fingerprints in a plastic bag or paper envelope and label with your initials, the date and an exhibit number. *DO NOT HANDLE ANY OF THESE DIRECTLY WITH YOUR FINGERS.*

- Separate all components such as blasting caps, batteries, wires, etc.

- Place each component in a separate plastic bag making sure that all items bearing tool marks are wrapped in tissue paper and secured with tape.

- Seal each bag and label each bag with your initials, the date and an exhibit number.

- Place a small quantity ($\frac{1}{8}$ tsp.) of the suspected

explosive in a small sealable glass or metal container. *DO NOT SEND EXPLOSIVES THROUGH THE MAILS.* Small quantities may be shipped to the laboratory in accordance with the provisions of the code of Federal Regulation Title 49—"Transportation" Parts 1-199, paragraph 173.

3. FABRICS

Introduction. Any and all fabric found near or at the crime scene, or missing from the crime scene, may be either supportive or necessary evidence in establishing a relationship between the crime and the suspect. Collect and preserve such items carefully to avoid contamination. No object is too large or too small to be of value; do not pass over an item because you doubt its relationship or attachment to the case under investigation. The following describes procedures for collecting fabrics, large or small, as well as comparison standards where applicable and possible.

3.1 Large Articles

- Before collecting and packaging large articles such as mattresses or upholstered chairs, record the exact position of the evidence. For example, indicate in your notes or diagram which end of a bloodstained mattress was next to the headboard.
- Care should be taken during the collection and preservation process not to loosen any trace materials. Wet surfaces should be allowed to dry before packing.
- Large pieces of fabric should be carefully folded, protecting any torn edges, and placed in a clean bag, sealed and marked.

- Plastic bags and bottles are not satisfactory for packaging any material which may contain petroleum.
 - Package large articles such as mattresses and upholstered chairs intact in large crates or boxes.
 - Affix an evidence tag to all articles and mark with your initials, the date, and an exhibit number.
- DO NOT TEAR, STRETCH OR HANDLE FABRICS ROUGHLY.**
- *Collect a comparison standard if possible.*

3.2 Small Articles

- Look carefully for small articles of fabric throughout the general crime scene, at entrances and exits and on any victims.

DO NOT OVERLOOK FIBERS THAT MAY BE ON THE VICTIM'S MOUTH, FEET OR HANDS.

- Search for imprints of fabric weave in painted surfaces, putty or on other objects. Handle these carefully, do not contaminate with fingerprints or other impressions.
- Collect small articles carefully with tweezers, ensuring that torn edges are protected.
- Allow small articles containing wet surfaces to dry before packing. These surfaces should be protected with non-abrasive material during shipment.
- Place in small containers but not so small as to require folding. Folding will cause distortion of threads.
- Fabric impressions on objects such as paint, metal surfaces and putty require careful handling. See the following sections for collection and preservation procedures: 4.3 for soft surfaces such as putty; 9.3 for

impressions on metal; and 12.1 for paint impressions.

- Package each fabric impression separately in a glass or plastic vial, a small box or other appropriate container.
- Seal each container and label with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Small Articles

Comparison standards are fabric items that can be identified and collected at the crime scene which might later be compared with fabric or fibers found on the suspect. For example, a piece of torn clothing found on a victim, a torn bedsheet or curtain might later provide an important link to a fiber found on the suspect's clothing. Package these items as described in 3.1 or 3.2 depending on the size of the object.

4. FINGERPRINTS

Introduction. Generally, latent fingerprints on non-porous materials deteriorate rapidly upon prolonged exposure to conditions of high temperature and humidity; consequently, they should be collected and forwarded to a lab as soon as possible. The following describes procedures for collecting and preserving fingerprints on absorbent and non-porous surfaces as well as collecting comparison standards where applicable and possible.

4.1 On Absorbent Materials

- Place the paper or other absorbent material in a plastic bag or cellophane protector.

DO NOT HANDLE THE MATERIAL WITH YOUR FINGERS.

DO NOT ATTEMPT TO DEVELOP LATENT FINGERPRINTS ON ABSORBENT SURFACES YOURSELF.

- Label the bag or protector with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

4.2 On Hard Surfaces

- Dust plastic cards, metal plates, glass bottles or other hard surfaced objects for latent fingerprints.
- Remove developed prints with lifting tape and place the tape on a 3" x 5" card which contrasts in color with the dusting powder used.
- Mark the card with your initials, the date and an exhibit number, place it in an envelope and seal.
- *Collect a comparison standard.*

4.3 On Soft Surfaces

- Carefully remove putty, caulking compound or other soft material bearing visible fingerprint impressions. Leave as much excess material surrounding the fingerprint as possible.
 - Glue the mass of material to a stiff section of cardboard that is marked with your initials, the date and an exhibit number.
 - Tape a protective cover over the specimen. A paper cup or baby food jar is useful for this purpose.
- DO NOT TOUCH OR OTHERWISE DISTORT THE FINGERPRINT.**
- *Collect a comparison standard.*

Comparison standard—Fingerprints

Collect and identify fingerprints of suspects and other persons who may have touched an object under investigation. Place fingerprint records in a stiff envelope to protect them from being bent. Seal the envelope and label it with your initials, the date and an exhibit number.

5. FIREARMS AND AMMUNITION

Introduction. Firearms leave unique markings on bullets and cartridge cases as well as detectable residues on the shooter's hands. The following describes procedures for collecting and preserving gunshot residue, handguns, serial-numbered items, shoulder weapons, spent bullets and spent cartridges.

5.1 Gunshot Residue

DO NOT COLLECT RESIDUES IF A .22 CALIBER WEAPON WAS USED, IF MORE THAN SIX HOURS HAVE ELAPSED SINCE SHOOTING, OR IF THE SUBJECT HAS WASHED HIS HANDS.

- Wash your hands or put on a pair of plastic gloves.
- Moisten two cotton swabs in dilute (5%) nitric acid and thoroughly swab the back of the suspect's right hand.
- Place swabs in a plastic bag and label with your initials, the date, and an exhibit number.

DO NOT PLACE SWABS IN GLASS VIALS.

- Repeat the above process for the right palm, the back of the left hand, and the left palm areas of the suspect's hands.

- Moisten a swab with dilute acid and place it in a bag marked *CONTROL SWAB*.
- If a spent casing is available, swab the interior using plain water, not acid, and place swab in plastic bag and label *CASING*.
- Package articles of clothing to be tested for gunshot residue separately in plastic bags, seal bags, label with your initials, the date and an exhibit number.
- If the distance from the bullet entry hole to the gun muzzle is to be determined, send the firearm if it is available.

5.2 Handguns

- Process weapon for fingerprints.
- Unload revolver, taking notes describing the position of spent casings and live rounds in the cylinder with respect to the barrel.
- Attach an identification tag to the weapon which describes the handgun, lists the serial number, and shows your initials, the date and exhibit number.
- Remove magazine or clip from weapon, dust exterior of clip for prints, then place clip intact into envelope of appropriate size. Label envelope.
- Place the weapon in a plastic or paper bag also label it with your initials, the date and an exhibit number.

DO NOT SEND A LOADED FIREARM THROUGH THE MAIL.

5.3 Serial Numbers

- Make an identifying mark on the weapon if it has an obliterated serial number.
- Affix an evidence tag to the weapon which has your

initials, date, and exhibit number and a description of the weapon.

- Place the weapon in a paper or plastic bag.
- DO NOT ATTEMPT TO RECOVER THE NUMBER YOURSELF WITH ACID-ETCH SOLUTIONS.*

5.4 Shoulder Weapons

- Dust weapon for latent prints.
- Unload weapon.
- Affix an identification tag to the weapon which describes the weapon, include serial number.
- Remove clip from weapon, dust clip exterior for prints.
- Place intact clip into labelled envelope of appropriate size.
- Place unloaded weapon in a wooden or sturdy cardboard box. Seal box, label it with your initials, date and exhibit number.

5.5 Spent Bullets

- Remove spent bullet from object leaving layer of extraneous material surrounding it.
- Wrap the bullet in cotton and place it in a non-breakable container.
- Label the container with your initials, the date, and an exhibit number.

DO NOT SCRATCH THE OUTER SURFACE OF THE BULLET WHILE REMOVING IT FROM AN OBJECT: DO NOT SCRATCH THE SIDES OF THE BULLET WITH IDENTIFYING INFORMATION.

5.6 Spent Cartridge Cases

- If possible, scratch your initials and the date on the inside lip of the casing with a stylus or a needle. *DO NOT MARK THE BASE OR THE SIDES OF THE CASING.*
- Wrap the casing in cotton and place in a small plastic bag or paper envelope.
- Seal the package and label with your initials, the date and an exhibit number.

6. FOOD AND DRUG SPECIMENS

Introduction. Since food and drug specimens exhibit a wide variety of identifiable characteristics, they may corroborate other evidence or link a suspect with a crime scene. When handling this type of evidence, it is important to prevent any contamination among the specimens or from other sources. The following describes procedures for the collection and preservation of liquid, powder, solid or plant material specimens as well as comparison standards where applicable and possible.

6.1 Liquids

- Try to collect a minimum of one pint of the specimen. Using a leak-proof container for this purpose.
- Seal the container with adhesive tape and label it with your initials, the date and an exhibit number.
- If the container used is glass or has a glass stopper, mark it *FRAGILE*.
- *Collect a comparison standard.*

6.2 Plant Material

- Thoroughly dry sample by spreading it on brown paper for at least 24 hours.
- After sample has been dried, place in a pillbox, a vial or other container, and secure with adhesive tape. *DO NOT MIX SAMPLES. PACKAGE EACH SEPARATELY TO AVOID MIXING DURING MAILING.*
- Label the outside of the container with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

6.3 Powders or Solids

- Place in a container such as a pillbox, plastic vial, etc.
- Seal container and label with your initials, the date and an exhibit number.
- Refrigerate samples as needed. *DO NOT ADD PRESERVATIVES TO SOLID FOOD SAMPLES.*
- *Collect a comparison standard.*

6.4 Tablets and Capsules

- Place in a container such as a pillbox, plastic vial, etc.
- Seal container and label with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Liquids, Powders, Solids, Plant Material, Tablets and Capsules

Collect comparison standards for food, liquids, plant material, tablets and capsules (in cases such as unattended death and suspected poisoning) in the

same manner as described in 6.1 thru 6.4. When collecting standards, search the refrigerator, cupboards and storage places for like material, particularly that which is labelled. *DO NOT REMOVE THESE SAMPLES FROM THEIR ORIGINAL CONTAINERS*: seal them in clean (sterile if possible) second containers. Refrigerate samples as necessary to retard further growth of microorganisms and deterioration. Expedite their delivery to a forensic laboratory.

Comparison standards for drugs should be collected in the manner described above. When collecting standards, collect any containers displaying prescription labels. *DO NOT REMOVE PILLS, CAPSULES, POWDERS OR LIQUIDS* from their original containers; seal them in clean second containers and label them. *NEVER MIX SPECIMENS* regardless of their proximity on the scene or their similarity in appearance.

7. GLASS

Introduction. All glass, except small fragments, might contain latent fingerprints and should be handled accordingly. In cases where glass fragments might be present on clothing, shoes, tools, or other objects, the articles should be submitted to the laboratory as soon as possible. The following describes procedures for collecting and preserving large and small fragments of glass as well as comparison standards for glass where applicable and possible.

7.1 Large Fragments

- Dust fragments for latent fingerprints and submit prints.
- Protect thin protruding edges of fragments against damage by embedding them in modeling clay, putty, or any similar substance.

AVOID CHIPPING THE FRAGMENTS.

- Use tweezers or other similar type of tools to collect glass. Exercise care in protecting the edges and avoiding scratching the surface.
- Place adhesive tape on each piece for identification. Place initials and date on tape.
- Wrap each piece separately in cotton and place in a sturdy box with a tight-fitting lid, seal, and label each package with your initials, the date and an exhibit number.
- Package separately, questioned pieces of glass from known pieces.
- If you are submitting glass for the purpose of determining the direction of a bullet's impact or for any other fracture analysis, mark surfaces with tape indicating whether the glass was found outside and inside the building. Likewise, mark glass taken from a window frame which side was facing outside.
- *Collect a comparison standard.*

7.2 Small Fragments

- Examine articles of clothing and shoes for the presence of glass fragments.
- Use tweezers or other similar tools to collect glass.

Use care in protecting the edges and avoid scratching the surface.

- Wrap each article of clothing containing fragments separately in clean paper or plastic bags.
- Package separately any questioned pieces of glass from known pieces.
- Seal each bag and label each with your initials, the date and an exhibit number.
- Place shoes and other solid objects in separate containers such as shoe boxes. Tape each object to the bottom of containers to prevent rattling.

DO NOT PACK ARTICLES CONTAINING MICROSCOPIC FRAGMENTS IN COTTON OR OTHER SOFT PROTECTIVE MATERIALS.

- Seal each package completely, making sure there are no holes through which glass fragments might be lost.
- Place loose glass fragments in pillboxes, plastic or glass vials and seal them tightly. Place cotton in the container to prevent rattling and chipping during transit.

DO NOT USE ENVELOPES AS CONTAINERS.

- Label everything with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Glass

Obtain comparison samples from an area as near as possible to the point of impact. Collect samples that are at least the size of a quarter. Label each comparison fragment with a piece of adhesive tape marked with your initials, the date and an exhibit number.

Wrap each comparison sample according to appropriate procedures described in 7.1 or 7.2. When direction of force is a question to be answered by the laboratory, always take a glass standard from any remaining glass in a window or door frame as close as possible to the point of breakage. Label pieces with respect to which surface was *INSIDE* and which was facing *OUTSIDE*. Standards should also be taken from the ground only when there is no glass remaining in the area.

8. HAIR AND FIBERS

Introduction. In crimes involving physical contact, particles are often transferred among the victim, suspect, and weapon or other objects. Hairs and fibers are among the most common of these evidentiary items and can be extremely valuable to an investigation. The following describes procedures for collecting and preserving hair and fibers from surfaces (metal or fabric) and from individuals as well as comparison standards where applicable and possible.

8.1 On Fabric Surfaces

- If hairs or fibers are observable, remove from surface with clean tweezers.
- If you use an evidence sweeper (vacuum), remove the material that accumulates in the filter and the filter paper and place it in an evidence bag.
- Seal the evidence bag and label it with your initials, the date and an exhibit number.

DO NOT USE ENVELOPES FOR PACKAGING

FILTER SWEEPINGS OR FOR OTHER VERY SMALL MATERIALS, AND DO NOT CRUSH HAIRS WITH TWEEZERS WHEN HANDLING THEM.

- *Collect a comparison standard.*

8.2 On Individuals

- When it is desirable to obtain hair samples from an individual, pull or comb out about twenty hairs with a clean pair of tweezers or a clean comb.
- Another but less desirable method for obtaining hair samples from an individual is to cut them off as close to the skin surface as possible. However, cutting or clipping only gives part of a sample. When hair has been recently dyed, misleading information can result.
- Obtain samples of hair, whether pulled, combed, or cut from various locations and package separately according to their location. Various locations include arm, underarms, chest, pubic, and leg areas. Remove hair surrounding any wounds on a body and place them in a container that is marked with your initials, the date and an exhibit number.
- If a pillbox is used as a container, ensure that the entire length of the hair is in the box and it is not crushed between top and bottom when a lid is placed on. If paper is used, avoid kinking the hair or fiber when folding the paper. Mark the box with your initials, the date and an exhibit number.
- Also submit articles of the individual's clothing. Package each article separately in evidence bags which

are sealed and labelled with your initials, the date and an exhibit number.

8.3 On Hard Surfaces

- Remove suspicious hairs or fibers from surfaces with clean tweezers.
- Place these items in a pillbox or folded piece of clean paper. If you use paper, avoid kinking the hair or fiber when folding the paper.
- Seal and label the container with your initials, the date and an exhibit number.

DO NOT CRUSH HAIRS WITH TWEEZERS WHEN HANDLING THEM.

- *Collect a comparison standard.*

Comparison standard—Hair and Fibers

Collection of hair samples from both victim and suspect is important. Collect and preserve hair as described in 8.2. Submit approximately 20 hairs in each sample if possible. Collect any articles of clothing or fabric as a comparison standard which might have come in contact with the suspect. Likewise, collect samples of rugs, draperies, furniture or upholstery material which might have transferred fibers to the suspect's clothing. Collect hair standards from pets or fur pieces found at or near the crime scene.

9. IMPRESSIONS

Introduction. Impressions made by footprints, tires and tools can easily be destroyed during a preliminary crime scene search. To prevent inadvertent loss of

such evidence, one of the earliest concerns of any crime scene investigation should be the security of the scene and the collection and preservation of impressions. The following describes procedures for the collection and preservation of footprints, tire impressions, and tool marks as well as comparison standards where applicable and possible.

9.1 Footprints

- Photograph each print that you have located. Follow these steps:
 - Place a ruler or other means of scalar identification next to the print.
 - Take the photograph by holding the camera directly over the impression, while illuminating the impression by holding a detached flash or strobe light, low and to the side of the impression.
- Prepare plaster or other casting material and make a plaster impression of each footprint. *It is a good idea to practice first on your own footprint since casts destroy impressions when they are removed.* The cast should be reinforced with plastic coffee stirrers, pieces of coat hanger wire, etc.
- When dry, scratch your initials, date and an exhibit number into the back of the cast.
- Also scratch or mark a directional arrow pointing *NORTH* on the back of the cast.
- Wrap each cast separately using corrugated paper and place in a well-padded box or container. *DO NOT REMOVE DIRT ADHERING TO THE CAST.* Use torn newspaper or excelsior for padding.

- Seal and identify with label, box contents.
- *Collect a comparison standard.*

9.2 Tire Prints

- Follow same procedure as those described in 9.1.
- *Collect a comparison standard.*

9.3 Tool Marks

- Whenever possible, preserve tool marks as you find them and submit the intact object bearing the tool marks to the laboratory.
- If it is not possible to submit the intact object bearing the tool marks to the laboratory, remove that portion or section of the object bearing the tool mark and submit it to the laboratory (e.g., fender of car, door jams, etc.). Affix an evidence tag, label it with your initials, date and exhibit number.
- Before a portion or section is removed from a large item, photograph the entire item. Submit this photograph with the intact object being forwarded to the laboratory for examination.
- *Collect a comparison standard.*

Comparison standard—Impressions

Footprints: Collect shoes or other footwear worn by suspects and send them to the laboratory according to the procedures outlined in 14.1. Preserve any soil particles which are attached to this footwear.

Tire Prints: Send to the laboratory for comparison with casts of any tires used by suspects for comparison with plaster casts. Also send soil particles found on

the tires. Package soil according to procedures in 14.1.

Tool Marks: Collect any tools found at the scene of the crime that might have been used by suspects and send to the laboratory as standards. Also submit any tools later found in a suspect's possession (e.g., garage, car, etc.). Package as described in 11.2.

10. LIQUIDS AND VISCOUS SUBSTANCES

Introduction. Liquids such as alcohol and gasoline and viscous substances such as glue, oil and ink can link a suspect to a crime. When collecting these substances, handle carefully to prevent evaporation and contamination. The following describes procedures for collection and preservation of liquids and viscous substances as well as comparison standards where applicable and possible.

10.1 Liquids

- Handle containers with cloth gloves.
- Dust containers holding liquids for latent fingerprints. Process and submit any prints which appear.
- Pour the liquid into glass bottles *no larger than pint size* with tight-fitting narrow neck screw caps. If the cap is metal, make sure that it is lined with inert plastic to prevent contamination of the liquid.
- If liquid has been spilled, spoon or scrape as much as possible of the liquid into a tightly capped glass bottle. Even if only a few drops can be obtained, a meaningful analysis can be performed.
- If the liquid has been spilled onto a porous surface such as carpeting or soil, place the wet portion of the

material into tightly capped glass or metal containers.

- Pack the bottles carefully and surround them with foam rubber or polyurethane chips or similar packing material.

- Make sure each sample container is identified in ink with your initials, the date and an exhibit number. In addition, label the packing boxes *FRAGILE*.

- If a liquid is suspected of being hazardous (i.e., inflammable), consult postal authorities for correct mailing procedures.

- *Collect a comparison standard.*

10.2 Viscous Substances

- Handle containers with cloth gloves.

- Dust containers for latent prints and submit any prints which appear.

- If the substance appears to be grease, do the following:

- small amounts: wipe up the substance with a cotton swab and place in a labelled plastic bag and seal. Small smears may be sufficient for analysis.

- large amounts: transfer substance to a sealable plastic container using cotton swabs or a plastic spoon.

- seal and identify the container.

- If the substance appears to be oil, ink, or glue, do the following:

- if possible, transfer by pouring into a glass or plastic wideneck bottle with a tight-fitting screw cap.

- if the material is in a tight-fitting container which is not larger than one pint, submit it in the original container.
- if the substance is too viscous for pouring, transfer it to a container using a clean plastic spoon or other instrument.
- Package all exhibits as in 10.1, making sure each exhibit container is identified in ink with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Liquids and Viscous Substances

Submit samples of any evidentiary substances found in a suspect's possession or in his belongings so they can be compared with substances found at the scene of a crime. If several samples are found, collect a quantity of each separately. Package and identify comparison samples as above.

II. METALS

Introduction. Many of the objects used in the commission of a crime—guns, knives, ice picks, jimmies, etc.—are composed of metal. Metals can show a wide range of identifiable characteristics, striations, surface imperfections, scratches and chemical composition. The following describes procedures for collecting and preserving various forms of metals as well as a comparison standard where applicable and possible.

11.1 Filings

- Collect filings caused by sawing, drilling for filing by carefully lifting or scraping into a plastic bag. *Use*

a non-metallic device to transfer the filings to the collection bag.

- Seal the bag, affix an evidence tag labelled with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

1.2 Fragments

• These include tips of jimmies, bullets, bullet fragments, grillwork, headlight frames, dies, small tools, etc. They can be unembedded or embedded in some matter.

Unembedded:

- Collect and place carefully in plastic bags or other suitably sized containers.
- Package the items, using padding that will prevent any damage to identifying characteristics or to the area along a fracture plane.
- Seal and label as in 11.1 above.

Embedded:

- Allow a laboratory to extract the fragments from the material in which they are embedded.
- Package as much of the solid matter holding the fragments as practicable.
- Use a suitably sized container, box, etc., to hold the material.
- Seal containers when used.
- In all cases either label the container or affix an evidence tag directly to the material with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

11.3 Large Sections

- Photograph visible marks on safe doors or other objects that are too bulky to remove.
- Preserve visible marks by casting in a silicone rubber compound.
- Package and label the casting as in 9.1 but omit *North* marking.
- *Collect a comparison standard.*

Comparison standard—Metals

At the crime scene: Items such as a safe door which has been pried open serves as a location to obtain a standard source for filings on the floor. Collect, package and label such filings as in 11.1.

In the suspect's possession: Such things as a file, a prybar or metal filings found in a suspect's shoes, cuffs pockets or on other articles of clothing serve as a standard against which specimens already identified on the crime scene can be compared. Collect, package and label as directed in 11.1 thru 11.3 as appropriate.

12. PAINT

Introduction. Paint evidence can be in the form of liquid, chips or smears. The following describes procedures for collecting and preserving various forms of paint as well as comparison standards where applicable and possible.

12.1 Chips and Smears

On small portable objects and clothing containing paint chips or smears:

- Mark with your initials in an inconspicuous place.

Place each item in a separate plastic or paper bag, making sure that the area containing the paint is protected from any abrasion or destruction; cover these areas with plastic or brown paper.

Pick up chips either with tweezers or by scooping them up with a piece of paper. Place chips into a bag. Seal each bag and label each bag with your initials, the date and an exhibit number.

Collect a comparison standard.

Large non-portable objects:

Scrape the paint fragments off one area, using a clean knife or scraping instrument.

Remove the entire sample, getting down to bare metal or wood if necessary.

Try to dislodge the fragments onto a clean piece of paper by tapping the object.

Transfer the fragments from the paper into a pillbox, a glass vial, or other container which can be tightly capped.

DO NOT PACK PAINT FRAGMENTS IN COTTON. DO NOT ALLOW PAINT TO TOUCH ADHESIVE

Seal containers and label with your initials, the date and an exhibit number.

Collect a comparison standard.

Let paint smears on cloth, wood, metal, or glass:

Let paint dry completely before placing smeared item in protective container.

If possible, mark item in an inconspicuous place with your initials.

- Place item in a container, seal and label with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

12.2 Liquid

- Follow procedure for Viscous Substances 10.2.

Comparison standard—Paint Chips and Smears

Using a clean knife or scraping instrument, remove paint samples from two areas on the object where the paint was found and from the suspected source of the questioned paint. Try to obtain at least $\frac{1}{2}$ sq. inch of surface area for each sample with all paint layers represented. Submit all available chips or scrapings. If the object is small, send entire object. Package and label all items as noted in 12.1.

13. QUESTIONED DOCUMENTS

Introduction. The questioned documents per se contain a wide variety of identifiable characteristics that can be used to corroborate other evidence and associate a suspect with the crime. Likewise, these can be used by a laboratory to clear a suspect of a crime in certain instances. The following describes procedures for collecting and preserving questioned documents as well as standards for comparison where applicable and possible.

13.1 Charred

- Carefully place charred documents between layers of cotton.
- Enclose in a crush-proof container, seal, and label with your initials, the date and an exhibit number.

- Indicate *FRAGILE* on the mailing container.

13.2 Crumpled

- Follow the procedures outlined in 13.1.

13.3 Intact

- Whenever possible, submit the original document rather than a photograph, photostat or other type of copy.

- Handle the document carefully; preserve latent fingerprints, using tweezers or gloves as necessary.

- When identification is necessary, mark in a non-critical area of the document. Use a medium different from that used on the document (i.e., use pencil when document is in ink).

DO NOT USE STAPLES OR PINS ON THE DOCUMENTS. DO NOT FOLD THE DOCUMENTS.

- Place document in a protective covering such as an envelope or plastic covering, seal and label with your initials, the date and an exhibit number.

- *Collect a comparison standard.*

Comparison standard—Questioned Documents

Standards for questioned documents are not the questioned documents themselves but, instead, are facsimiles or replicas of handwriting, typewriter print or ink visible on the questioned document that might have been made by the makers of the original document.

Handwriting Examples: Request the subject to write the text of the questioned material several times, after having informed him of his Constitutional rights. Do not allow him to see the questioned writing, and give

no instructions as to spelling, punctuation, etc. In forgery cases, obtain samples of the name of the person whose signature is forged. If the text of the questioned material is extensive, have the subject write a substantial part of it each time. Make sure that the examples are written on something other than the questioned document and are witnessed at the time of writing by you or by another person. If possible, try to make the example comparable to the questioned document in the type of writing instrument used, the kind of writing surface used, the amount of space available for writing, and the type of writing (i.e., cursive, printed, etc.). Also, in the case of a legal document where there is a question of age, try to obtain other documents executed near the date of the questioned document. Clearly label the samples as standards and submit them along with the original document in a protective covering such as a large envelope or plastic covering, seal and label with your initials, the date and an exhibit number.

Typewriter Examples: Collect specimens of typewriting from the typewriter believed to have been used and submit them to the document analyst. When obtaining these examples, use the typewriter in the condition in which is found (i.e., the same ribbon). Type the text of the questioned material three times, once through carbon paper with the ribbon adjustment set on "stencil." On each specimen, record the brand name, model number and serial number of the typewriter that was used. Place specimens in a plastic or reinforced envelope. Do not fold and label with your initials, the date and an exhibit number.

Ink Examples: Collect samples of unquestioned documents that contain the same type of ink that was used in the questioned document. If you are unsure whether the ink on the standard is the same as that on the questioned document, submit samples of all available inks that might have been used. If samples of fluid ink are available, place the bottles containing the ink in a suitable container that is labelled with your initials, the date and an exhibit number, indicate *FRAGILE* on the container, and submit to the laboratory.

14. SOIL

Introduction. Since soil and minerals can provide proof that a suspect or object was at the scene of a crime, samples of soil must be representative of the soil characteristics at the crime scene area. The following describes procedures for collecting and preserving caked mud, dry soil, and mud and comparison standards for such items where applicable and possible.

14.1 Caked Mud

- Use a spoon, knife, or other instrument suitable for collecting pieces of caked mud. Any instrument used *must be cleaned* after each sample is taken.
- Place in a clean plastic bag any personal articles such as clothing and shoes which bear traces of caked mud. Place each article in a separate bag.
- Seal each bag and label with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

14.2 Dry Soil

- Collect at least $\frac{1}{2}$ pound of all available soil when possible.
- Place dry soil in a box or other similar cardboard container.
- Seal and label with your initials, the date and an exhibit number.

DO NOT USE ENVELOPES FOR DRY SOIL.

DO NOT USE GLASS CONTAINERS.

- *Collect a comparison standard.*

14.3 Mud

- Use a clean knife and scrape off mud on objects that cannot be sent to the laboratory.
- Place scrapings in a plastic or cardboard container.
- Seal the container and label it with your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard Caked Mud, Dry Soil and Mud

Collect samples of surface soil from the seat of the crime out to 100 feet on four sides of the crime scene. Samples should consist of approximately $\frac{1}{2}$ pound of soil. Show the exact location of samples taken in a crime scene sketch. When taking samples from around a foot impression that is deep, take samples from the different levels appearing at the edge of the footprint. Place each sample in a separate, leakproof container, seal and label with your initials, the date and an exhibit number.

15. MISCELLANEOUS

Introduction. Such items as cigarette butts—tobacco, jewelry, magnetic tape recordings, or writing instruments can all serve as evidence to connect a suspect to a crime. Each item, either through its use or basic structure, can provide a unique identifiable characteristic. For instance, tape recordings of anonymous voices received as part of a threat prior to a bombing or extortion may be identified with known voices of a suspect through voiceprint analysis, provided care is exercised during the recording of questions and known voices. The following describes the procedures for collecting and preserving cigarette butts—tobacco, jewelry, magnetic tape recordings, small objects, writing instruments, as well as comparison standards where applicable and possible.

15.1 Cigarette Butts—Tobacco

- Pick up the cigarette butt on a piece of paper or with tweezers and place in small plastic bag.

DO NOT HANDLE THE CIGARETTE BUTT DIRECTLY WITH YOUR HANDS.

- Mark a label with your initials, the date, exhibit number as well as where the object was found.

- Place the label on the plastic container and seal.

- Empty tobacco material from pipes or clothes pockets into a plastic type pillbox. Mark and seal as above.

Comparison standard—Cigarette Butts—Tobacco

No comparison standard of the cigarette material need be collected. If serological testing is desired, how-

ever, collect saliva standards from both victim and suspect (s) as in 1.2.

15.2 Jewelry

- Handle with tweezers or cloth gloves.
- Dust for fingerprints and place in a suitable crush-proof container.
- If the composition of precious metals such as gold, silver, or platinum must be determined in order to prove common origin, send appropriate metal samples for comparison purposes.
- Label each sample container by writing on it in ink your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Jewelry

When possible, submit comparison samples of jewelry along with any questioned samples. The origin of some stolen jewelry may be traced to a particular jewelry store by analyzing the adhesive used to glue a precious stone to its setting. Known samples of the adhesive used by the jeweler should be submitted to compare with questioned samples. Place samples in crush-proof containers and seal them. Label each exhibit container as in 15.2.

15.3 Magnetic Tape Recordings

When making recordings of anonymous phone calls, follow this procedure:

- Eliminate all background noise when making recordings.
- Use polyester or mylar-backed tape that is at least 1.0 mil thick.
- Use standard cassette recorders or reel-to-reel re-

corders that are either electrically or battery operated. Make sure batteries are at full charge.

- If you use cassette tapes, use C-15, C-30, C-60, or C-90 cassettes. **DO NOT USE MINI-CASSETTE RECORDERS.**

- Use only new or bulk-erased tapes.

- Use inductive pickup such as donut or suction cup pickup.

- if donut pickup is used, place it over the earpiece on the telephone and plug it into the microphone jack on the recorder.

- if suction cup is used, place it on the back side of telephone handset.

- Identify the tape recording container by writing in ink on the container the complaint number, date, time, location telephone number and name of investigating officer.

- Before packing the tape, place it in its original box and wrap with aluminum foil to guard against magnetic fields which may alter or destroy the recorded material.

- *Collect a comparison standard.*

Comparison standard—Magnetic Tape Recordings

Make recordings of the voices of suspects so that a comparison can be made to the recording of the original anonymous voice. Use the following procedure:

- Duplicating the recording conditions of the anonymous call as closely as possible.

- If the original recording was made over the phone, make the comparison recording over the phone.

- Have the suspect repeat the exact same text as the anonymous call.
- Ask suspect to speak in his normal voice, but notice if he appears to be disguising his voice.
- Package and identify comparison recordings as in 15.3.

15.4 Small Objects

- At each crime scene, search for small objects such as burned matches, particles of glass, broken fingernails, cigarette butts, etc.
- Follow procedures outlined in this handbook for each of the known items. If you do not have specific directions for an item of evidence, place it in a crush-proof container without touching it directly with your fingers, seal, and identify the container by writing on it in ink your initials, the date and an exhibit number.
- *Collect a comparison standard whenever possible.*

Comparison standard—Small Objects

Comparison samples of small objects or items found in the possession of a suspect or in his belongings should be submitted so that a comparison with items found on the crime scene can be made.

- Package and identify comparison samples as in 15.4.

15.5 Writing Instruments

- Handle with tweezers or cloth gloves being careful not to smudge fingerprints.
- Dust for and collect fingerprints.

- Look for and submit instruments bearing teeth-marks.
- Place instrument in a suitable crush-proof container and identify the container by writing on it in ink your initials, the date and an exhibit number.
- *Collect a comparison standard.*

Comparison standard—Writing Instruments

Collect any writing instruments found in the possession of a suspect or in his belongings in the manner described above. Package and identify comparison samples as described above.



**SECTION III—TRANSMITTAL OF
EVIDENCE TO A LABORATORY**



III. TRANSMITTAL OF EVIDENCE TO A LABORATORY

General Procedures

Use the procedures recommended and published by your agency for the transmittal of evidence and information to a laboratory for forensic examination. In lieu of published procedures use the following guidelines:

- After the evidence has been collected and preserved as described in Section II, package the evidence exhibit whenever practicable in a cardboard box.
- Wrap liquid samples in padding to avoid breakage.
- Wrap the box with brown kraft paper and seal the edges with either masking or paper tape, suitable for accepting a rubber stamp impression.
- Attach a transmittal letter to the package. Use sample transmittal letter as a basis for your letter.
- Send the evidence package either by **Registered Mail** or by **Railway Express (Signature Service)**, or personally deliver it.

SAMPLE TRANSMITTAL LETTER:

Chief, Forensic Laboratory
U.S. Treasury Department
Washington, D.C. 20226

April 2, 1974

Dear Sir:

On July 24, 1973 at 3 A.M., an explosion occurred at the First City Bank of Stanton, Ohio. The windows and glass door panels were blown into the bank by the force of the explosion.

**BRIEF
DESCRIPTION
OF THE
FACTS IN
THE CASE**

A shallow crater was located on the sidewalk two feet in front of the bank door. The crater was about 1/2" deep, 1" wide and 6" long. Metal fragments were recovered from the wooden portion of the door frame and from under an automobile parked 200 feet from the blast seat.

It is requested that the material submitted be examined to determine the type of explosive used and its method of containment and initiation. Please perform any other examination necessary which will provide information pertinent to the investigation.

**TYPE OF
LABORATORY
EXAMINATION
DESIRED**

This investigation has been assigned our case B-73-927HY and it will be helpful if you will refer to this number in future correspondence concerning this matter.

**CASE
NUMBER OR
IDENTIFIER**

Items Submitted

Exhibit A—Metal from wood portion of door frame.

**BRIEF
DESCRIPTION
OF THE
EVIDENCE**

Exhibit B—Metal found in street under parked car.

Exhibit C—Debris from crater.

Exhibit D—White substance from window frame.

Exhibit E—Glass and debris from bank entrance.

Exhibit F—Copy of crime scene sketch.

If you need additional information, please contact me at (914) 396-5228.

Sincerely,

PHONE
NUMBER

Harris T. Young
Detective Stanton Police
Department
Stanton, Ohio, 45440

YOUR NAME
&
RETURN
ADDRESS



**SECTION IV—LABORATORY
ANALYSIS AND EXAMINATION
TIME**



LABORATORY ANALYSIS

1. BODY FLUIDS

1.1 Blood

The presence of blood can be verified using the Benzidine test and, if present, identified as animal or human. Human bloodstains can be grouped by testing with anti-serum (ABO, MN, Rh, etc.) and compared with the blood groups of the suspect and victim.

Examination time: 2 days.

1.2 Saliva

If a person is a secretor, his blood group can be determined from nonblood body fluid stains by anti-serum tests, thereby allowing comparison of saliva or urine stains with the blood group of a victim or suspects. Saliva samples are needed to determine by analysis if an individual is a secretor.

Examination time: 2 days.

1.3 Semen

The presence of semen is verified using Florence Reagent as a preliminary test and a microscopic examination as a confirmatory test. Also, if a person is a secretor, his blood group can be determined from the seminal stain by anti-serum tests. Saliva samples are needed to determine by analysis if an individual is a secretor.

Examination time: 2 days.

1.4 Sweat

If a person is a secretor his blood group can be determined from nonblood body fluids such as sweat by anti-serum testing. Saliva samples are needed to determine by analysis if an individual is a secretor.

Examination time: 2 days.

1.5 Urine

If a person is a secretor, his blood group can be determined from nonblood body fluids such as urine by anti-serum testing. Saliva samples are needed to determine by analysis if an individual is a secretor.

Examination time: 2 days.

2. EXPLOSIVES AND INCENDIARIES

2.1 Arson Debris

Once the residue is isolated in the debris, traces of gasoline, kerosene, and a variety of other commonly encountered accelerants can be detected and identified in the debris by gas chromatography.

Examination time: 3 days.

2.2 Explosive Debris

The explosive used in a destructive device can be identified from its residues by the use of chemical testing and instrumental analysis such as infrared, thin layer chromatography, and gas chromatography. In some cases, the device can be reconstructed and its method of detonation determined.

Examination time: 3 days to 2 weeks depending on problem complexity.

2.3 Explosive Substances and Devices

The explosive can be identified by chemical testing and instrumental analysis such as infrared, gas chromatography, thin layer chromatography, and x-ray diffraction. Component parts of a device: timers, blasting caps, batteries and fuses can be identified by manufacturer and type.

Examination time: 2 days.

3. FABRICS

3.1 Large Articles

Examination may include microscopic methods, ultraviolet methods and color spectography. Color, pattern, thickness, weave, type of material, fabrication characteristics, and possibly the manufacturer can be revealed. In addition, examination of fabric might also reveal the type of instrument or weapon used in committing the crime, the direction traveled by a bullet, and the distance from which a weapon was fired.

Examination time: 1-2 hours to 2-3 days depending on the amount of analysis required.

3.2 Small Articles

See Section 3.1.

CONTINUED

1 OF 2

4. FINGERPRINTS

4.1 On Absorbent Material

Paper and other absorbers are treated with nin-hydrin, AgNO_3 or iodine fumes and latent prints are developed.

Examination time: 2 hours to 3 days.

4.2 On Hard Surfaces

Metal, glass, plastic and other non-absorbent materials are processed by heat treatment, magnesium oxide deposition, silver nitrate, and X-ray techniques and the presence of latent prints can be revealed.

Examination time: 2 hours to 3 days.

4.3 On Soft Surfaces

Substances bearing visible fingerprints can be compared directly with a suspect's inked prints or can be photographed for latent comparison.

Examination time: 2 hours.

5. FIREARMS AND AMMUNITION

5.1 Gunshot Residue

Hand swabs are examined by Atomic Absorption (AA) or Neutron Activation Analysis (NAA) for the presence of barium and antimony which are commonly found in gunshot residue.

Examination time: 3 hours to 3 days depending upon problem complexity.

Clothing is examined for barium and antimony components. The Walker Test or X-ray techniques are used to obtain gunshot powder patterns; these permit determination of the distance of the gun muzzle from the bullet hole when the weapon was fired.

Examination time: 3 hours.

5.2 Handguns

Microscopic examination and test firing of the weapon can determine if the firearm is operable or if it has unusual features that would make bullets or cartridge cases fired in the weapon readily identifiable.

Examination time: 3 hours.

5.3 Serial Numbers

Acid etch, X-ray or magnaflux techniques are used to recover obliterated serial numbers or other stamped impressions.

Examination time: 3 hours to 3 days depending on problem complexity.

5.4 Shoulder Weapons

Sections of barrel or stock removed from an altered weapon can be matched to that weapon by microscopic and chemical testing.

Examination time: 3 hours to 3 days depending on problem complexity.

5.5 Spent Bullets

Microscopic examination of a bullet or bullet fragments can indicate the caliber and type of weapons

from which a bullet could have been fired. If a suspect weapon is available, it can be microscopically determined if the bullet was fired from that particular weapon. Bullet leads can occasionally be compared by neutron activation analysis and atomic absorption to show or disprove common origin.

Examination Time: 3 hours to 3 days depending on problem complexity.

5.6 Spent Cartridge Cases

The type of weapon in which the casing was fired can be established. If a suspect weapon is available, it can be microscopically determined if the casing was fired in that weapon.

Examination time: 3 hours.

6. FOOD AND DRUG SPECIMENS

6.1 Liquid

Liquid food and drugs are analyzed by organic and inorganic methods of analysis.

Examination time: 3 hours.

6.2 Plant Material

Microscopic examination can be employed to compare components of plants with a standard and to identify the specific species of plant.

Examination time: 2 days.

6.3 Powder and Solids

Samples can be analyzed by microscopy. The organic

composition can be determined by techniques such as gas chromatography, thin layer chromatography; the inorganic elements by spectrography, NAA and AA techniques.

Examination time: 3 days.

6.4 Tablets and Capsules

Samples can be analyzed by gas chromatography, thin layer chromatography, spectrographic analysis, microscopic analysis, NAA or AA techniques, depending on the information desired.

Examination time: 3 days.

7. GLASS

7.1 Large Fragments

Laboratory examination of glass fragments is almost exclusively a process of comparison. Properly collected, glass fragments can be examined microscopically to determine:

- if fragments came from a particular broken glass object;
- what type of object the fragments came from;
- which side a projectile came from;
- the origin and direction of the fracture;
- the direction of the force producing it; and
- the order of occurrence of multiple fractures.

Elemental analysis of the glass using NAA or other instrumental techniques can provide information concerning common origin of the samples.

Examination time: *Microscopic Examination*—3 weeks
Elemental Analysis—2 weeks

7.2 **Small Fragments**

See Section 7.1.

8. **HAIR AND FIBERS**

8.1 **On Fabric Surfaces**

See Section 8.3.

8.2 **On Individuals**

See Section 8.3.

8.3 **On Hard Surfaces**

Hair: Hairs are subjected to microscopic examination. This examination can determine:

- race of an individual;
- the part of the body from which the hair originated;
- whether or not the hairs were forcibly removed;
- whether they were cut with a dull or a sharp instrument;
- whether they were treated with chemical dye or bleach; and
- whether they were crushed or burned.

Elemental analysis by NAA, AA, or other instrumental techniques may reveal characterizing information which may show that the questioned and known hairs came from the same individual.

Examination time: 3 hours to 2 weeks depending on problem complexity.

Fibers: Laboratory analysis of fibers can determine type, color, and matching characteristics by microscopic, microchemical, dyeing tests, melting point examinations and X-ray diffraction.

Examination time: 3 hours to 2 weeks depending on complexity of problem.

9. IMPRESSIONS

9.1 Footprints

See Section 9.2.

9.2 Tire Prints

A comparative analysis of a plaster cast and a suspected item such as a shoe can be made. Analysis of the evidence can reveal either:

- size, pattern, degree of wear or peculiarities that are distinct in character;
- size and pattern of both impressions are similar, normal wear is present but more distinctive marks are lacking; or
- size, shape, pattern and wear are similar but detail reveals defects, similarly oriented on both impressions.

Some laboratories contain files for determining manufacture, distribution, size, etc., of components that made a particular questioned impression.

Examination time: 3 hours.

9.3 Tool Marks

Tool mark impressions are microscopically compared with those produced by a tool in question. The class

and individual characteristics unique to that tool can be identified. Microscopic examination can be conducted to detect trace material. If located, this material is examined physically, chemically and spectrographically and then compared with trace material found on the impression of known physical evidence to establish common origin.

Examination time: 3 hours.

10. LIQUIDS AND VISCOUS SUBSTANCES

10.1 Liquids

Alcohol: Gas liquid chromatography is used to identify and measure the volatile congeners present and to determine the alcohol content. Atomic absorption and neutron activation analyses are performed to determine the characterizing trace elemental composition of the samples and to establish common origins.

Examination time: 3 hours.

Gasoline: Gas liquid chromatography is performed to confirm the liquid as gasoline or other flammable substance. Thin layer chromatography is sometimes used to identify the colored dyes in the gasoline.

Examination time: 3 hours.

10.2 Viscous Substances

Grease, Glue and Oils: The materials are first examined microscopically for the presence of contaminating substances, i.e., chips of paint or metal fragments. Next they are tested by one or more of the following techniques: neutron activation analysis, atomic absorption, X-ray diffraction or emission spectro-

graphy. Individual contaminants found in the substance can be further examined to characterize them specifically. Dried glue samples are analyzed for elemental composition, and for polymeric components present by pyrolysis gas chromatography.

Examination time: 3 days.

Ink: Liquid samples of writing ink are analyzed by thin layer chromatography, infrared, visible or ultraviolet spectrophotometry to determine organic constituents. Printing and other pigment inks are also examined to identify their metallic components. Dry ink samples are examined primarily by thin layer chromatography, infrared and ultraviolet fluorescence techniques after removal from the paper or other supporting material. It is possible to identify the ink and determine its first production date.

Examination time: *Dry inks*—3 hours.

Liquid inks—3 days.

11. METALS

11.1 Filings

These are examined by NAA and spectrographic analysis. The results of these examinations can link a suspect or his possessions to a crime scene by establishing common type or origin.

Examination time: 2 days.

11.2 Fragments

These are subjected to NAA to permit spectrographic determination of metal type. They are also examined with a comparison microscope to determine similar fracture lines caused by a suspect's tool.

Examination time: 3 days.

11.3 Large Sections

Since a suspect tool may be linked to the crime scene through the tool marks it produces, large sections are examined visually or microscopically and compared at points where striations or other evidence of tampering are apparent.

Examination time: 2 days.

12. PAINT

12.1 Chips and Smears

Samples can be analyzed by either gas chromatography, spectrographic analysis and microscopic analysis to establish common origin. Spectrographic analysis can reveal metal components. Chemical analysis can determine non-metal constituents and synthetic lacquers. Microscopic examination can identify fine details such as number and type of layers. Laboratory analysis may also determine whether paint fragments fit together along a common fracture edge, are present in minute amounts or as a single common variety and, if a vehicle is involved, its most probable type, color and year of manufacture.

Examination time: 3 days.

12.2 Liquid

Liquid paint is analyzed chemically and by gas chromatography to determine its exact constituents. These constituents can be compared with paint found at a crime scene or in a suspect's possession and links of common origin established.

Examination time: 3 days.

13. QUESTIONED DOCUMENTS

13.1 Charred

See Section 13.3.

13.2 Crumpled

See Section 13.3.

13.3 Intact

The physical state of a questioned document does not materially affect the amount of difficulty a technician will have in corroborating the authenticity of the characteristics on it. In each case (i.e., charred, crumpled or intact document) the principal areas of analysis are as follows:

Handwriting and Typewriting: Document analysts can study individual characteristics of handwriting and typewriting and compare them with the standards submitted or examine the documents for specific changes or modifications. Techniques used for making comparisons include the use of magnifying glasses, monocular and binocular microscopes, ultraviolet and infrared lighting in combination with associated filters, polarizing screens, and cameras with a variety of lenses or other mechanical and optical aids.

Examination time: 1 week.

Paper: Paper can be compared with specimens by mechanical and optical aids, and photography for watermarks, defects or other identifying characteristics. If the paper contains a watermark, standard paper samples can be obtained from the manufacturer and compared with questioned papers by neu-

tron activation analysis. This process can determine the year of production of the paper. Also, the composition of two or more questioned papers can be compared to determine whether they may have originated from the same batch of paper.

Examination time: 2 days—2 weeks, depending on the number of documents.

Ink: Proof that a writing ink is the same as a standard can be determined by thin layer chromatography, colored filters, photography, ultraviolet and infrared examination or chemical processes and spectrophotometry. These inks on documents can be identified and their first production dates determined by comparing with the standard inks in the Bureau of Alcohol, Tobacco and Firearms Standard Ink Library. Using this technique, it often can be shown that a document has been backdated. Printing inks can be analyzed for comparison purposes only.

Examination time: 1 week.

Techniques can also be used to study erasures, secret writing, alterations, additions, and obliterated or charred writings. These techniques include chemical analysis, and ultraviolet and infrared lighting in combination with associated filters.

Examination time: 1 week.

14. SOIL

14.1 Caked Mud

Soil whether it be caked mud, mud, etc., is dried thoroughly and then is broken up for examination. Examination can include use of the microscope with

appropriate chemical or differential thermal analyses to determine particle size distribution and mineralogical identity of particles. This can establish common origin.

Examination time: 1 week.

14.2 Dry Soil

See Section 14.1.

14.3 Mud

See Section 14.1.

15. MISCELLANEOUS

15.1 Cigarette Butts—Tobacco

Laboratory analysis of saliva stains can be performed using antiserum solutions to determine the smoker's blood group, provided the individual was a secretor. Microscopic analysis can reveal the brand of cigarettes or tobacco and chemical analysis the presence of some meaningful particular type of trace evidence.

Examination time: 2 days.

15.2 Jewelry

Elemental analysis by neutron activation, atomic absorption, X-ray diffraction, emission spectrography or pyrolysis gas chromatography on questioned and known specimens of precious stones, metals or adhesives can be carried out to determine whether the materials have common origin.

Examination time: 3 days to 2 weeks depending on complexity and number of items to be examined.

15.3 Magnetic Tape Recordings

Voiceprints of the unknown voices on magnetic tape are made with a sound spectrograph and these voiceprints are compared with those produced from the recordings of known voices of suspects. Tapes containing substantial background noise can be filtered out using sophisticated electronic filtering equipment. **Examination time:** Depends on the number of unknown voices to identify, the number of tapes and whether filtering is necessary. Average time is 5 days per case.

15.4 Small Objects

Elemental analysis similar to those described for jewelry can be performed to identify common origin. **Examination time:** 3 hours to 3 days depending on problem complexity and number of items to be examined.

15.5 Writing Instruments

Microscopic examination of the writing produced by a specific pen can sometimes reveal individual characteristics of the pen such as gooping, striation and skip marks. Chemical analysis of the ink by thin layer chromatography and other techniques can determine the composition of the ink from which it is possible to identify the specific formulation of ink in the pen.

If the date of a particular writing is in question, the ink can be compared with a library of standard inks maintained by the Bureau of Alcohol, Tobacco and Firearms to determine when the formulation was first manufactured. (Toothmarks on the pen can be compared with known toothmarks of a suspect.)

Examination time: 3 days.



SECTION V—GLOSSARY



GLOSSARY

- Accelerant** —a flammable liquid or material used to increase rate and/or intensity of burning.
- Acid-Etch Method** —a method for the restoration of obliterated writing or serial numbers on metal by using acid to remove the metal surrounding the numbers.
- Anticoagulant** —a chemical substance which retards the clotting of blood.
- Atomic Absorption (AA)** —an instrumental method of chemical analysis in which a solution is atomized in a flame and the atoms of the solution absorb certain wavelengths of light peculiar to the atoms in each substance.
- Benzidine Test** —a screening test for blood.
- Blood Group** —the classification of blood according to chemical characteristics of the blood cells.
- Chemical Analysis** —an analysis which reveals the chemical composition of a pure substance or mixture by type (qualitative) and/or by the amount of each component present (quantitative).
- Common Origin** —materials originating from the same source, natural or manufactured.
- Coroner** —an official responsible for an inquiry into the causes and circumstances of

- any violent, unexpected or suspicious death occurring within his jurisdiction.
- Elemental Analysis** —the determination of which chemical elements are in a sample and in what concentrations.
- Emission Spectrography** —a method of chemical analysis. A sample is burned in an electric arc and the various elements present are identified by the wavelength of the emitted light.
- Filters** —as used in photography: a transparent material such as colored glass that absorbs light of certain wavelengths or colors selectively and is used for modifying light that reaches a sensitized photographic material. Also called "color filters."
- Flameless Atomic Absorption** —a variation of atomic absorption which uses a source of heat other than a flame for atomization.
- Gas Chromatography** —a method for the separation of complex mixtures into their individual components. As vapor of the mixture is passed through a column, the individual components dissolve to varying extents in a liquid within the column and a separation is effected. The separated components provide an indication of the identity of the original mixture.

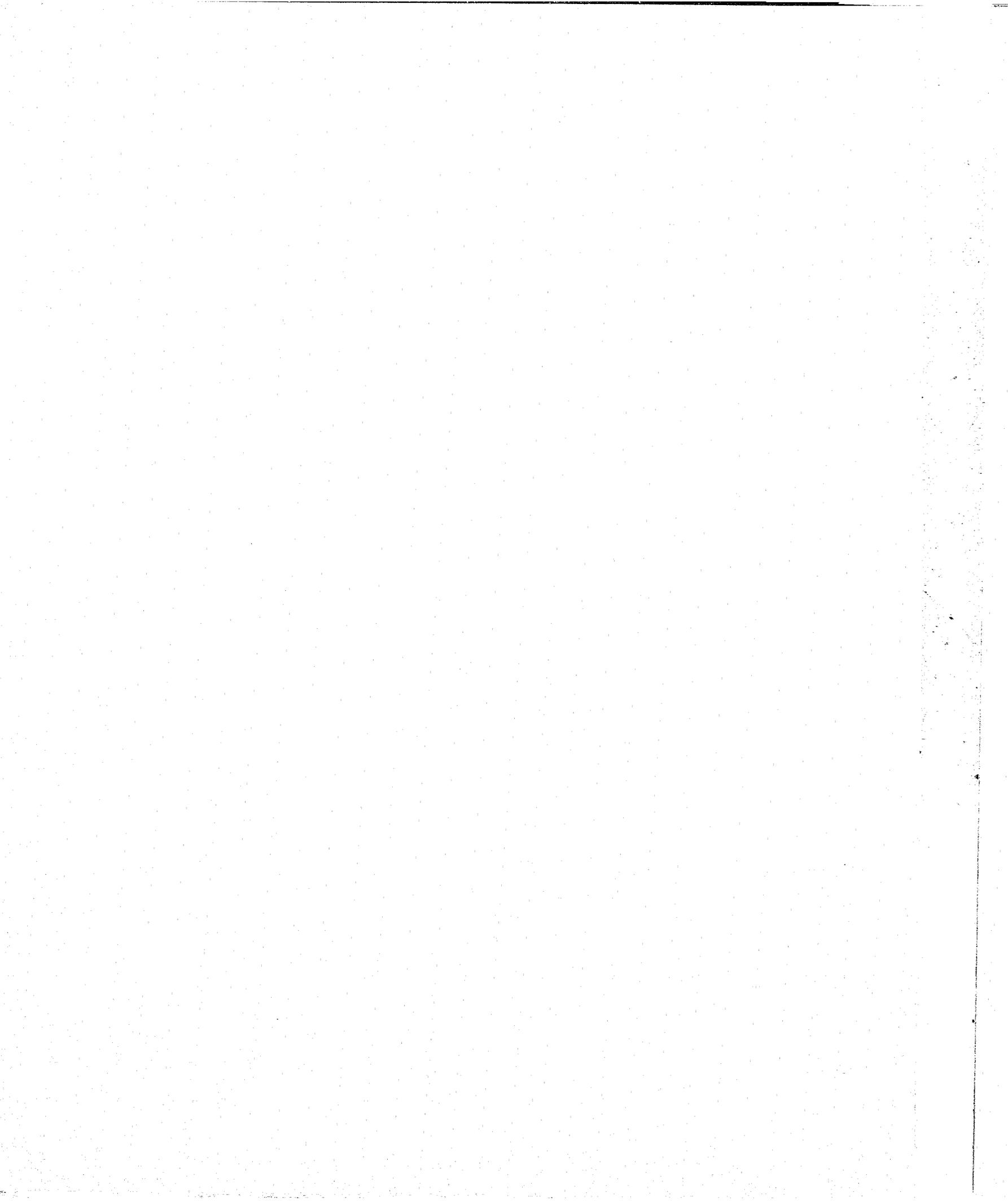
- Gooping** —heavy deposits of ink caused by the accumulation of ink on the exterior of the ball point assembly of a ball point pen.
- Gunshot Residue** —material from the primer, powder, cartridge casing and bullet deposited on the hands of the shooter or on a wound of a victim shot at close proximity during a firearm discharge. Barium and antimony from the primer compound are principal gunshot residue components.
- Infrared** —term used to describe rays of the electromagnetic spectrum contiguous to the red end of the visible spectrum but invisible and of greater wavelength than red light.
- Medical Examiner** —a physician, usually a pathologist, authorized by statute to perform medical legal investigations in unexpected violent, or suspicious deaths.
- Melting Point Examination** —a determination of the temperature at which a solid is converted into a liquid.
- Microchemical Tests** —chemical tests performed on extremely limited amounts of a sample, often requiring observation of the test with a microscope.
- Microscopic Comparison** —an examination of the two items made with the aid of a microscope to identify similar or dissimilar characteristics not visible to the unaided eye.

- Mineralogical Identity** —determination of the type of mineral (s) present in a sample.
- Molotov Cocktail** —an incendiary device consisting of an ignition source and a breakable container containing a flammable liquid.
- Neutron Activation Analysis (NAA)** —a sensitive method of chemical analysis utilizing the measurement of radioactivity induced into a sample to determine the type of and the amount of each chemical element present in the sample.
- Particle Size Distribution** —a measurement of that portion of a total sample represented by each of the different sized particles present.
- Polarizing Screens** —used in photography to decrease reflection by causing lightwaves to vibrate in a definite pattern, i.e., to straighten out diffused lightwaves.
- Polymer** —substance consisting of large molecules formed from small molecules of the same type and which have a definite spacial arrangement of the components. These materials affect the elasticity and consistency of products.
- Pyrolysis Gas Chromatography** —high temperature decomposition of a substance into characteristic gaseous fragments which are examined by gas chromatography to provide identification of the original material.
- Secretor** —a person whose blood-type chemicals

- are secreted into other body fluids (*saliva* or *semen*) allowing his blood type to be identified from these fluids.
- Specimen** —sample to be examined or item of interest.
- Spectrographic Analysis** —chemical analysis based upon the measurement of emission or absorption of light.
- Spectrophotometry** —the measurement of the relative intensities of light in different parts of a spectrum.
- Standard** —material of a known origin or composition used as a reference or as a basis for comparison purposes.
- Thin Layer Chromotography** —a technique for separating chemical compounds by means of a thin layer of absorbent material coated onto a supporting plate.
- Ultraviolet** —term used to describe invisible rays of the electromagnetic spectrum lying outside of the violet end of the visible spectrum.
- Volatile Congeners** —natural flavor components in alcoholic beverages which are derived from the raw materials (grain, sugar, grapes, etc.) used to make the product.

- Watermark** —an identifying mark made on paper during manufacture and visible when the paper is held up to the light.
- X-Ray Diffraction** —unique scattering of X-rays as a function of the crystal structure of a solid material.

NOTES



END