To close the yellow note, click once to select it and then click the box in the upper left corner.
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Examination of Hair Samples

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Hair exhibits class characteristics that are useful when comparing crime scene evidence with evidence taken from suspects and victims. Class characteristics are those characteristics of evidence that can be used to tie that evidence to a class or group. Hair can be characterized by examining its features under a compound microscope. The root, shaft, and tip are illustrated in Figure 1. The root of the hair is bulb-shaped and grows in the scalp. If a hair has some scalp tissue adhering to the bulb, that hair was removed forcibly. The shaft is the central portion of the hair. The tip end of hair is the end farthest from the root. If hair was recently cut, the tip end will be blunt or squared off. Otherwise, the tip will be pointed.

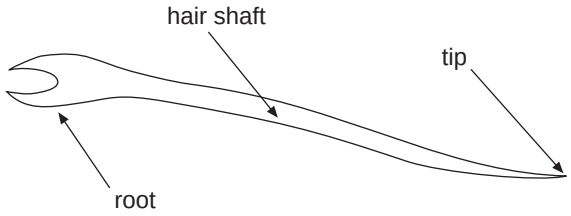

Figure 1: Hair anatomy

The hair fiber has three layers: the cuticle, cortex, and medulla. The cuticle is the outer protective coating of the hair which makes hair resistant to chemical and physical change. The cuticle has characteristic scale patterns that can be used to help determine if a hair sample is animal or human in origin. Scales on hair point toward the tip end of the hair shaft. Common scale patterns are illustrated below. (See Figure 2.) Imbricate scale patterns are found on both humans and animals. Spinous scales have angular edges and are found in animals only. Coronal scales are similar to cups stacked one inside the other. They are most often found in bats and rodents and are occasionally found on human hair.

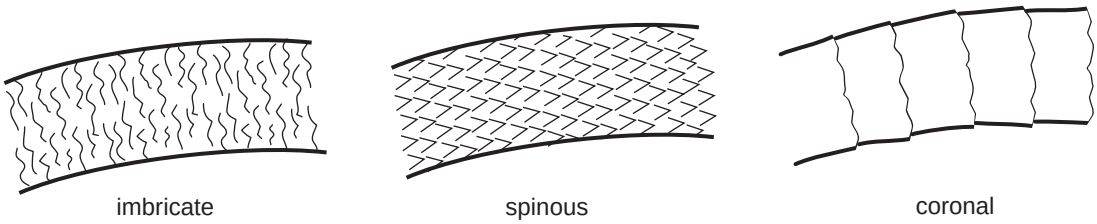

Figure 2: Common scale patterns

The cortex of the hair is the next layer of a hair fiber and it is where pigment granules are found. In general, pigment granules are more evenly distributed in human hair than in animal hair. Hair that has been bleached will have the pigment granules stripped from it. Gray hair will have fewer, more unevenly distributed pigment granules.

The medulla is the central canal of the hair. The medulla is often very broad in animals and is generally more than half the width of the hair shaft. Animals exhibit continuous or fragmented medulla. The medulla of animal hair often has characteristic, unusual patterns. Humans have very narrow medullas. Human medullas are generally less than one third the width of the hair shaft. Human medullas can be fragmented, interrupted or nonexistent. (See Figure 3.) Medullas are rarely continuous in humans except among Asians, who generally have continuous medullas.

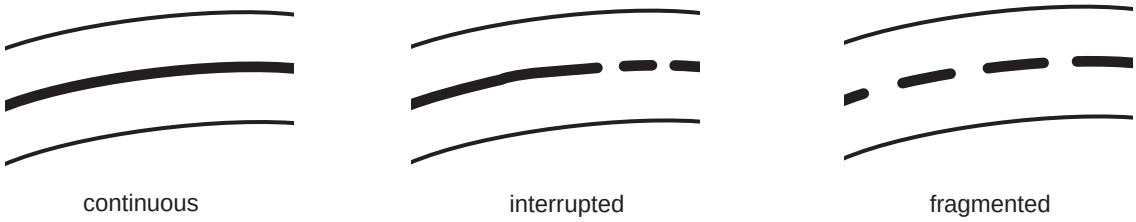

Figure 3: Types of medulla

Materials

Per class

- compound microscopes
- microscope slides
- cover slips
- hair samples—human, animal (cat, dog, and deer), and synthetic
- several bottles of clear nail polish
- ethanol
- Kimwipes®

Procedure

Examination of Common Features

1. Remove a strand of your own hair and wipe the hair clean with a Kimwipe® dampened with alcohol to remove any traces of hair spray, hair gel, oil, grease, etc.

2. Place the hair on a microscope slide.

3. Add a drop or two of water and place a cover slip on top of the hair.

4. View under the compound microscope, first at low power and then at higher powers as necessary.

5. Sketch the features of the hair including the medulla, cortex, cuticle, and distribution of pigment granules. Note any distinguishing features.

6. Repeat steps 1–5 for several different types of hairs including human hair of different colors, synthetic hair, cat hair, dog hair, and deer hair.

Examination of Scale Patterns

1. Remove a second strand of your hair and clean the hair as described above.

2. Paint a thin coat of clear nail polish on a glass slide.

3. Embed the shaft of the cleaned hair in the nail polish. Leave the root and tip ends free.

4. When the nail polish is nearly dry, grasp both free ends of the hair and pull straight up.

5. Examine under the compound microscope, first at low power and then at higher powers as necessary.

6. Sketch the cuticle patterns of the hair.

7. Repeat steps 1–6 for several different types of hairs including human hair of different colors, synthetic hair, cat hair, dog hair, and deer hair.

Crime Scene Scenario

Police are called to the scene of a hit-and-run accident in which a pedestrian is killed. The medical examiner collects a hair sample from the victim at the autopsy and turns this sample over to the police crime lab. Through the combination of eyewitness testimony and interviews with the victim's friends, the police identify a suspect, Jennifer Truro. Ms. Truro's car has heavy damage to the front end. Ms. Truro states that she hit an animal on her way home from a party at a friend's house. Ms. Truro stated that the accident occurred very late at night, and she could not be sure what type of animal she hit. Police collect a few strands of hair from the damaged front end of Ms. Truro's car. Examine the hair and determine whether Ms. Truro hit the victim or not.

INSTRUCTOR NOTES
Examination of Hair Samples

1. Although compound microscopes are not commonly used in a chemistry laboratory, they are relatively easy to use. If you are unfamiliar with the use of a microscope, ask a colleague in the life sciences to show you how to use one.

2. This lab can be used early on in a chemistry class to introduce the students to observation, scientific record-keeping, proper labeling of samples in the lab, and the scientific method. When viewed through the eyes of forensic science, the relevance of good laboratory technique and attention to detail in the laboratory is clearly evident.

3. A hair will exhibit only one scale pattern.

4. The medulla and cortex can exhibit variations throughout the length of a single hair as well as between hairs removed from different regions of the scalp. To get a true sense of the hair features of an individual, crime labs take a total of fifty hairs from various regions of the scalp. This is not practical for the purposes of this lab. However, students should scan the entire length of a hair to detect variations in a given hair.