The Petnapping of Maya
Forensic Lesson Plan
Grades 2-4

Abstract: This is a forensic lesson plan for grades 2-4. It is designed as a fun activity while developing observational and reasoning skills in students. Everything needed is contained in this lesson plan. It would be a great activity for after testing, when a substitute is in, at the end of a semester or any other time when you are looking for something fun.

Purpose: This is a thinking exercise. It introduces students to scientific reasoning. It enables children to compare data and come to a hypothesis based on their evaluations.

Standard: This supports North Carolina 3rd grade standard "Science as Inquiry" and the NGSS 2-PS1-1 grade 2 standard "Observation".

Format: This is a station activity taking place indoors. It can be completed in groups or individually. The children are given the background information before starting the stations.

Time: The kids should have 15 minutes at each station. The Instructor can choose how many stations to present.

Included: The story of the petnapping, description of suspects, the ransom note, pictures of the pet victim, pictures of the suspects, light microscope images of hair samples, light microscope images of soil samples, ink test images, fingerprints, and forms for the students to write their observations.

What the Instructor Needs: Access to a color print, crayons or color pencils.

Final Assessment: The assessment will be a group discussion. The groups will present their hypotheses on who pet napped Maya and how they came to this conclusion. Then the instructor will read who the criminal was and why he/she committed the crime. The instructor will also present the evidence that supports this. There should be time for more discussion after this. The instructor can also pick up the forms the students filled out.

This information can be scrambled and used again with a different outcome.

The Crime – Sasha's dog Maya was pet napped.

Sasha called the dog walker, Boris, that afternoon before she left work. He came by at 5pm to walk Maya for 30 minutes and then left her in the yard to play until Sasha returned home. Sasha has a screened porch with a doggie door, so Maya has shelter from the weather if she needs it. Sasha returned home from work at approximately 6:30pm, her normal time, and entered her house through the garage. She could not find Maya on the porch or in the yard. Sasha found the gate to her fence was closed and the house doors were still locked. She found a ransom note taped to the front door (Please read the note). Sasha called her neighbors, but no one had seen the crime take place. Sasha then called the police.

When the police arrived, they took Sasha's statement. They also looked over the house, yard, back porch and driveway to see if any evidence was left by the perpetrator. The police have come up with a list of suspects after interviewing Sasha.

Victims:

Sasha – She is a research scientist and loves her dog Maya. Sometimes she has to work late, so she employees a dog walker to look after Maya. Sasha has a large fenced yard that Maya can run and play in. Sasha has a long dirt driveway that leads up to her house.

Maya -

The Suspects:

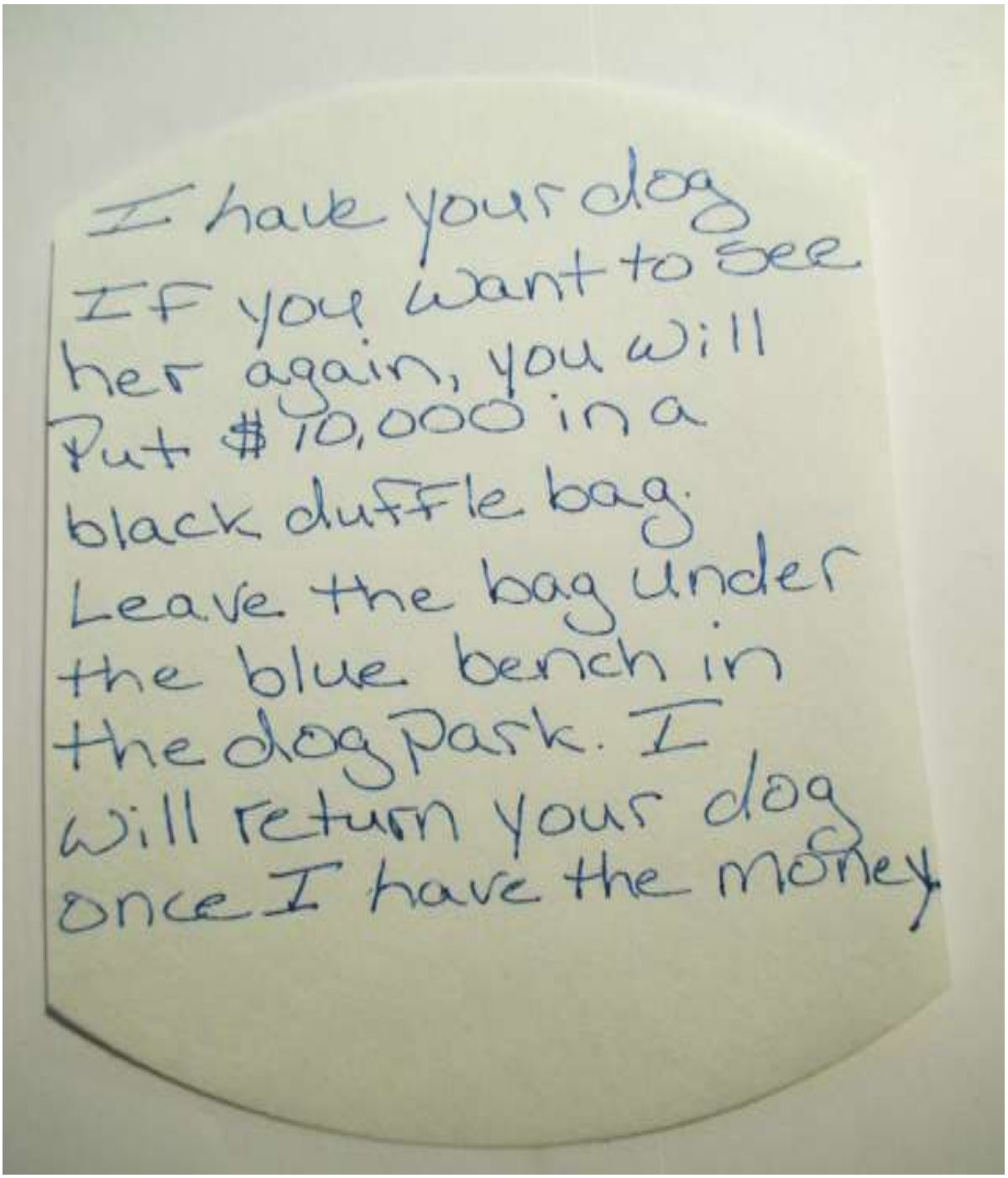
Suspect 1 - Mika – Neighbor, lives directly behind victim. She has complained about Maya's barking and has threated to muzzle Maya in the past. Mika has 2 cats and no dogs.

Suspect 2 - Mr Sato - Neighbor, lives on the street behind the victim. Maya escaped her fence last week and was found in Mr Sato's flower bed. She had dug up all of Mr Sato's recently planted daisies. He was very unhappy with Maya. Mr Sato has a small black dog.

Suspect 3 - Charlie – Dog groomer. Maya was taken to her after she escaped her fence and was covered in mud. Maya's normal dog groomer was out of town and Charlie was filling in for her. Charlie was appalled at Maya's appearance. She suspected that Maya was being neglected in her home and threated to report Sasha to the authorities.

Suspect 4 - Boris - Dog walker/pet sitter. He has been Maya's pet sitter and dog walker for 14 months. He was the last person to see Maya. He is a suspect because a year ago one of this other customer's dog was pet napped. That dog was returned safely after the ransom was paid. That crime has gone unsolved.

Ransom Note:


I have your dog
If you want to see
her again, you will
Put $10,000 in a
black duffle bag.
Leave the bag under
the blue bench in
the dog park. I
will return your dog
once I have the money.

Stations:

Station 1 Hair Samples (suspects): A hair was found on Sasha's back porch that does not match Sasha's hair. Compare the suspects hair with the one found at the crime scene. See below.

Stations 2 Hair Samples (pets): Pet hair/fur samples were removed from the suspects clothing. If the suspect has come in contact with Maya, then they should have Maya's fur on them. A piece of Maya's fur was removed from one of her brushes. Compare Maya's sample to the samples that were removed from the suspects. See below.

Stations 3 Soil Samples: Sasha has a long dirt driveway and a foot print was found in it. Soil samples were taken from the possible suspects shoes. Compare the samples with a sample taken from the dirt driveway. See below.

Station 4 Fingerprints: The pet-napper left a finger print on the gate handle on the fence in Sasha's yard. Compare the fingerprints of the suspects with the one found at the crime scene. See below

Station 5 Comparing Ink: The ransom note was written with a blue ink pen. Pigments used in blue inks vary with different manufactures. These pigments can be separated from each other. Examine the different inks from the pens that were found on the suspects. See below.

Criminal – Charlie
The finger print and the human hair sample match. There was no reason that a hair or finger print from Charlie would be at Sasha's house. The ink from the ransom note matched the Charlie's pen. Both Boris and Charlie had Maya's fur on them. But Boris had just walked Maya, so it is to be expected that he has Maya's fur on him.

Why she did it
Charlie was worried about Maya. She did not think the Sasha was taking good care of her. She thought that if Sasha paid the ransom that would mean that she really loved Maya. If she did not pay, then Charlie would find someone else that would love and care for Maya. She was planning on donating the ransom money to the local animal shelter.

More:

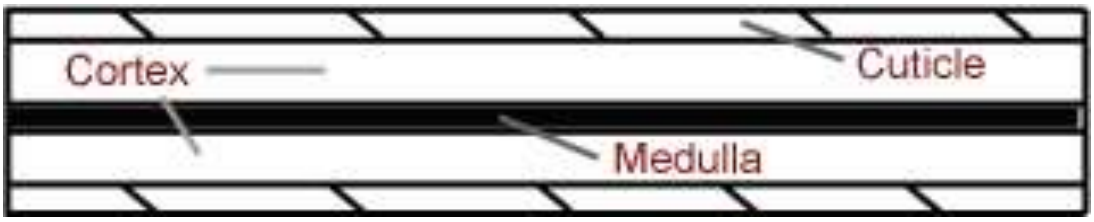
If you would like to pursue forensic further, you can set up a couple of experiments in the class room. Finger prints are the easiest, but also the messiest. You would just need a stamp pad, paper and magnifying glasses. Have the students do a thumb print onto the paper. Then look at them under a magnifying glass. Pick out the loops and swirls as well as the smaller features (in the station information).

The instructions for testing ink samples are attached. http://www.sciencebuddies.org/science-fair-projects/project_ideas/Chem_p008/chemistry/paper-chromatography.shtml#summary

Samples of hair and dirt are easy to come by. Have the students collect their own samples and look at them under the light microscopes. If you do not have these, our lab would be willing to help at no cost. We can image the samples and send the images back to you. We can also come into your class and do presentations with the students. We also have the ability to image samples on electron microscopes. I am attaching scanning electron microscope images of the dirt and hair. Please contact us if you would like to access our facility –
https://www.rtnn.ncsu.edu/education/ http://smif.pratt.duke.edu/

Station 1 - Human Hair

Hair is made up of about 85% protein. The protein is called keratin and it is hard and fibrous. There are two parts to a hair, the root and the shaft. The root is the part that is under the skin. This is where the hair grows. The shaft is the part of the hair that we can see. The hair shaft is made up of three layers, the cuticle, the medulla and the cortex.



http://summerwinds.com/downloads/howtodocs/ANATOMY-OF-HAIR.pdf

The **Cuticle** is the outer layer and protects the hair. It is transparent. The cuticle is made up of scales that overlap each other.

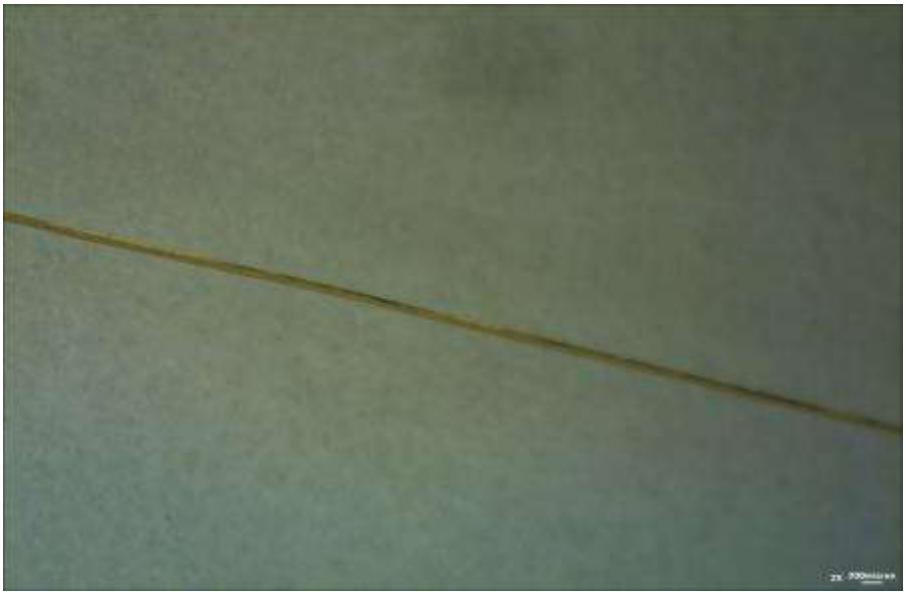
The **Cortex** is the next layer. It is in between the cuticle and the medulla. This is the layer that contains the pigment melanin and the protein keratin.

The **Medulla** is the middle layer. It is made up of large cells. Sometimes this layer is broken or absent.

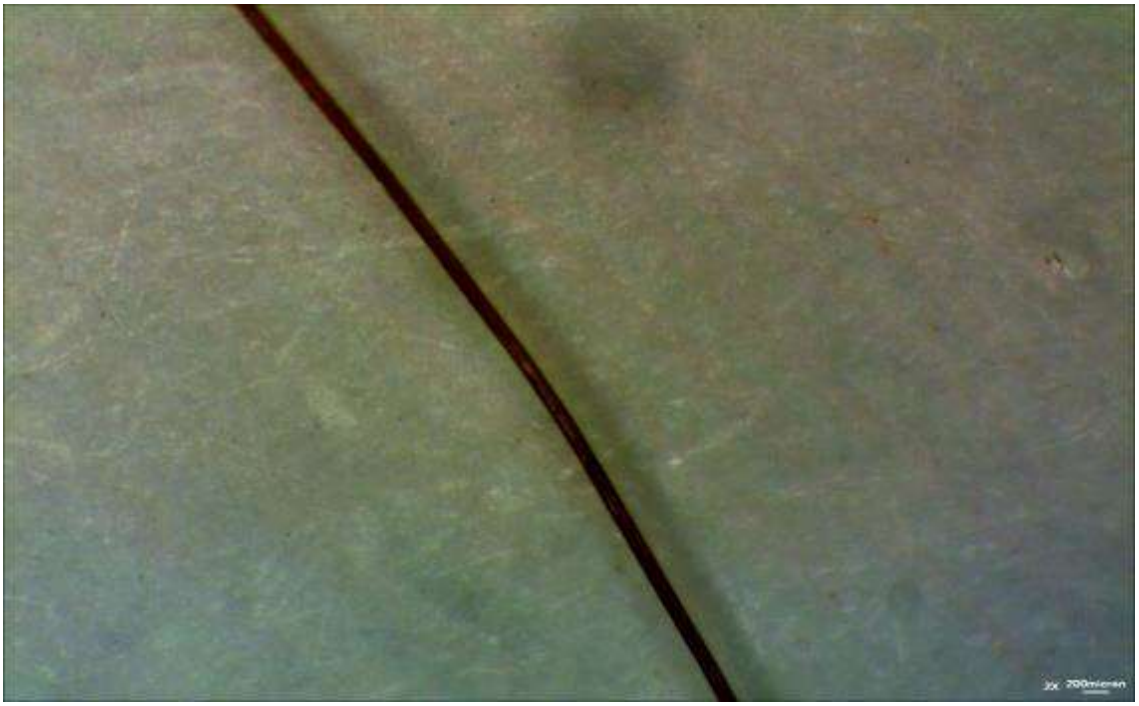
There are two main types of melanin – eumelanin and pheomelanin. Eumelanin is a dark pigment and is found in brown and black hair. Pheomelanin is a light pigment and is found in blonde and red hair. The amount of these pigments influences the color of the hair. White hair contains no pigment and gray hair contains just a little pigment.

Hair is evidence that is commonly found at crime scenes. It can help investigators determine if a suspect was at the crime scene or not. It is used with other evidence collected at the crime scene to help prove the investigators case.

A hair was found on Sasha's back porch that does not match Sasha's hair. Compare the suspects hair with the one found at the crime scene.

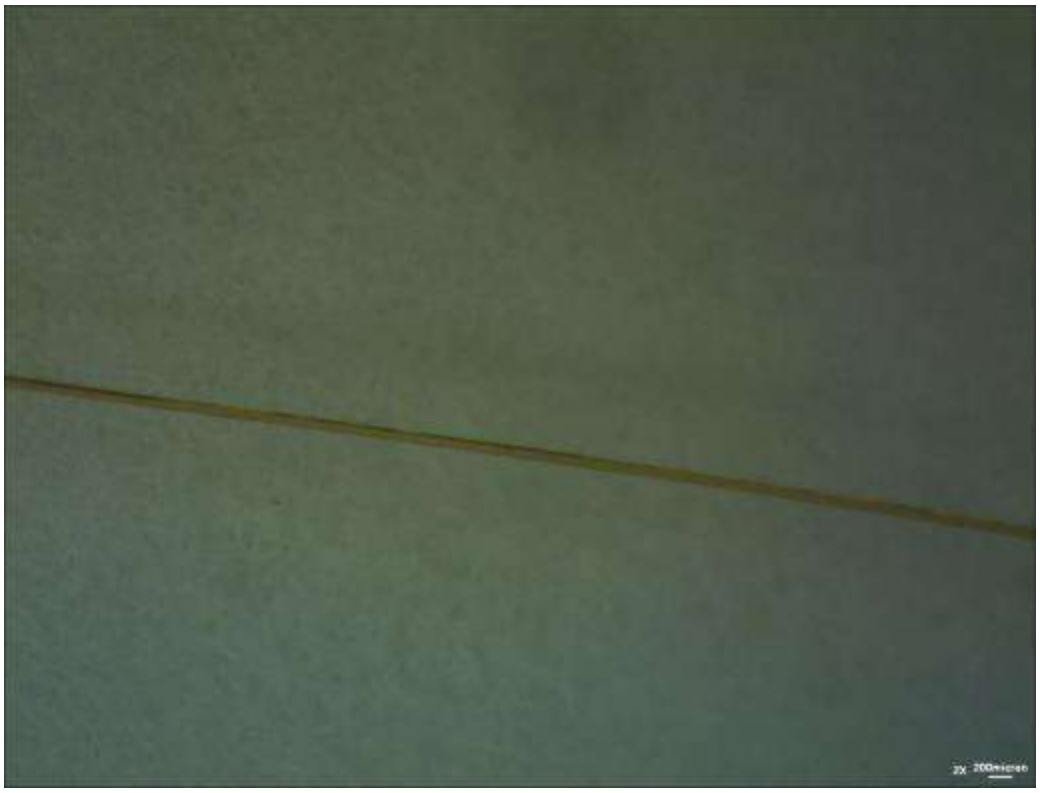


Hair found at the crime scene

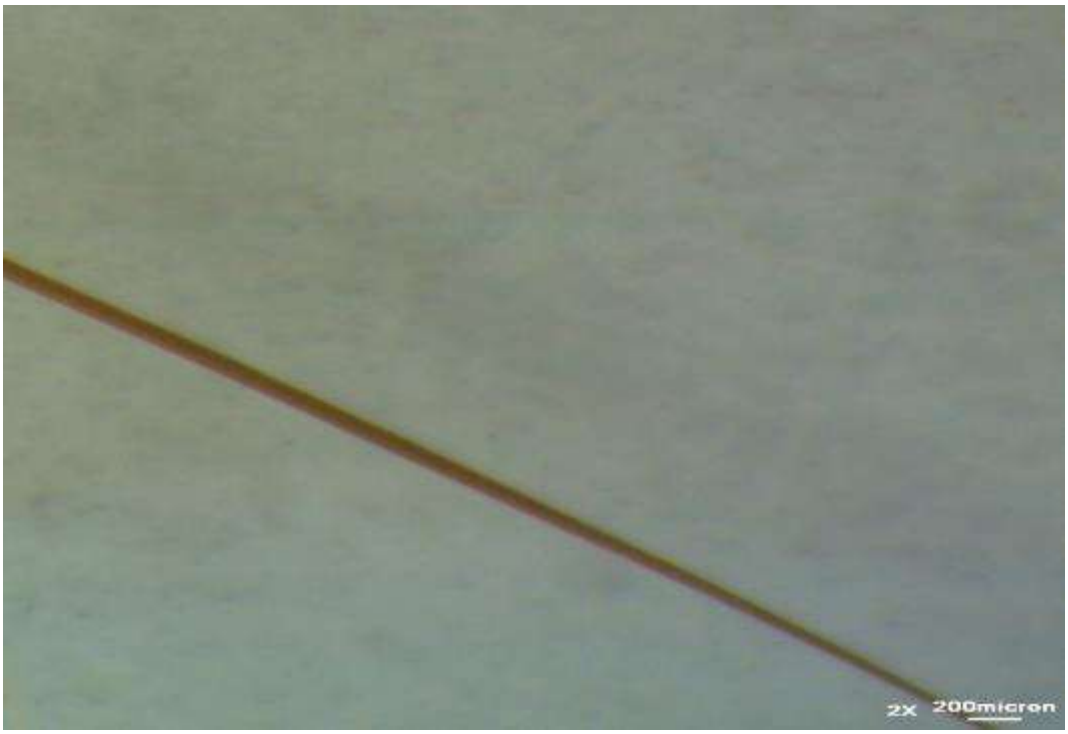


Hair from Suspect 1

Hair from Suspect 2



Hair from Suspect 3

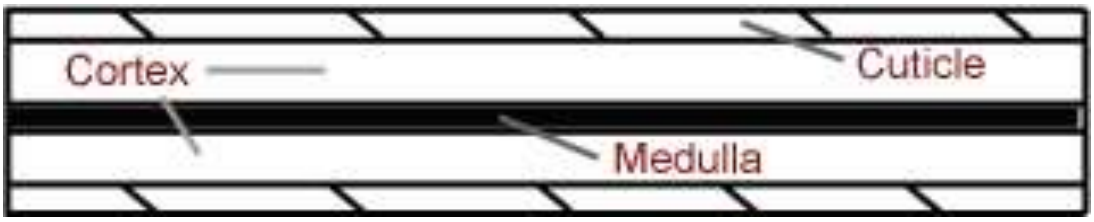


Hair from Suspect 4

Station 2 - Animal Fur

Animal fur is made of the same protein as human hair (keratin). The name fur has more to do with where it is and how it grows than what it is made up of. Fur grows all over the animal's body and usually only grows to a fixed length. Fur also contains a top coat and a softer undercoat.

The animal fur shaft is made up of the same three layers as human hair; the cuticle, the medulla and the cortex. In animal fur, the medulla can be thicker and have a more constant width.



http://summerwinds.com/downloads/howtodocs/ANATOMY-OF-HAIR.pdf

Animal fur is evidence that is commonly found on suspects. It can help investigators determine if a suspect was in contact with animals at a crime scene. It is used with other evidence collected at the crime scene to help prove the investigators case.

Animal fur samples were removed from the suspects clothing. If the suspect has come in contact with Maya, then they should have Maya's fur on them. A piece of Maya's fur was removed from one of her brushes. Compare Maya's sample to the samples that were removed from the suspects.


Maya's Fur


Samples from Suspect 1

Sample from Suspect 2

Samples from Suspect 3



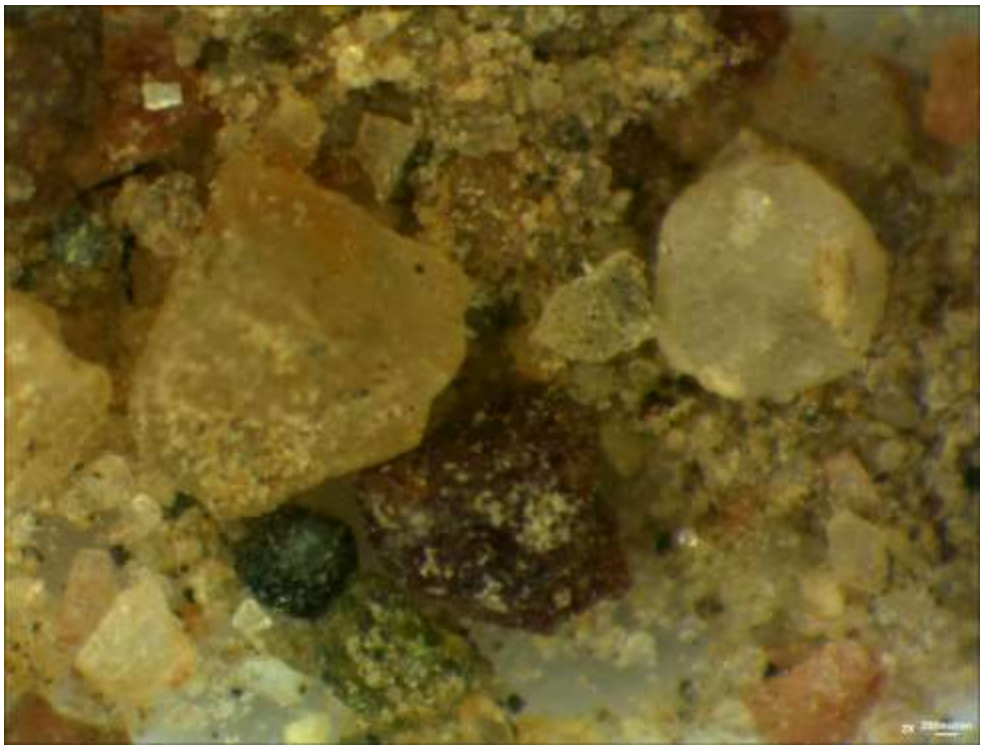

Samples from Suspect 4

Station 3 - Soil Samples

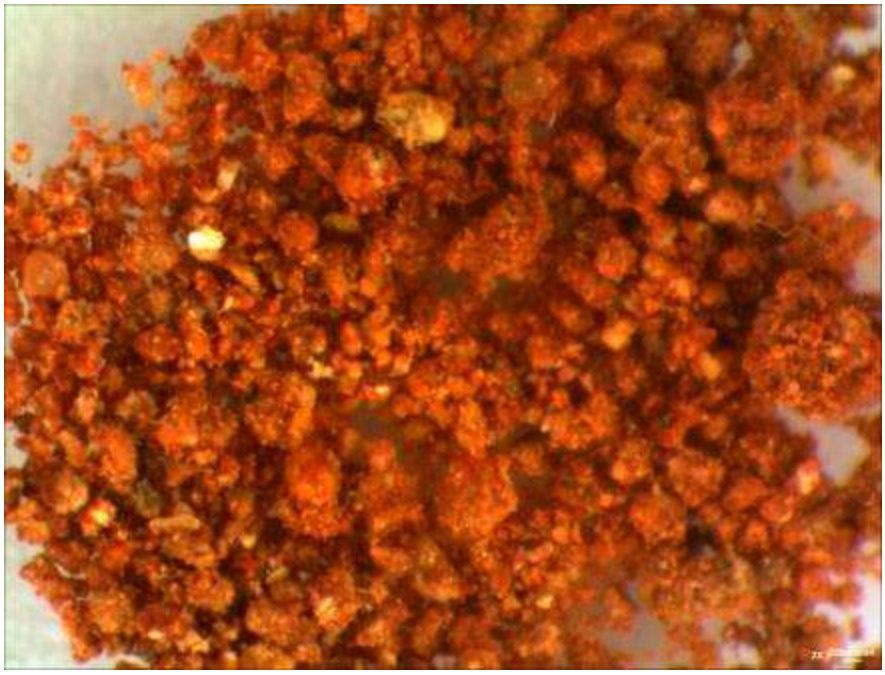
Soil is a mixture of many different things. It can contain minerals, animal material, plant material, and other particles like glass, plastics and metal. Soil is not a uniform material. It's make up can change in a few feet or even inches.

When investigators look at soil samples they look at the color, the shape of particles and the make-up of the soil. Soil samples can be taken from shoes, clothing, tires, carpet, floor mats and many other places. Soil samples are used with other evidence to build a case against a suspect. Soil samples can put a suspect in the area of a crime, but cannot tell investigators the exact time the suspect was there.

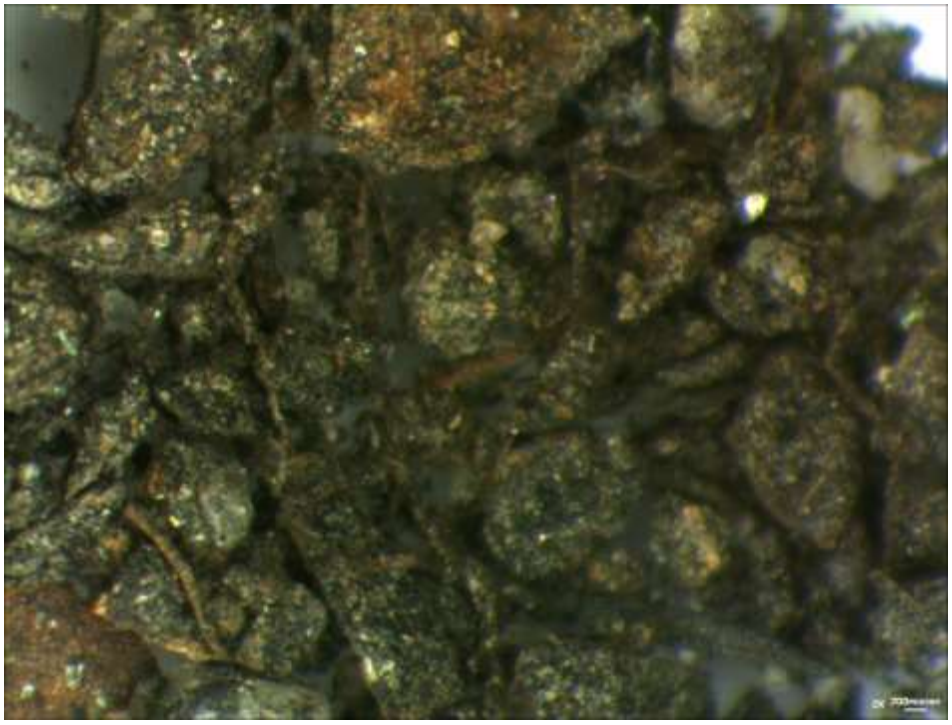
Footprints from a running shoe were found in Sasha's driveway. They did not match any of Sash's shoes. Running shoes were collected from the suspects and soil samples were removed. Match the soil from these shoes to a sample from Sasha's driveway.



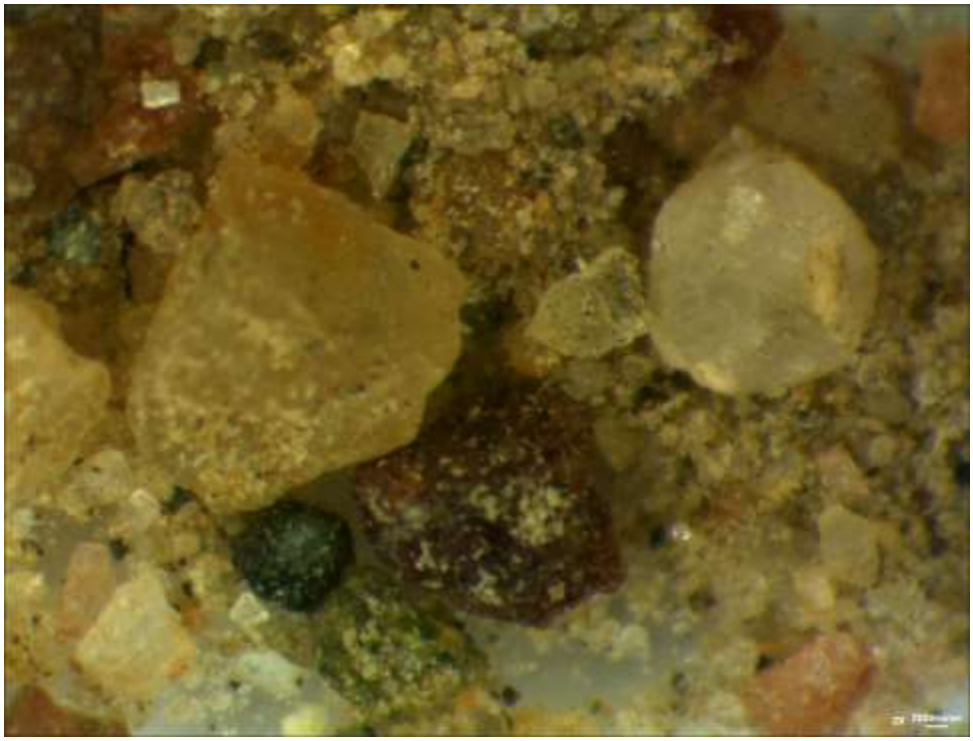
Sample of Sasha's driveway



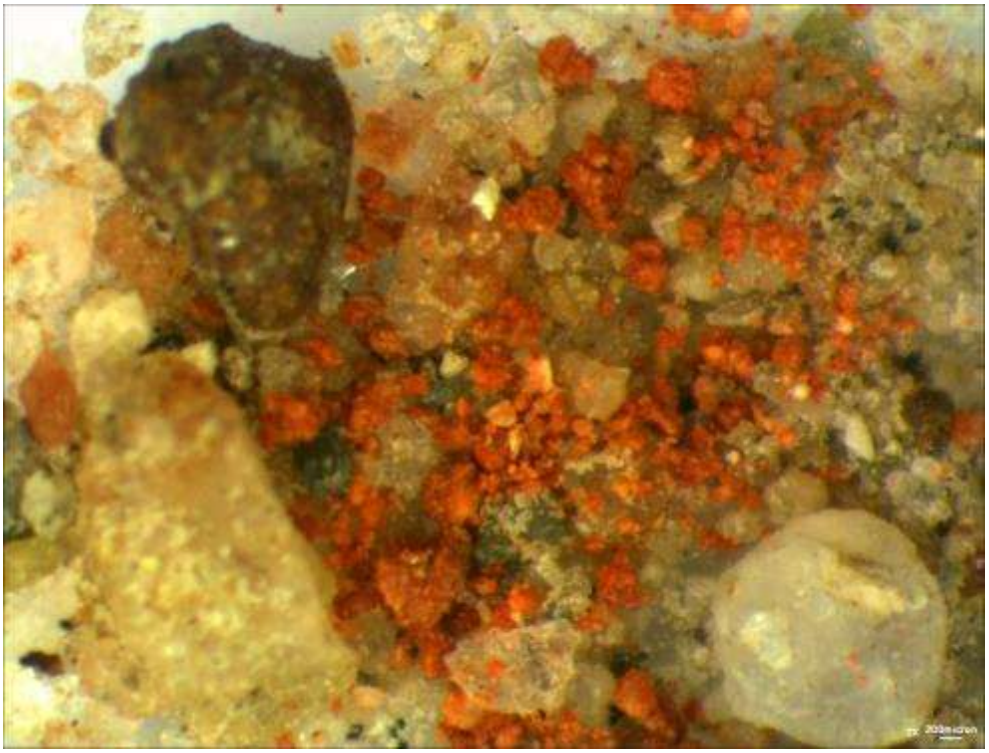
Soil from Suspect 1’s Shoes



Soil from Suspect 2’s Shoes



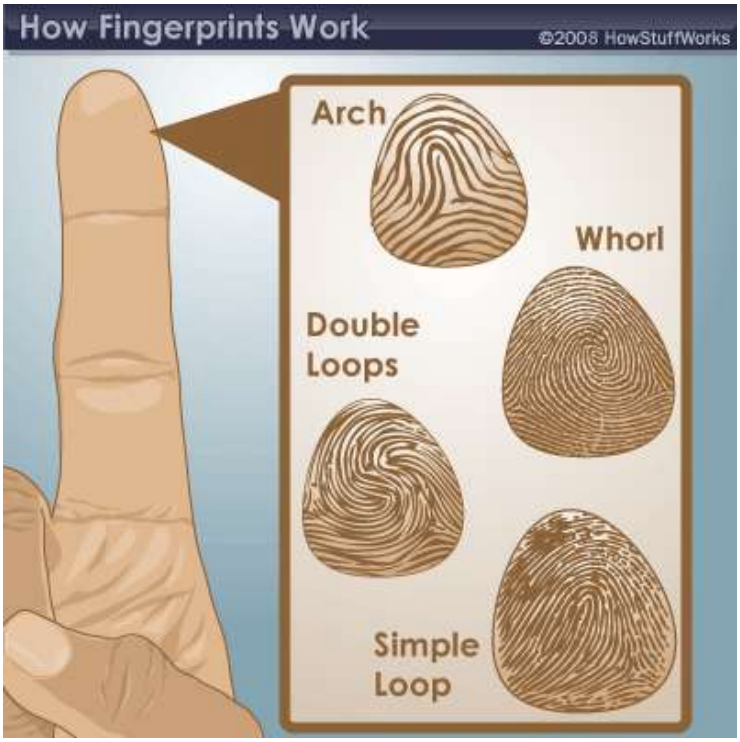
Soil from Suspect 3’s Shoes



Soil from Suspect 4’s Shoes

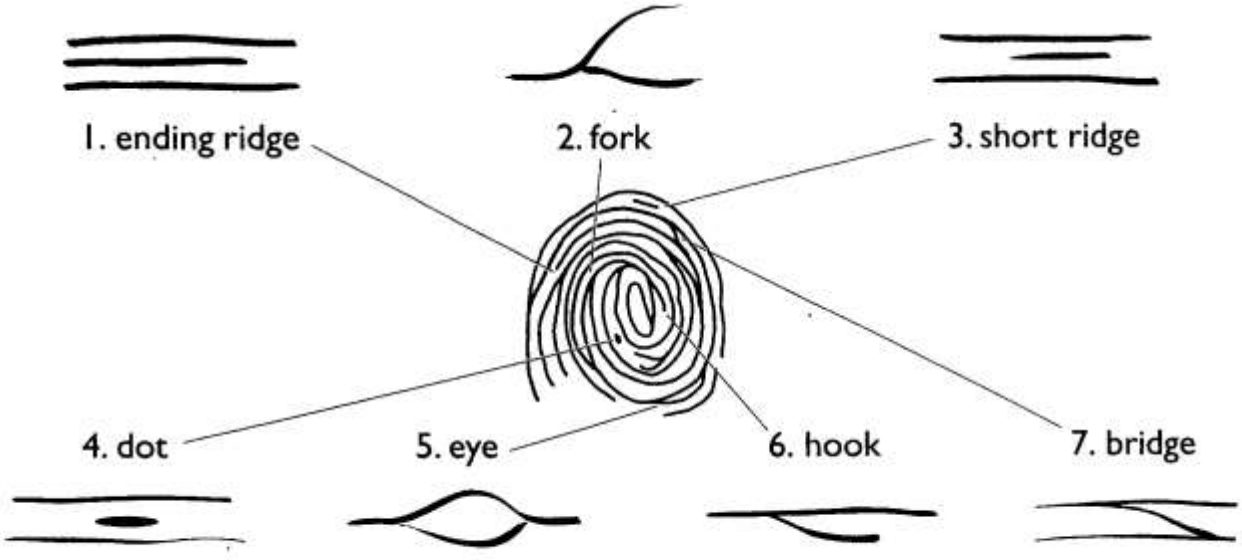
Station 4 - Fingerprints

Fingerprints are the tiny ridges and pattern on the end of our fingers. They are formed by pressure when are fingers are developing in the womb. No two people have the same fingerprints. They are absolutely unique. Fingerprints are even more distinctive than DNA, (the genetic material in each of our cells). Although identical twins share the same DNA, they do not have the same fingerprints.



http://science.howstuffworks.com/fingerprinting1.htm

Arches, whorls and loops are the large patterns in fingerprints (above). There are also smaller features in fingerprints like ridges, forks, dots, eyes, hooks and bridges (below).



Microscopic Explorations, LHS-GEMS, UC Berkeley 1998

Fingerprints help investigators solve crimes. They can prove a suspect was at the crime scene. But they cannot tell the investigators when the suspect was there.

A fingerprint was left on the gate handle on the fence in Sasha's yard. This fingerprint does not match Sacha's. Compare the fingerprints of the suspects with the one found at the crime scene.

Crime Scene Fingerprint

Suspect 1

Suspect 2

Suspect 3

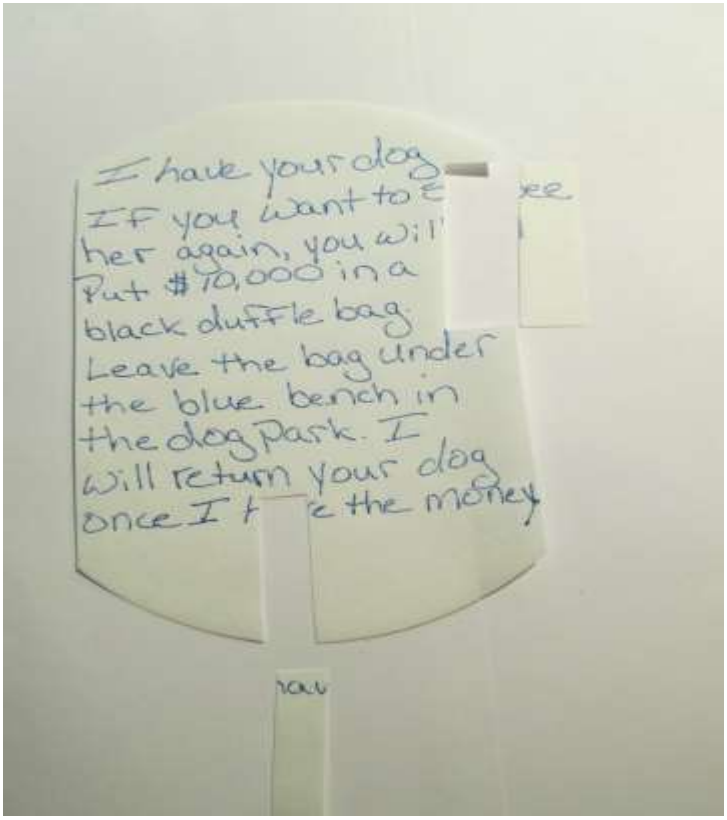
Suspect 4

Station 5 - Ink Test

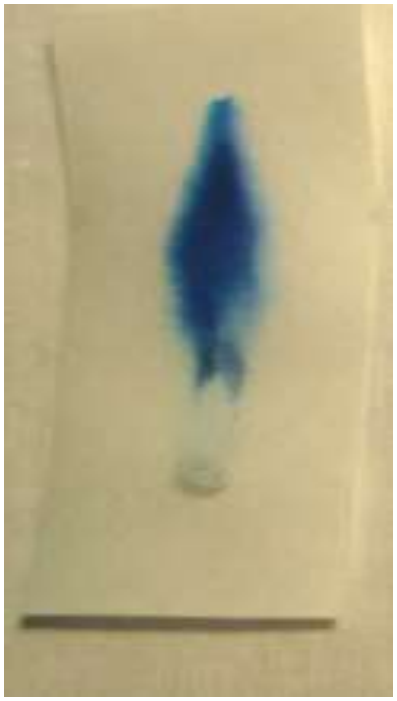
Inks that are found in pens are made up of different things called pigments and dyes. The ink in a blue pen made from two different manufactures can be composed of different pigments or dyes even though they look like the same color.

We can use a test called Chromatography to test what the ink is made up of. This test uses paper and a solution to separate the different parts of the ink.

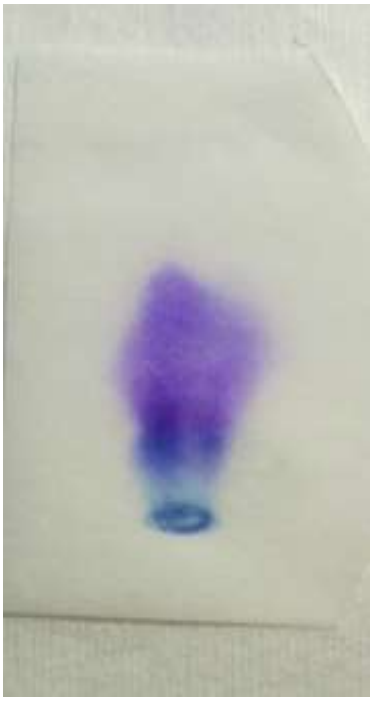
Pens have been collected from the suspects. A small part of the ransom note was cut off. The ink from the pens will be compared to the ransom note. See which one matches.



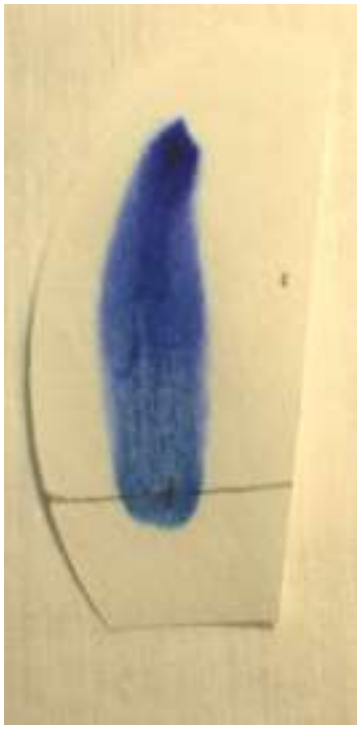
Pen from Suspect 1



Pen from Suspect 2

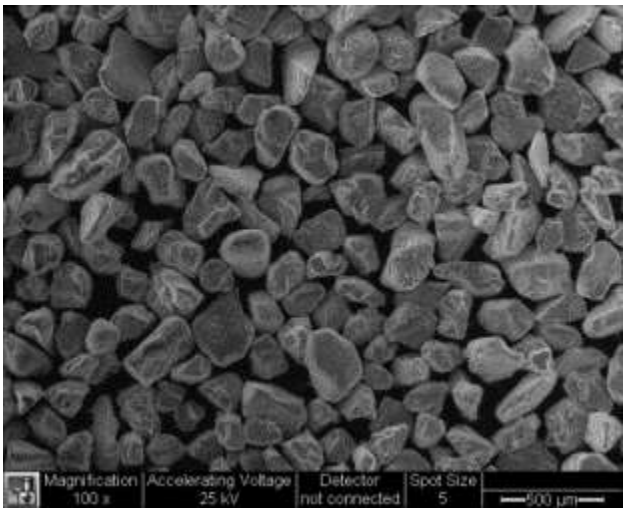


Pen from Suspect 3

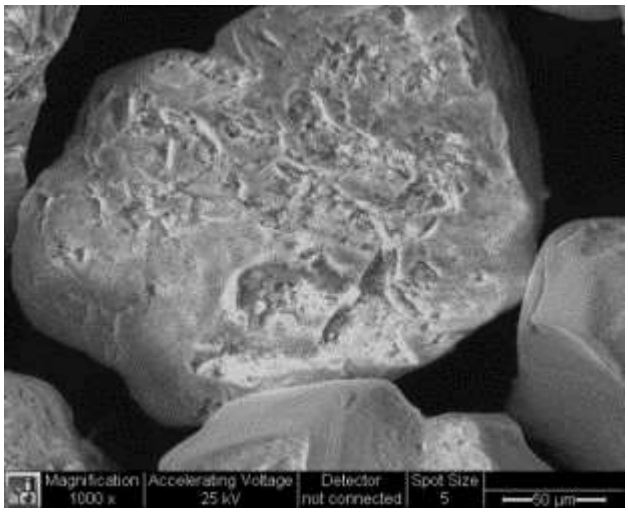


Pen from Suspect 4

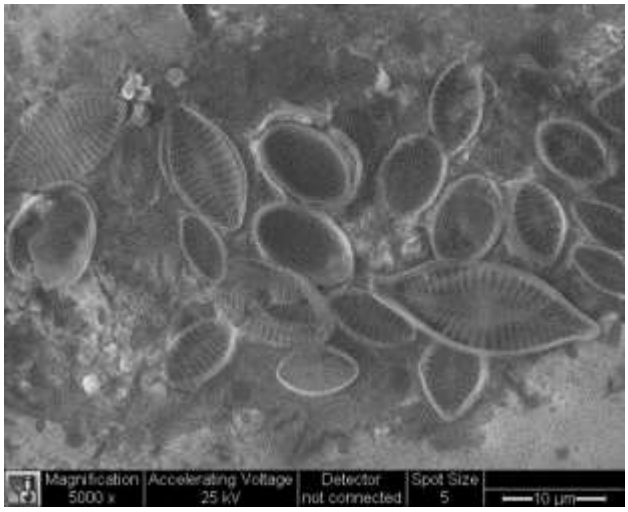
SEM Images



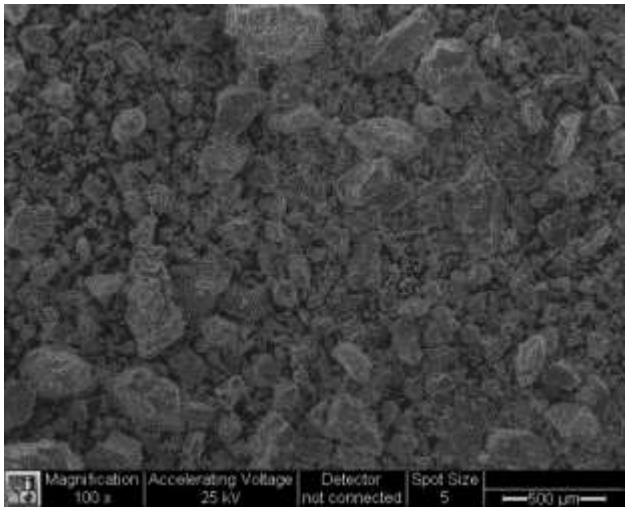
Beach Sand



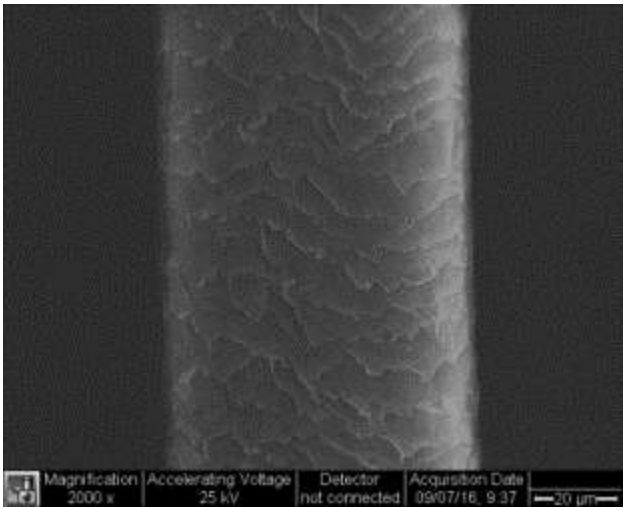
Close up of Sand



Diatoms on sand



Dirt Driveway



Human Hair