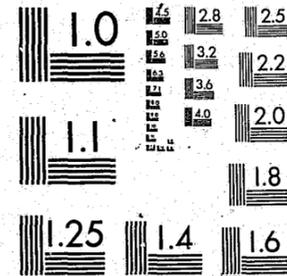


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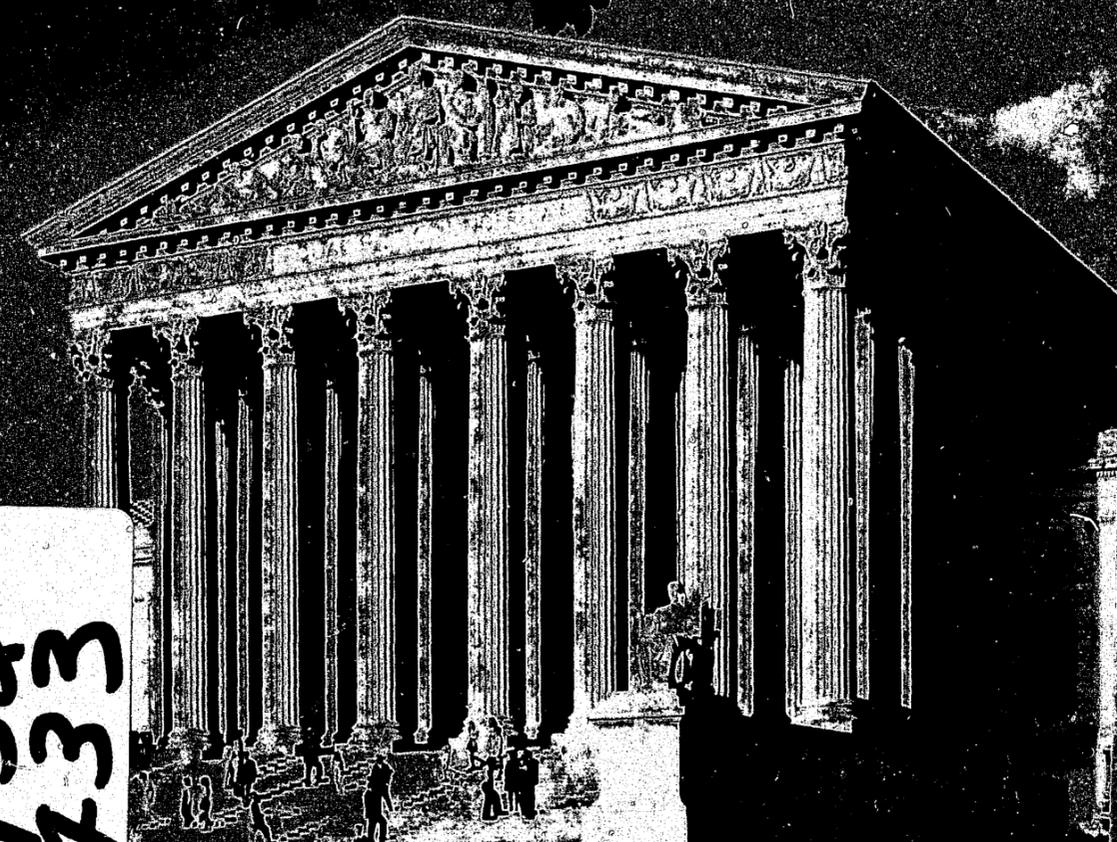
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FBI

Law Enforcement Bulletin

MAY 1976



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LAW DAY, U.S.A.

"200 Years of Liberty and Law"

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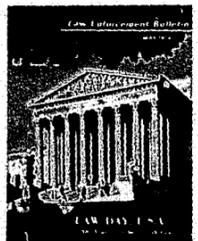
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THE COVER

Shown on this month's cover is the U.S. Supreme Court Building, Washington, D.C. Under the rule of law, our Nation's cherished heritage of freedom and justice has been perpetuated. Mr. Kelley's Message, beginning on page one of this issue, discusses the primacy of law in a free and just society. Photo courtesy of the Foundation of the Federal Bar Association.



Don't Miss a Hair



The successful investigation of violent offenses such as rape, murder, hit and run, assault, etc., is often materially assisted through the examination of hairs. Hairs are likely to become detached from the scalp, other

areas of the body, or clothing and transferred from one person to another in any violent encounter. Evidence of this nature is present in a large number of criminal cases which come to the attention of the FBI Laboratory.

Assaults and murders are often accomplished by blows to the head area. Hairs readily become attached to the instrument used, especially where there are bloodstains on the weapon to which the hairs will adhere. An examination of such hairs will aid in

establishing whether or not the instrument was used to perpetrate the crime. (See fig. 1.)

Hair evidence has been used to advantage in the solution of other crimes, such as breaking and entering, burglary, robbery, kidnaping, etc., where the subject or victim has brushed against objects or has come in contact with animal furs.

The examination of hairs may prove of value in identifying both the living and the dead. It tends to identify the perpetrator of a crime by placing him

This article, first printed in the August 1952 issue of the BULLETIN, and reprinted in the December 1968 issue, has been revised and brought up to date. Because of its basic value in scientific crime detection, it is being reprinted for BULLETIN readers.

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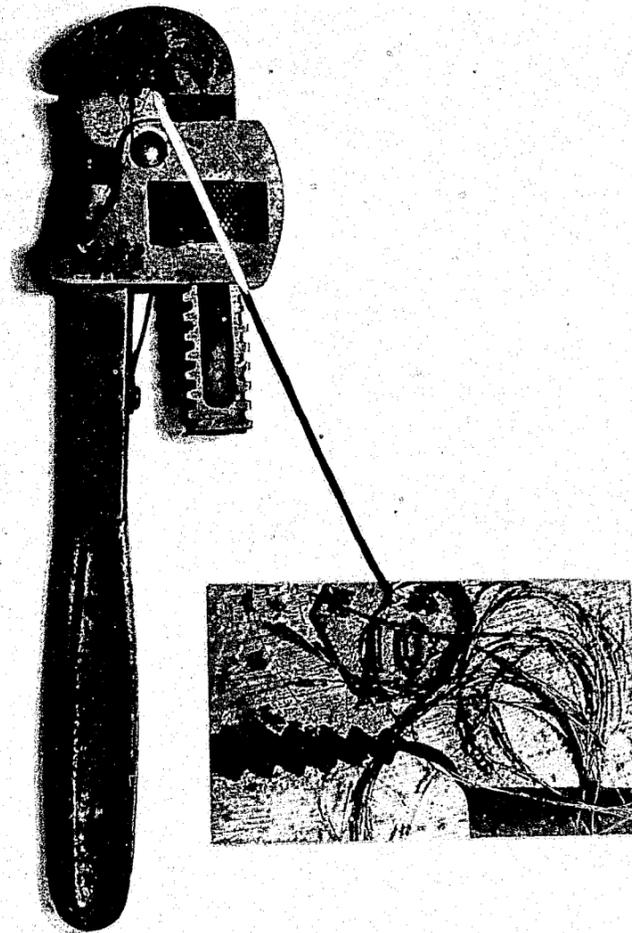


Figure 1. Hairs and bloodstains were found on death weapon in car of suspect.

at the scene of a crime or with the victim. (See fig. 2.) Hairs are very resistant to decomposition and putrefaction. They often remain as evidence of identification long after other means, such as facial features and fingerprints, have been destroyed.

Hair evidence can be difficult to locate, and a search for it can hardly be too meticulous. For example, in a hit-and-run case it is suggested that if the investigation reveals a car was possibly involved in the case, the car be placed on a lift or over a grease pit

and searched thoroughly with an oblique light from the underneath side to the top. (See fig. 3.)

If a hair examination is requested, all foreign fibrous debris is removed from the submitted specimens in the laboratory. The hairs are separated from the other debris and are prepared for examination.

If hairs are not fully developed or are too fragmentary, they are not suitable for an adequate hair examination.

Except in rare instances, there are

not enough individual characteristics in hair from which to determine positively that a hair of unknown source came from a particular person to the exclusion of all other persons.

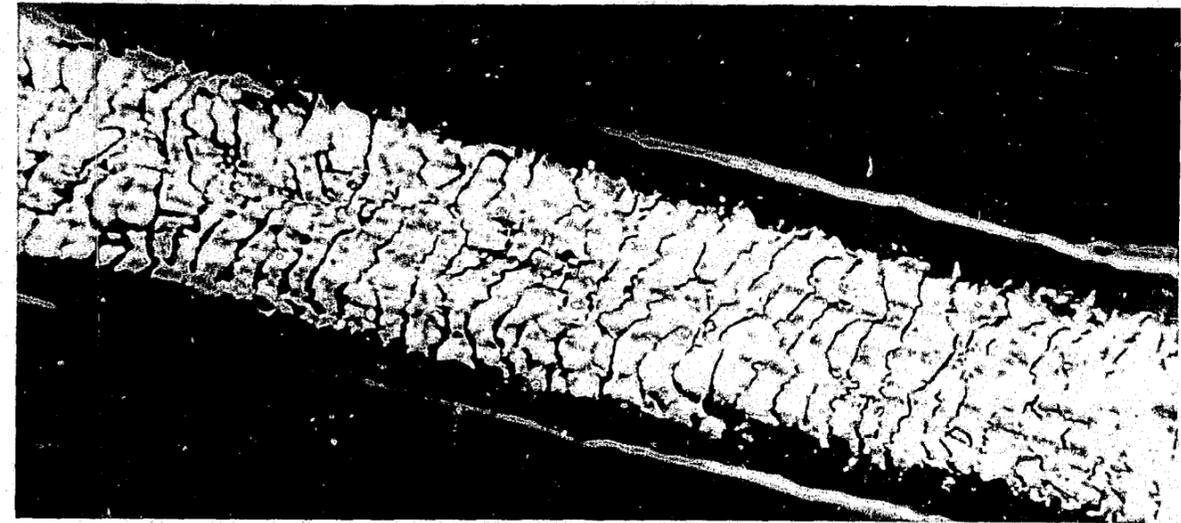
Examination of Hair Evidence

A hair is an appendage of the skin and consists of a bulb or root end, the shaft, and a tip end. The shaft grows outward from the root end and is composed of the cuticle or outside covering, the cortex, and the medulla or core. The cuticle is formed by overlapping scales which always point toward the tip end of the hair. The cortex consists of elongated cells which comprise the bulk of the hair. The medulla or core is composed of variously shaped cells. The pigment, when present, may be found in varying amounts distributed throughout the hair and is responsible for the color of the hair.

Human or Animal

It can be determined whether hair is human or animal in origin. Such a determination is based on root shape, scale shape, color patterns, pigment distribution, and medulla width. Also, in contrast to humans, most animals have two types of hairs; namely, an outer coat of guard hairs and an inner coat of fur hairs.

Hairs of many different types of animals are sufficiently characteristic that the kind of animal can usually be determined. Different breeds of the same animal family, such as the dog family, cannot be differentiated by an examination of a limited number of hairs. Animal hairs from an unknown source can be compared with a hair sample from a particular animal to determine if possibly the two samples could have come from the same animal, but animal hair comparisons are not as conclusive as human hair comparisons because of the many varia-



A human hair magnified 900 diameters.

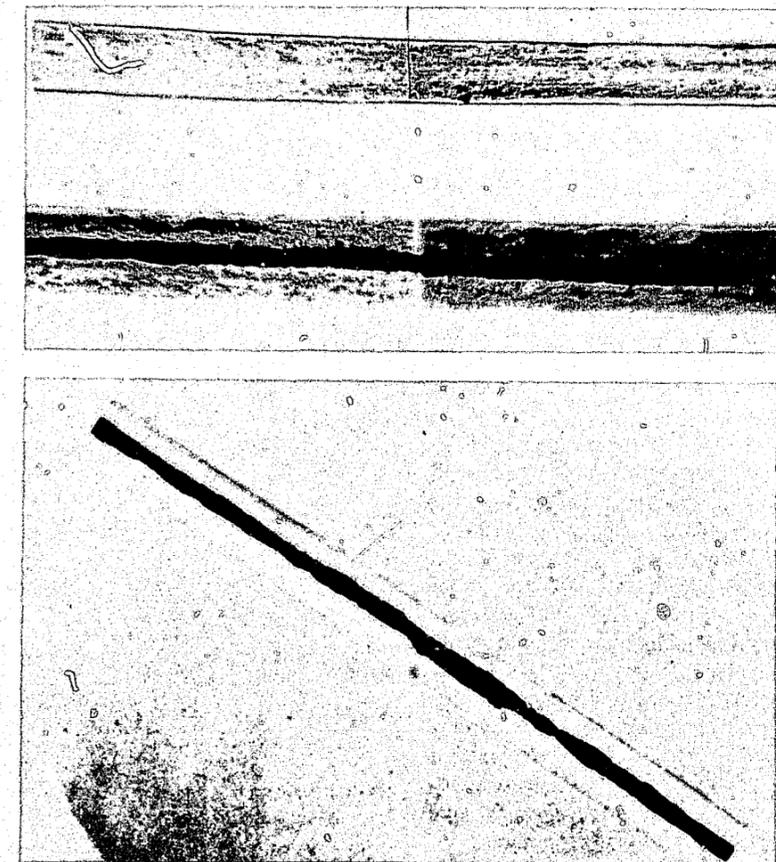


Figure 2. Caucasian-type hairs from a murdered police officer were found around the button of a suspect's shirt. These hairs were placed in the left field of a comparison microscope. Known specimens taken from the head of the deceased were placed in the right field. Note how the variations in the questioned specimens match those of the known specimens.



Figure 3. Caucasian-type scalp hairs were found on the undercarriage of an automobile involved in a "hit-and-run" accident. Hair No. 1 (reading from top to bottom) was forcibly shattered. Hair No. 2 was crushed at the widened area. Hair No. 3 shows a stain of human blood. Hair No. 4 was forcibly removed from the scalp. The microscopic variations in the structure of these hairs were also present in the known samples obtained from the victim. The subject in this case was found guilty of manslaughter.

Hair from members of the Caucasian race contains very fine to coarse pigment. The pigment is more evenly distributed than in hair from members of the Negroid and Mongoloid races. Cross sections of hairs from Caucasians are oval to round in shape. (See fig. 4.) Caucasian hair is usually straight or wavy and not tightly curled. It can vary in diameter along the shaft very little or to a moderate amount.

Hair from a person of mixed races contains primarily characteristics of the race that is prominent in the person's physical appearance.

The age and sex of a person cannot be definitely determined from a hair examination.

tions found in the hair from the same animal.

In most instances, it can be determined whether a human hair came from a member of the Negroid, Mongoloid, or Caucasian race or from a person of mixed racial origin.

Hair from members of the Negroid race contains heavy pigment distributed unevenly. A thin cross section of a hair from a member of the Negroid race is flat to oval in shape. (See fig. 4.) Negroid hair is usually tightly curled with marked variations in the diameter along the shaft.

Members of the Mongoloid race, which includes the American Indian, the Eskimo, and the Oriental, have hair containing dense pigment distributed more evenly than in Negroid hair. Cross sections made of Mongoloid hair are typically round in shape. (See fig. 4.) Mongoloid hair is coarse and straight with very little variation in diameter along the shaft of the hair. It usually contains a heavy black medulla or core.

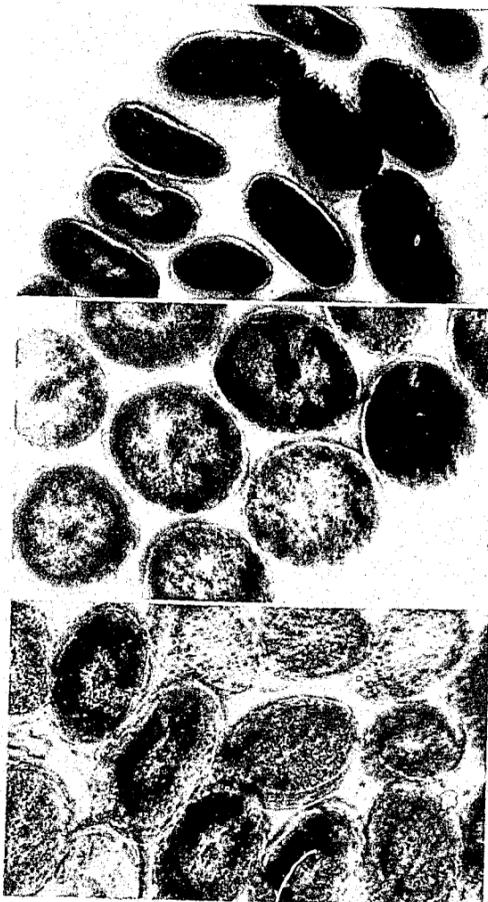


Figure 4. Cross sections of scalp hair—Negroid, Mongoloid, and Caucasian, reading from top to bottom.

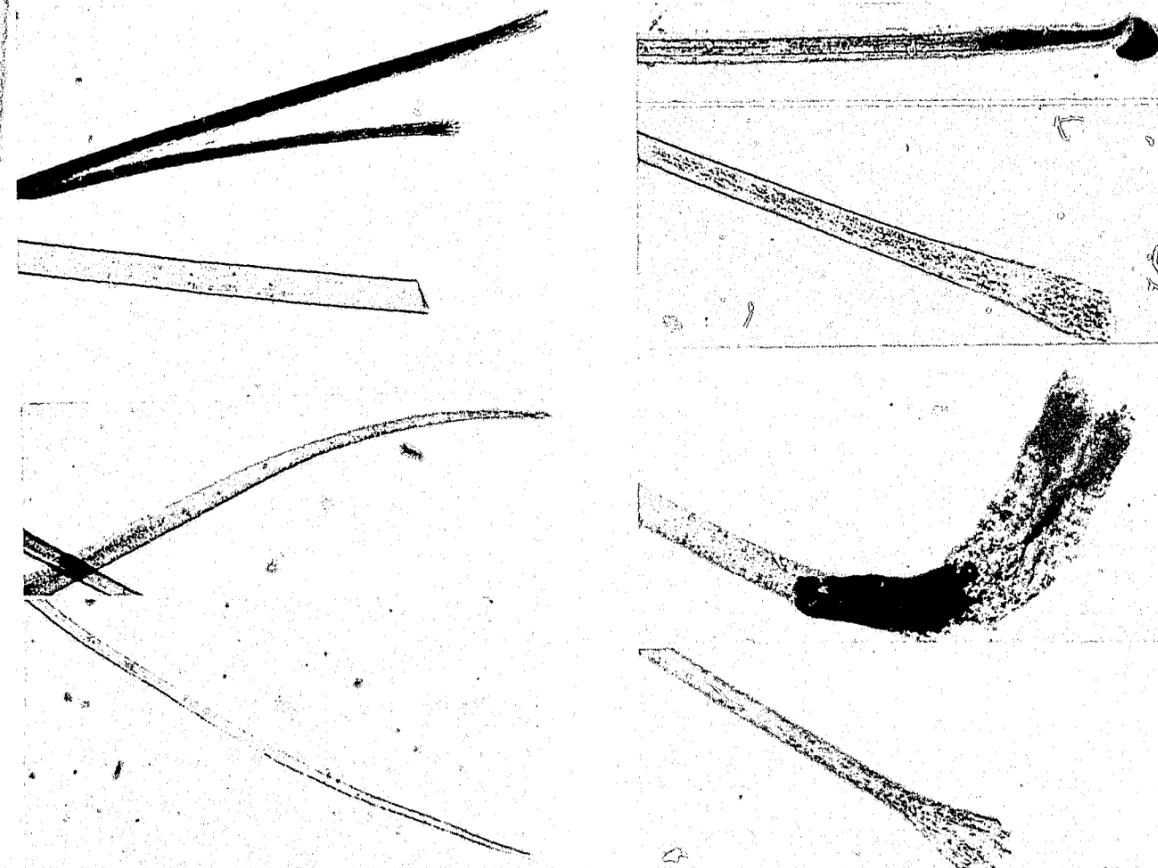


Figure 5 (left). Hair No. 1 (reading from top to bottom) is a scalp hair with a split tip end. Hair No. 2 has been cut with a sharp instrument. Hair No. 3 is from the nostril. The tip end has not been cut. Hair No. 4 is from the scalp, and the tip end has not been cut. Figure 6 (right). Hair No. 1 (reading from top to bottom) has been forcibly removed. Hair No. 2 fell from the scalp from natural causes. Hair No. 3 shows a burned end. Hair No. 4 was severed by crushing.

Body Area

The region of the body from which the human hair has been removed can be determined with considerable accuracy from the length, size, color, stiffness, curliness, general gross appearance, and microscopic appearance.

Scalp hairs generally show less diameter variation and a more constant pigment distribution than hairs from other body areas.

Beard hair is coarse, curved, and often triangular in cross section.

Hairs from the eyebrow, eyelid, nose, or ear are short, stubby, and

have wide medullas. They taper rapidly to a fine point and can be distinguished by the general overall appearance. (See fig. 5.)

Limb hairs typically taper from base to tip, have a granular medulla, and form an arc.

Axillary hairs are fairly long with unevenly distributed pigment. They vary considerably in diameter along the shaft, sometimes have a bleached appearance, and have fine pointed tips when not cut.

Pubic hairs are similar to axillary hairs but are coarser and do not appear bleached. They also are more wiry, have more constrictions and

twists, and often have continuous broad medullas.

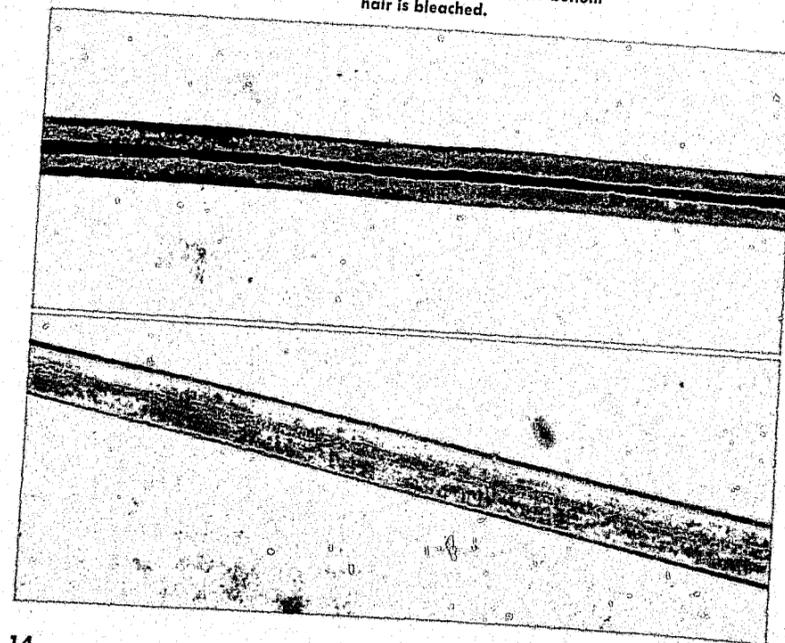
It is not difficult to establish whether hair has fallen out or has been pulled out forcibly, if the root end is present. Hairs which have fallen out from natural causes will have a bulb-like root. This bulb will have a clean appearance with nothing adhering to it. (See fig. 6.) Hairs that have been pulled forcibly will usually have a portion of the sheath clinging to the bulb, the bulb might not be fully developed, and the bulb will often have a mutilated appearance. (See fig. 6.)

An examination of the shafts of hairs often reveals that the hairs have

been crushed or shattered with a blunt object or cut with a sharp instrument. Under high magnification, crushed or shattered areas of the hair shaft are readily observable. A sharp cutting instrument leaves the cortical cells of the shaft severed with a clean and smooth cut. (See fig. 5.) A blunt instrument will leave the ends of the severed cortical cells of the hair shaft with a jagged or rough appearance. (See fig. 6.)

Dyed or bleached hair can be distinguished from natural hair. Dyed hairs, when observed microscopically, have a dull appearance, the inner margin of the cuticle is obscured, and the pigment granules are less prominent than in natural hairs. (See fig. 7.) Bleached hairs have a rough appearance and contain less pigment than natural hairs, varying with the degree of bleaching. (See fig. 7.) If there has been a subsequent growth of hair since dyeing or bleaching, the natural end portion will stand out markedly. Human hair grows approximately one-half inch per month,

Figure 7. The top hair is dyed, and the bottom hair is bleached.



and thus, by mathematical computation, it is possible to estimate the amount of time that has passed since dyeing or bleaching.

Origin of the Specimen

The prime purpose of human hair examinations in the FBI Laboratory is to determine whether a human hair specimen of unknown source, hereafter referred to as a questioned specimen, could have originated from the same source as a known hair sample representing a particular person. (See fig. 2.) As pointed out previously, it is not possible except in very unusual cases to determine definitely by microscopic examination that a questioned hair sample came from a particular person. It can be determined, however, that the hair of unknown source matches a known hair sample from a certain individual in all microscopic characteristics and, accordingly, could have originated from the same source or that it is sufficiently dissimilar to the known hair sample

and, therefore, is not from the same person.

In making hair comparisons, a comparison microscope is most essential so that the questioned hairs and the known hairs can be viewed at the same time. Any variations in the microscopic characteristics can thus be readily seen. Hair from any given area of the body, such as the scalp, will exhibit a range of characteristics. Therefore, it is very important to have several hairs in the known specimen in order to determine if all the variations in the questioned sample are also present in the known sample.

The hairs should first be observed microscopically in the condition that they were obtained. In this examination, particular attention should be given to any foreign material, such as blood, that might be on the hair. Any foreign material on the hair should be identified, if present in sufficient quantity for testing.

Microscopic Examination

The hairs should then be mounted on a glass slide in one of the commercially available mounting media for detailed microscopic examination. Such an examination would normally include considerations of: race; body area; color; tip (cut, broken, split, pointed, rounded); root (normal, distorted); diameter (fine or coarse, variation); cuticle (thickness, clarity, color); scales (protrusion, length); pigment (granule size, density, distribution); medulla (distribution, width, dark or light, clarity); cortex (cells prominent or obscured); artificial treatment (bleached, dyed, time since treatment); and damage (cut, crushed, broken, burned).

On occasion, a hair will possess special characteristics that are particularly useful in comparing questioned hairs with a known sample. Such characteristics include a cracked cuticle, abundant cortical



Figure 8. Known samples of different kinds of hairs and fibers are mounted on glass microscope slides in a hair and fiber reference file.

fusi (intercellular spaces, diseases, a double medulla, and vermin).

The examiner of hairs should have a ready reference file containing samples of human and animal hairs which can be used for comparison purposes in the examination of questioned hairs. (See fig. 8).

No opinion should be expressed as to the results of the examination of hairs unless the examiner has had wide experience in examining and identifying hairs.

Collecting and Submitting Evidence

A complete search of the crime scene should be made as soon as possible. All of the hairs in the questioned specimens should be submitted, but do not mix hairs found at different places.

In assault and murder cases, obtain the clothing of the victim from the hospital or morgue to avoid the loss of evidence by careless handling and to prevent the clothing from being destroyed.

Avoid placing the victim's clothing and the subject's clothing in the same part of an automobile; on the same

object, such as a table; or in the same container or package before each piece has been separately wrapped and sealed to insure against transfer of hairs or other evidence from one garment to another.

Representative Samples

Representative samples of hair from the victim, as well as the suspect, should be obtained if available. To be representative, at least a dozen hairs should be taken from different areas of the scalp, pubic region, or other body areas being sampled. Full length hairs are preferable, but they may be cut close to the skin surface rather than pulled. If there has been an injury, the hair sample should be taken from the injured area. Do not mix known samples of hair from different parts of the body, such as, for example, scalp and pubic hairs.

The hairs should be placed in a powder paper (folded paper) or in a pill box, and the containers should be securely sealed with tape.

Hairs should never be secured to a piece of paper or cardboard with tape. The hairs may be damaged, and any debris clinging to them may be lost.

Do not put hairs loosely in an en-

velope. The corners of envelopes are not securely sealed and hairs will be lost.

Areas on an object containing hairs should be protected with cellophane or paper taped over the areas before wrapping the object for transmittal to the laboratory. Hairs should be removed from objects too large to transmit; however, it is suggested that photographs of the hairs on the object be made before removing the hairs.

Although hairs cannot be positively identified as originating from a particular person to the exclusion of all others, hair evidence can contribute significantly to the investigation of a case and subsequent court action. From the investigative standpoint, hair recovered at a crime scene can provide valuable leads and most certainly should not be overlooked. At a trial, testimony concerning hair examinations has the primary value of corroborating other evidence such as the statement of witnesses. The testimony of FBI Laboratory experts concerning the results of hair examinations has long been accepted in State and Federal courts throughout the Nation.