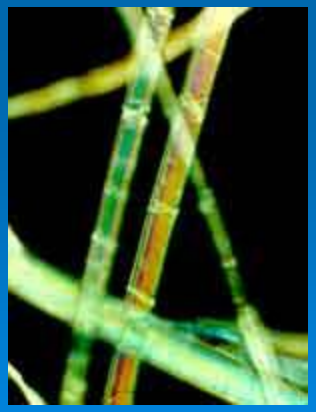
Trace Evidence

- Trace evidence is a term for small, often microscopic material. This evidence can be a significant part of an investigation.

It includes an endless variety of materials but the trace evidence most often collected at a crime scene is *fiber, hair, glass, soil and paint.*



- When a suspect is detained all his/her possessions should be closely examined.
- Cases might not turn on physical evidence alone but the crime lab proves its value over and over by corroborating or refuting a defendant's story or a prosecutor's theory.

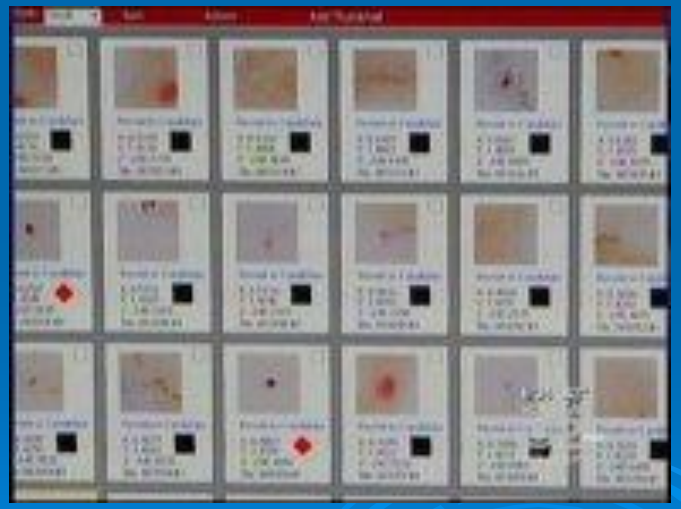
- Earlier Tuesday, Catherine Theisen, a forensic mitochondrial DNA analyst for the FBI and the quality assurance supervisor for the FBI laboratory, testified about hair samples, saying that hair from the trunk and hair from Caylee's skull were a mitochondrial match. That match could also be made to Casey Anthony, Casey's mother Cindy or anyone else in the maternal line, including Casey's brother Lee.

- Cindy Anthony testified that in 2008 she kept her hair short and dyed blond and that her son Lee kept his hair short as well. Cindy Anthony testified that she sometimes trimmed Caylee's hair but that she never colored it. She also said that Casey's natural hair color was brown but that she had colored it numerous times in the past, WKMG reported.

- Casey Anthony is charged with first-degree murder in the death of her daughter and faces a death sentence if convicted. She has pleaded not guilty. Prosecutors contend Casey Anthony suffocated Caylee with duct tape, while the defense says she drowned in her grandparents' pool.

- Caylee was not reported missing for 31 days. Her remains were found in a wooded area near the Anthony home in December 2008.

- Forensic crime labs maintain databases of the characteristics and manufacturing details of materials found at crime scenes for comparison. Thousands of samples are also kept on file.

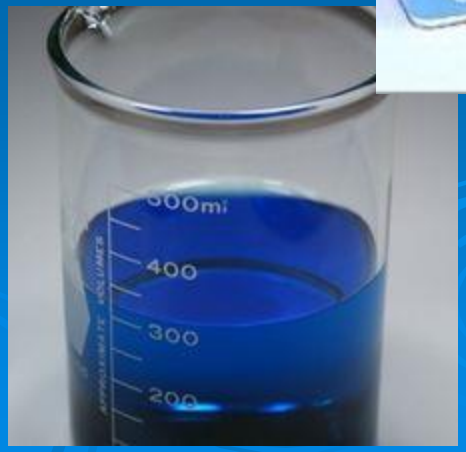


Fibers

- The mass production of our fabrics has caused them to possess class characteristics. It is only under unusual circumstances that fibers will provide individual characteristics.

- Natural Fibers – are derived from animal (wool or silk) or plant (cotton) sources.

- Man-made fibers – fall into two categories, **regenerated** and **synthetic**. Regenerated means it is made from natural raw materials (rayon, acetate). Synthetic fibers are produced solely from chemicals (nylon, polyester)



- Removal of fiber evidence is best done at the laboratory. If this is not possible, fiber evidence can be removed with forceps, tape, or vacuum sweeping.

- Classes of fibers can be identified by their properties. However, a forensics scientist frequently does not have a substantial quantity of fabric to work with and therefore select tests that will yield the most information with the least amount of material. The first and most important step is a microscopic comparison for color and diameter. Striations and pitting can also be observed. The tool used is a comparison microscope.

Once there is a fiber match for a crime and a suspect, what's its significance?

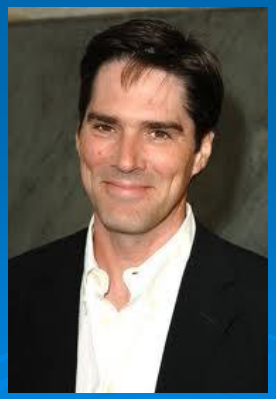
It's unlikely to find two different people wearing identical fabrics (with the exception of blue denim or white cotton). The significance increases dramatically if two or more distinctly different fibers can be linked to the same object or if other trace evidence can be linked.

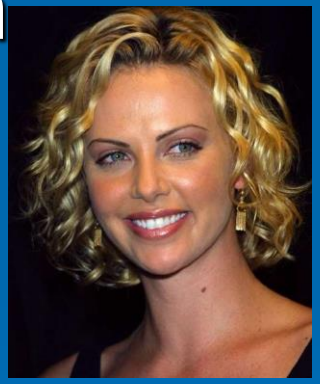
- Individual characteristics can be shown if a torn piece of cloth can by physically fitted into another, thereby proving a common source.

Hair as Evidence

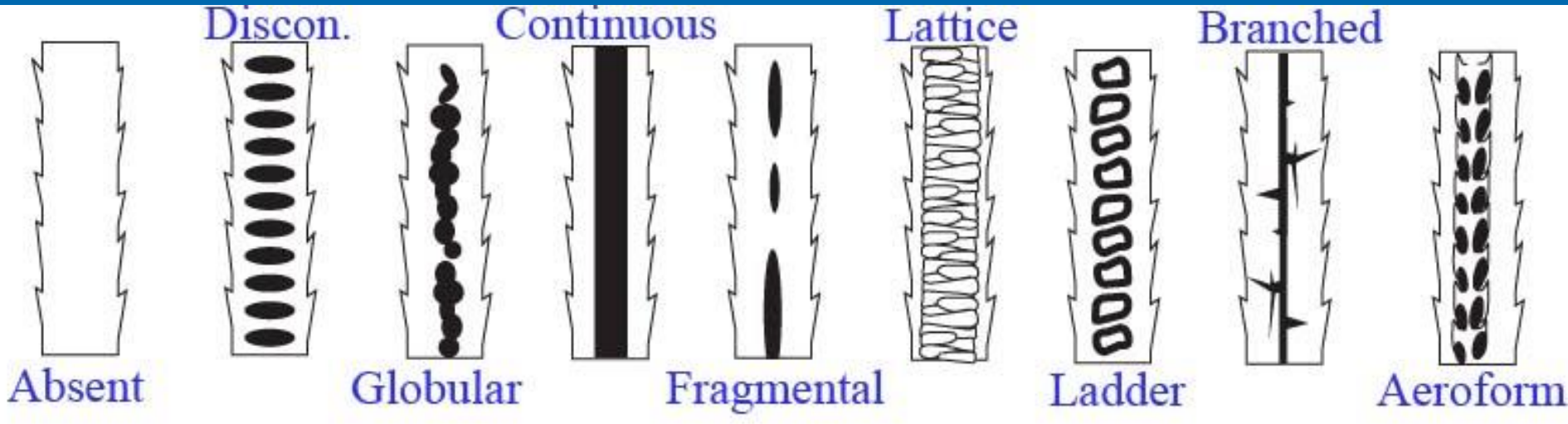
- Hair is class evidence. The value of hair as evidence depends on the degree of probability with which the examiner can associate the hair in question with an individual.

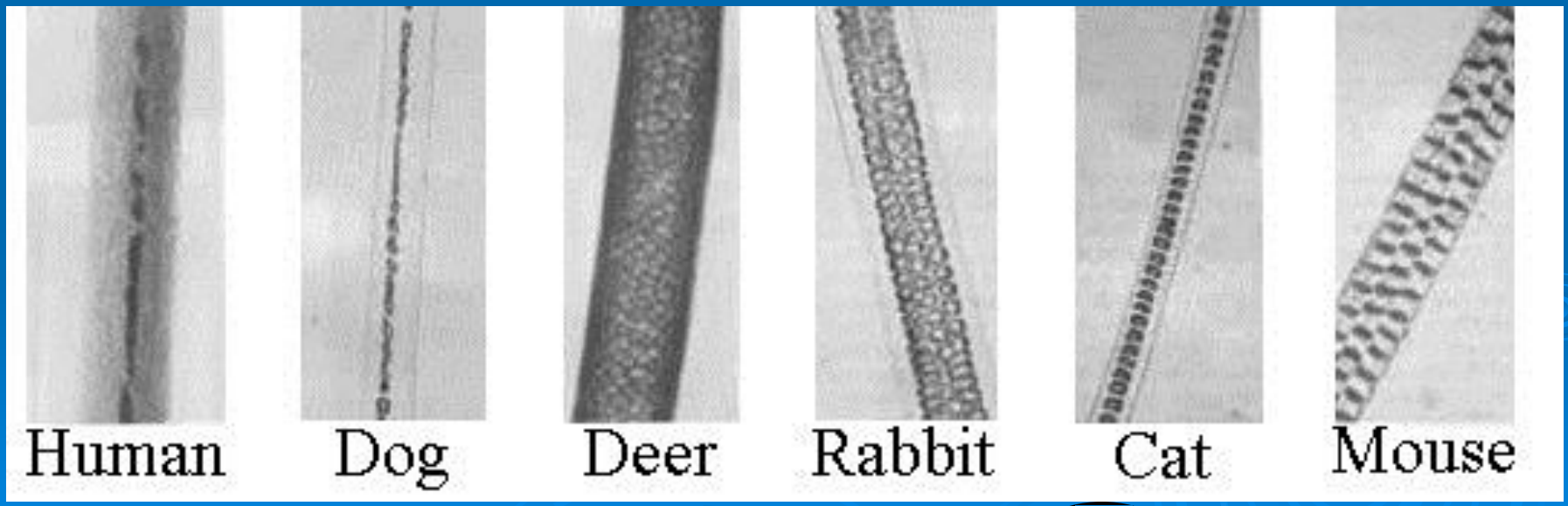


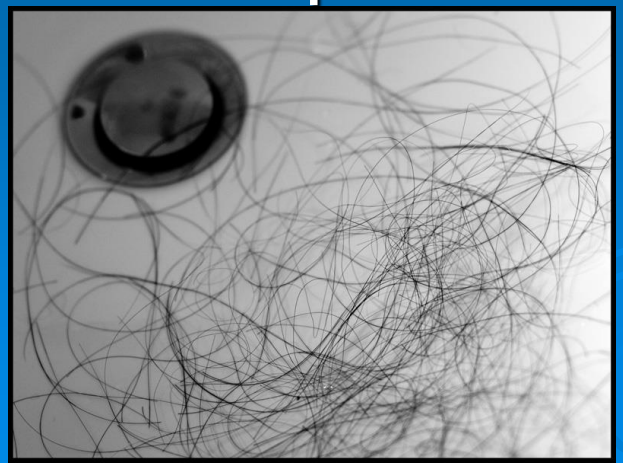
- A comparison microscope is used, looking for a match in color, length, diameter, the presence or absence of a medulla, and the distribution, shape, and color intensity of pigment granules, and abnormalities due to diseases or deficiencies. When there is a match, the odds against it originating from another person are about **4500 to 1!**


Discon.
Continuous
Lattice
Branched
Absent
Globular
Fragmental
Ladder
Aeroform


Human
Dog
Deer
Rabbit
Cat
Mouse

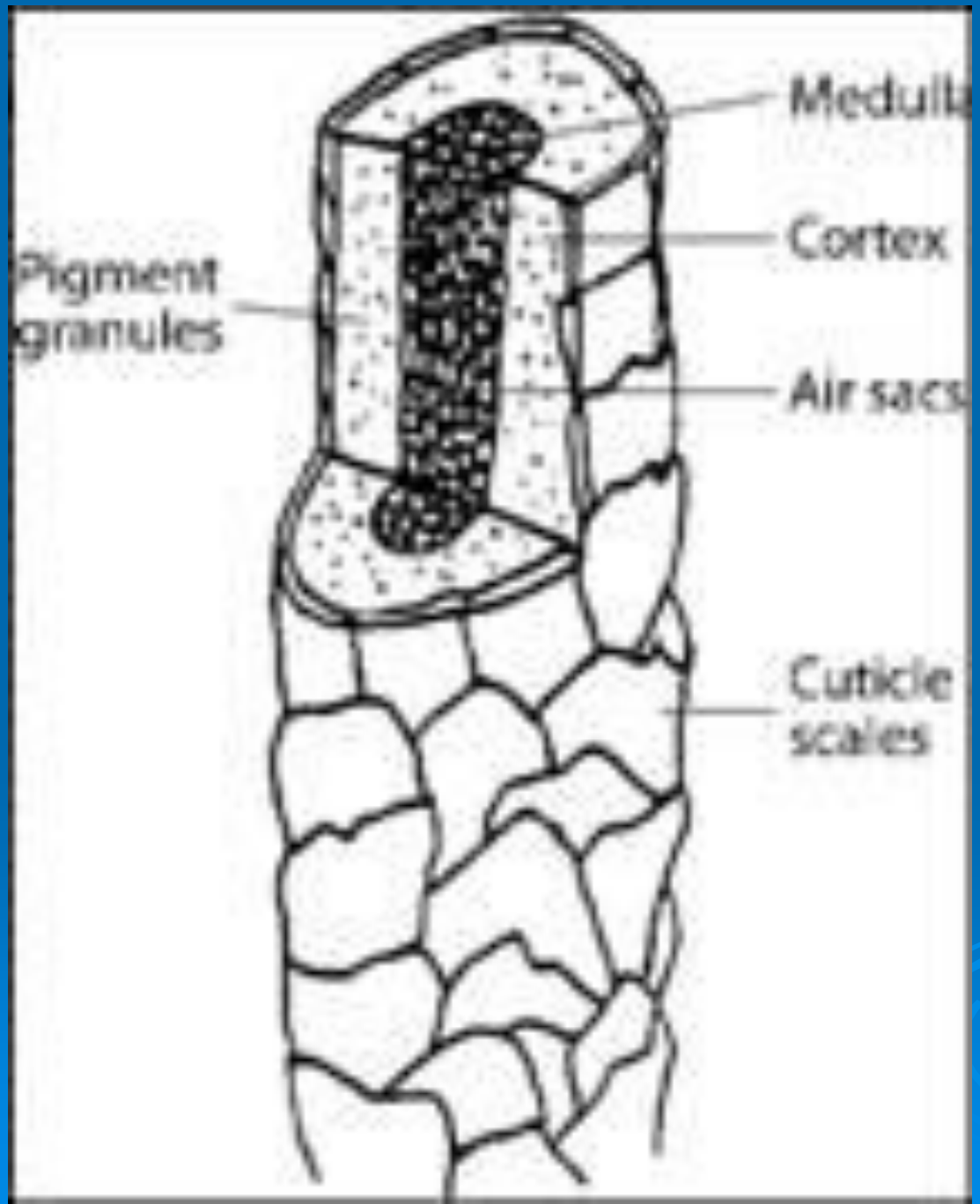
- Age and sex cannot be distinguished from hair with any certainty however, body area and race can generally be determined (with exceptions).
- It can sometimes determined if hair is forcibly removed. A hair root found to have follicular tissue (root sheath cells) adhering to it is indicative of a hair pulled out by a person or brushing.

- The hair roots and follicular tissue (a translucent piece of tissue surrounding the shaft near the root) contain nuclear DNA which can be analyzed to individualize the hair.
- However the majority of hairs found at a scene are usually naturally shed hairs at the end of their growth cycle with contain inadequate amounts of DNA.



- The collection of hair from an individual involves pulling or clipping hair at the skin line.

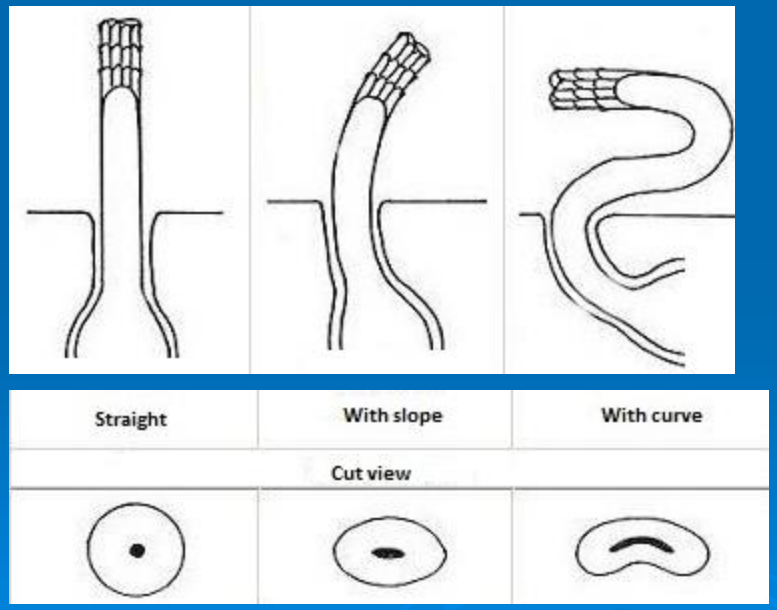
- 50 full-length hairs are collected from all areas of the scalp
- AND/OR 24 pubic hairs


Medulla
Cortex
Pigment granules
Air sacs
Cuticle scales

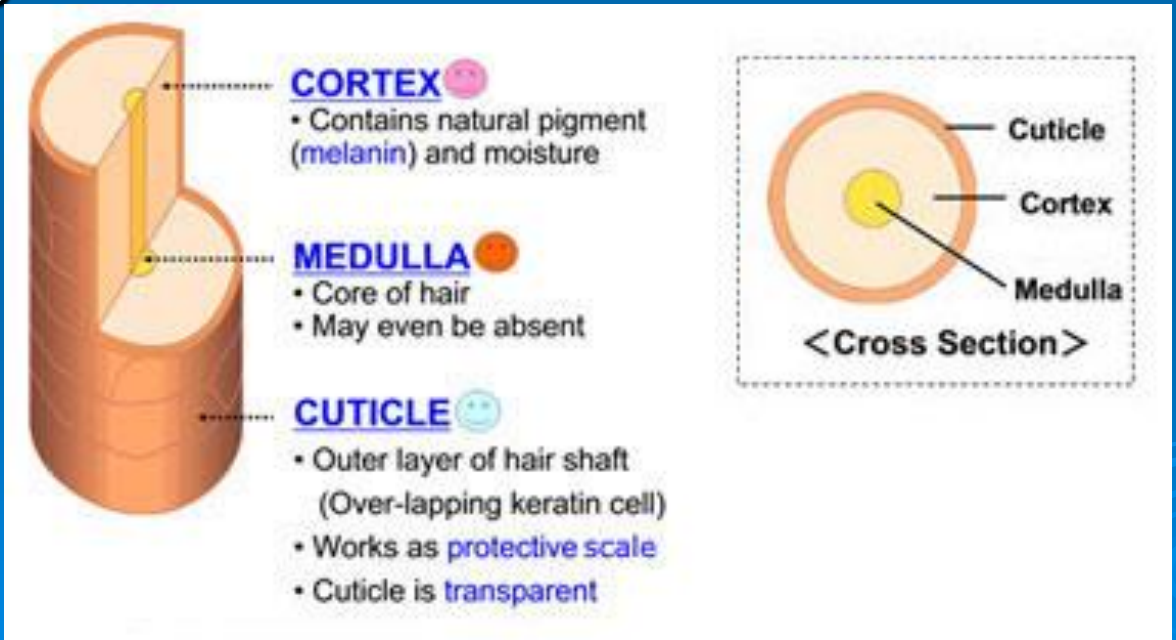
- It is not yet possible to individualize a human hair to a single person BUT hair can provide strong corroborative evidence for placing an individual at a crime scene. The advantages of hair as evidence are: it's resistant to chemical decomposition and it retains its structural features over a long period of time.

Shape of hair

- The shape of hair can be straight (round), curly (oval), or kinky (crescent moon).

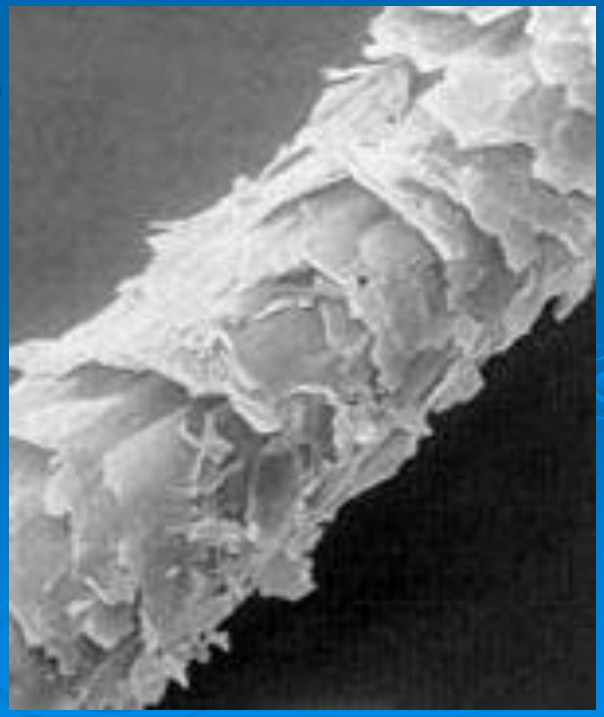


- Hair grows out of a hair follicle. It continues into a shaft and continues to a tip end. The shaft is composed of three layers – the cuticle, the cortex and the medulla – which is what forensic scientists study.



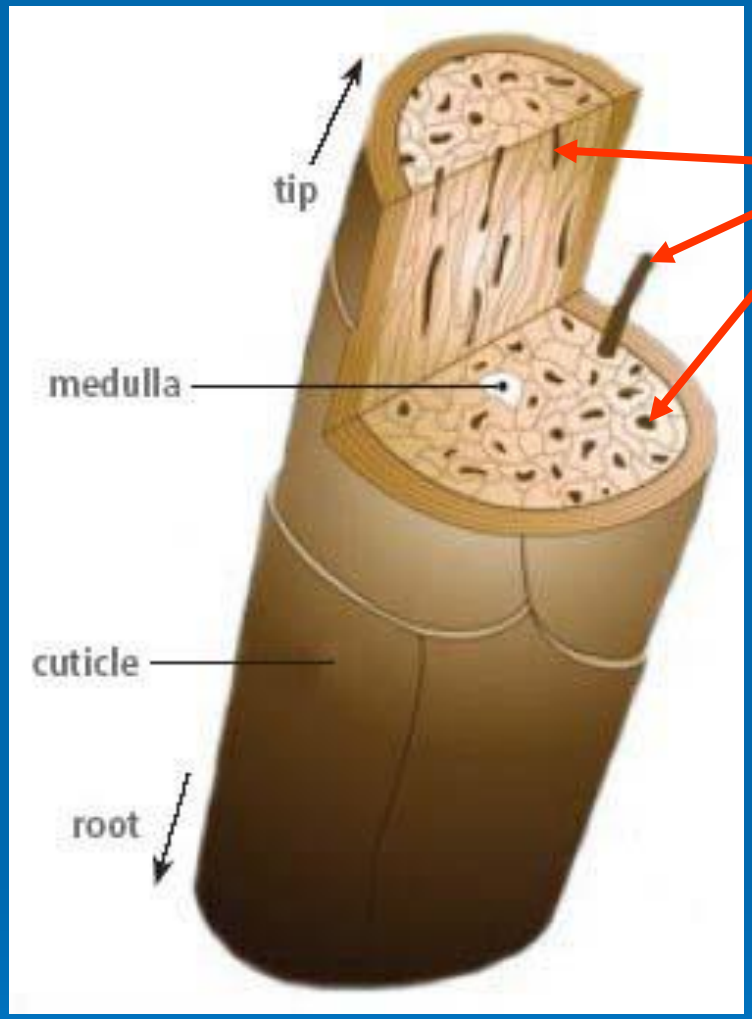
Cuticle

- The cuticle is formed by overlapping scales that always point toward the tip end of hair. The scales are formed from specialized cells which have hardened – keratinized – and flattened.

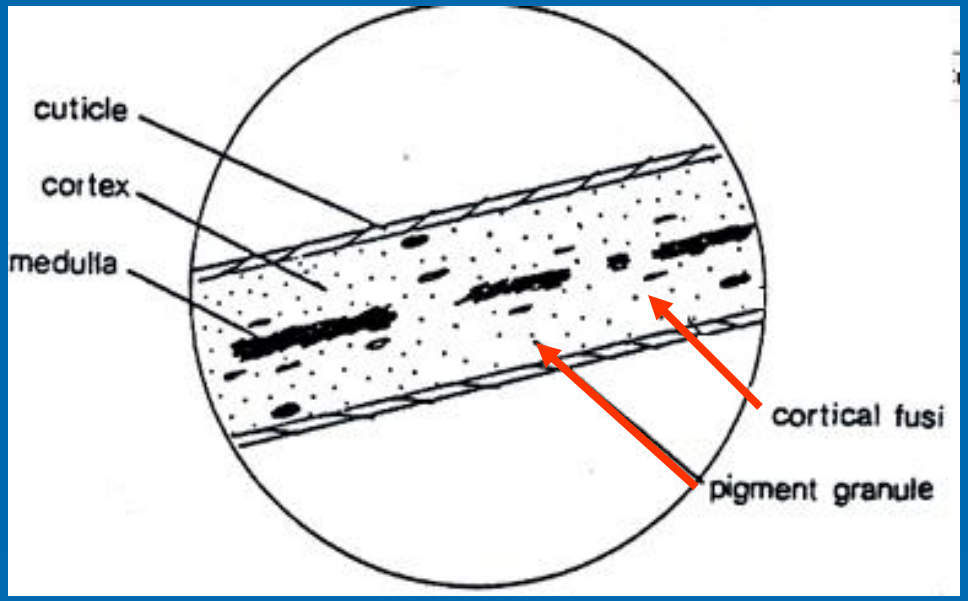


Cortex

- The cortex is made up of spindle-shaped cells that are aligned in a regular array, parallel to the length of the hair. 75 to 90% of human hair is cortex. It is embedded with pigment granules. It is the color, shape, and distribution of these granules that allow a forensic scientist to compare the hairs of different individuals. Cortical fusi are air spaces within the cortex.



Cortex area. Spindle shaped cells



Medulla

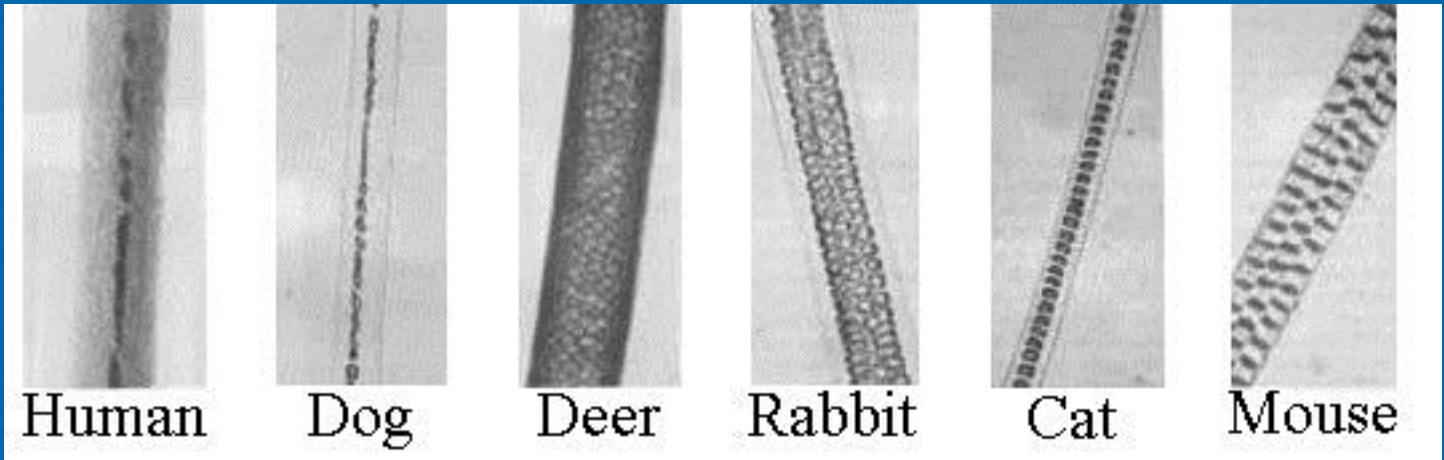
- The medulla looks like a central canal running through the hair.

Figure 3. Light micrographs of three human hairs. The left example illustrates dark hair with a typical fragmentary medulla. The middle hair is blond and has no medulla. The right coarser hair is white with a continuous medulla.

- The medullary index measures the diameter of the medulla relative to the diameter of the hair shaft, usually expressed as a fraction. For people the value is generally less than 1/3. the medulla varies from individual to individual and even between hairs of a given individual.

Human hair

- Medullae are classified as continuous, interrupted, fragmented or absent. Human hairs are usually absent or fragmented. Human medullae is cylindrical while other animals have a patterned shape.


Human
Dog
Deer
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Cat
Mouse