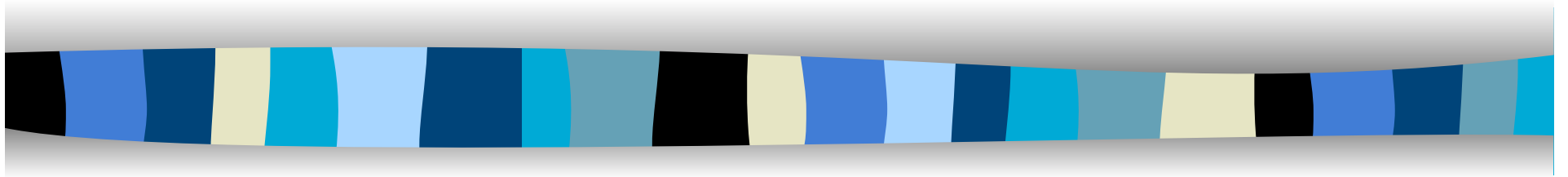


Crime Busters



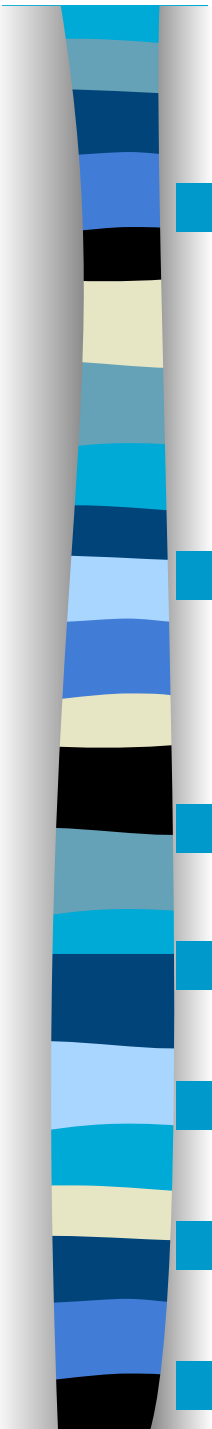
Lin Wozniowski
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Safety

- Students must wear:
 - Closed shoes
 - All skin from neck to toes covered
 - Lab coat or lab apron
 - Indirect vent or unvented chemical splash proof goggles.
 - All skin from neck to wrists covered
 - Long hair (shoulder length or longer) must be tied back.
 - Visorgogs now permitted

Students can bring

- 
- Spot plate, test tubes, rack, beakers/something to do reactions in
 - Spoon/something to get powders out
 - Forceps
 - pH paper
 - Magnet
 - Hand lens
 - Pipettes or eye droppers



Students Can Bring

- Something to stir the reagents
- Slide & cover slip
- Pencil
- Paper towels
- 5 pages of notes (both sides) from any source
- A test tube brush
- A writing instrument
- Nothing else is allowed



Supervisors will provide

- Unknowns
- Iodine Solution
- 1 M HCl
- Differential Density materials
- Chromatography Materials
- Wash bottle with Distilled or ROI water
- Candle and matches
- Waste Container



Supervisors may Provide

- Microscope
- Other reagents



Main Focus

- ❖ Chemical Analysis
- ❖ Polymers
- ❖ Chromatography
- ❖ Crime Scene Physical Evidence
- ❖ How to prepare students
- ❖ Resources



How To Prepare Students

- Have students develop a dichotomous key for identifying chemicals
- Practice identifying chemicals in as short a time as possible.
- Practice identifying powders mixed in groups of 2 & 3
- Practice identifying plastics
- Practice identifying hairs (only human, dog, cat possible)
- Practice identifying fibers (only animal, vegetable, & synthetic possible)



How to Prepare Students

- Practice doing pen chromatograms
- Practice doing juice chromatograms
- Practice identifying fingerprints
- Practice matching DNA chromatograms/
electropherograms
- Try a liquid Practice matching shoes &
tires to their tracks
- spatter activity
- Practice using a waste container



Resources

- The National SO Website www.soinc.org
- To prepare students
 - <http://mypage.iu.edu/~lwoz/socrime/index.htm>
- For Event Supervisors
 - <http://mypage.iu.edu/~lwoz/socrime/index.htm>
- For Lesson Plans to use in the classroom
 - <http://mypage.iu.edu/~lwoz/socrime/index.htm>



Questions?

■ Thank You



Time to Play

- I have a crime for you to solve if you want to get your hands wet so that you will know what you are doing with your students
- I am prepared to show you how to do any of the tests with either knowns or unknowns
- What do you want to do? Some can work & I will help while others may have specific requests of me



Crime

- Let's solve the crime
- Step one – read over crime
- Best to divide and conquer
- One partner starts on chromatography
- One partner starts on Qualitative Analysis
- Partner finishes chromatography & starts polymers
- Should finish in about 30 minutes and have remaining time to analyze.

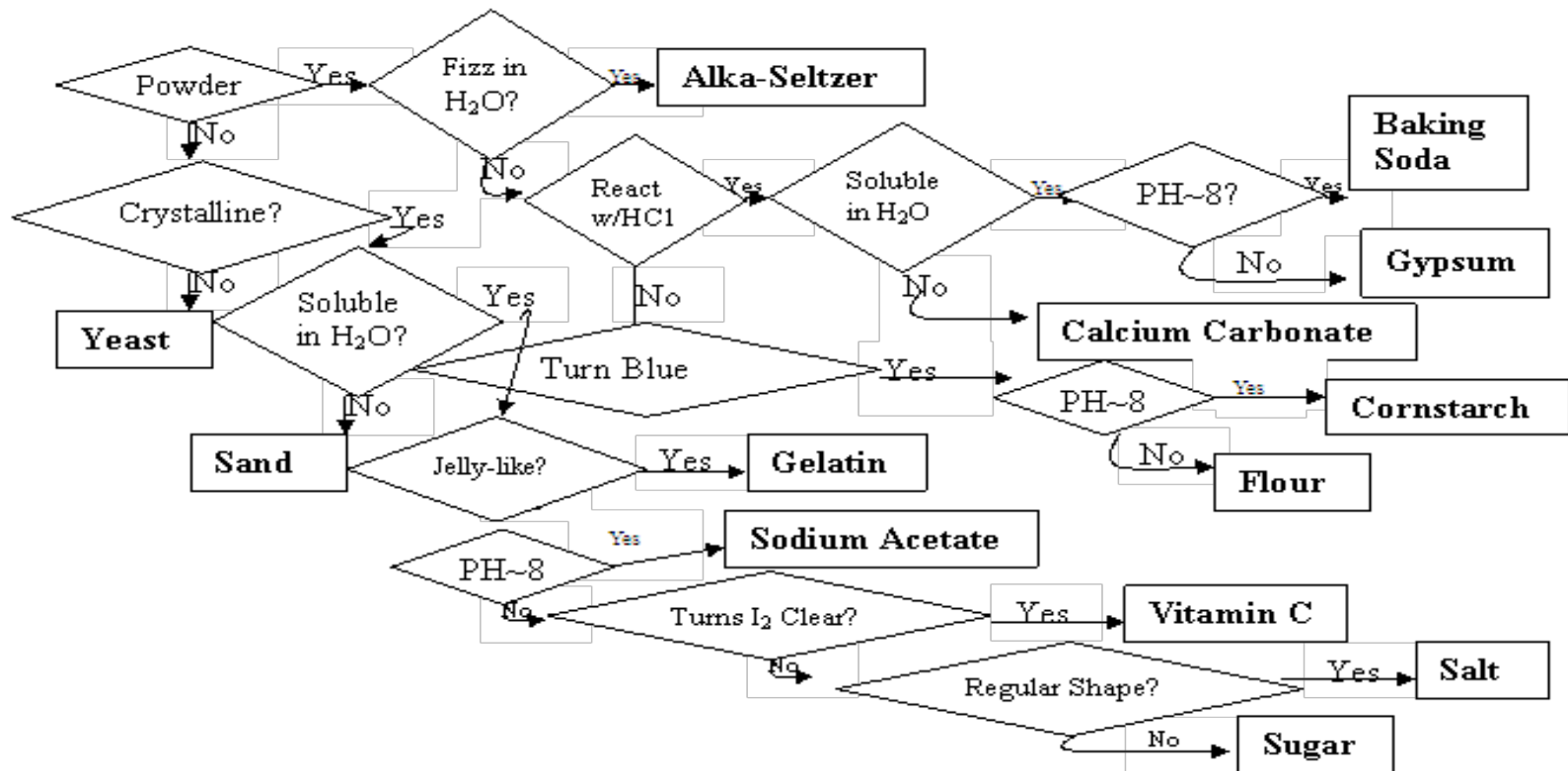


Chromatography

- Used to separate mixtures into components
- Uses stationary (paper) and mobile (water) phases
- Depends on affinity of molecules for the 2 phases for how fast molecule moves
- Strip or Sheet
- Draw a line ~ 2 cm from bottom in pencil
- Spot on line. Use toothpick for liquids.
- Use pencil to label at top above spot.
- Put bottom only of paper in water
- Wait until water moves up ~ 3/4ths of paper.

Powder Analysis

- Need well thought out and practiced dichotomous scheme.



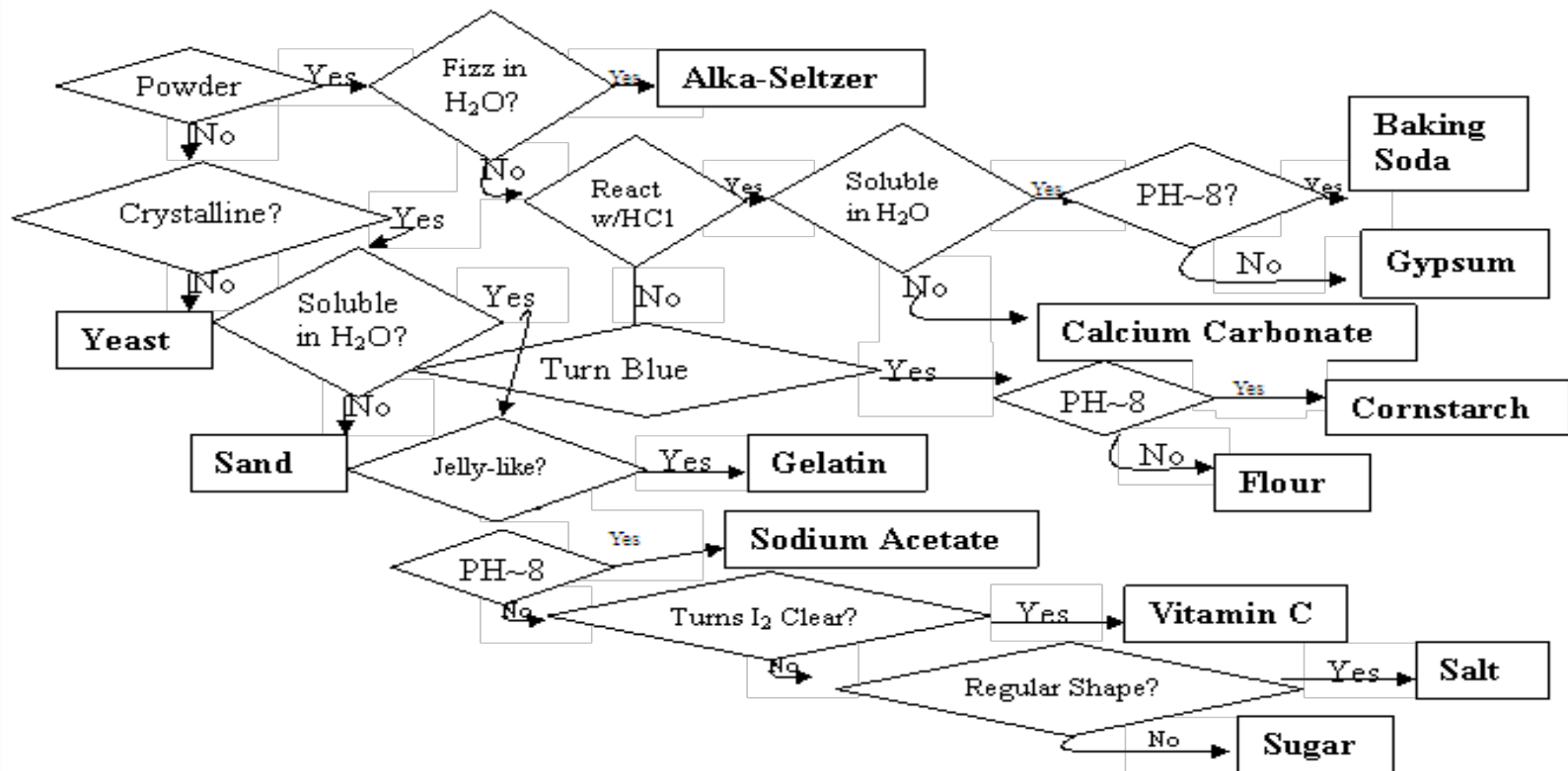
- Let's go through our powder

A vertical test tube containing a mixture of colored powders. The powders are layered in a sequence of colors: black, blue, light blue, yellow, dark blue, light blue, cyan, dark blue, light blue, yellow, black, light blue, cyan, dark blue, light blue, yellow, dark blue, light blue, and black.

Mixed Powder Analysis

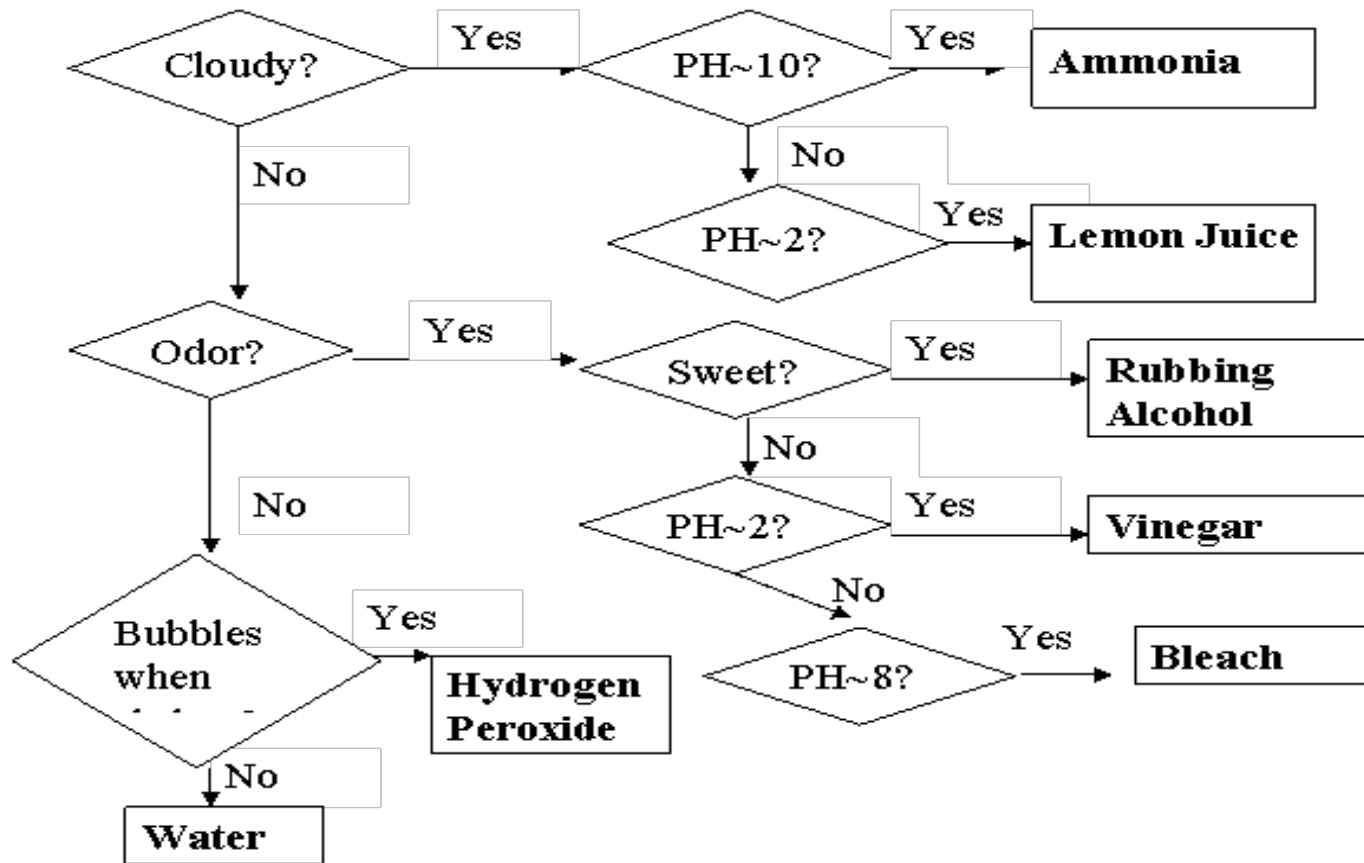
- Can have 2 or 3 of the “*” powders mixed.
- Students have to be told which powders are mixed and how many powders are mixed.
- Lets try our mixed powder and see what is in it using the dichotomous key

Mixed Powder Analysis



Liquid Analysis

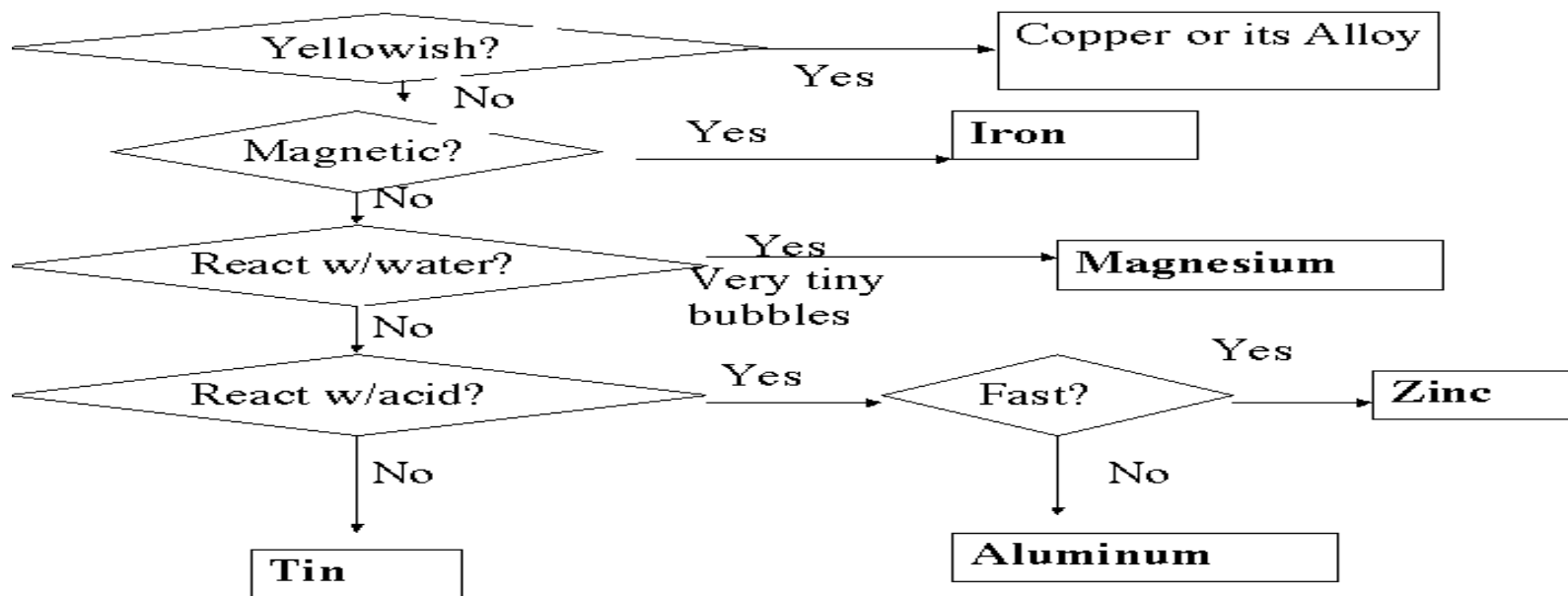
- Also need practiced dichotomous scheme



- Lets see what our liquid is

Metal Analysis

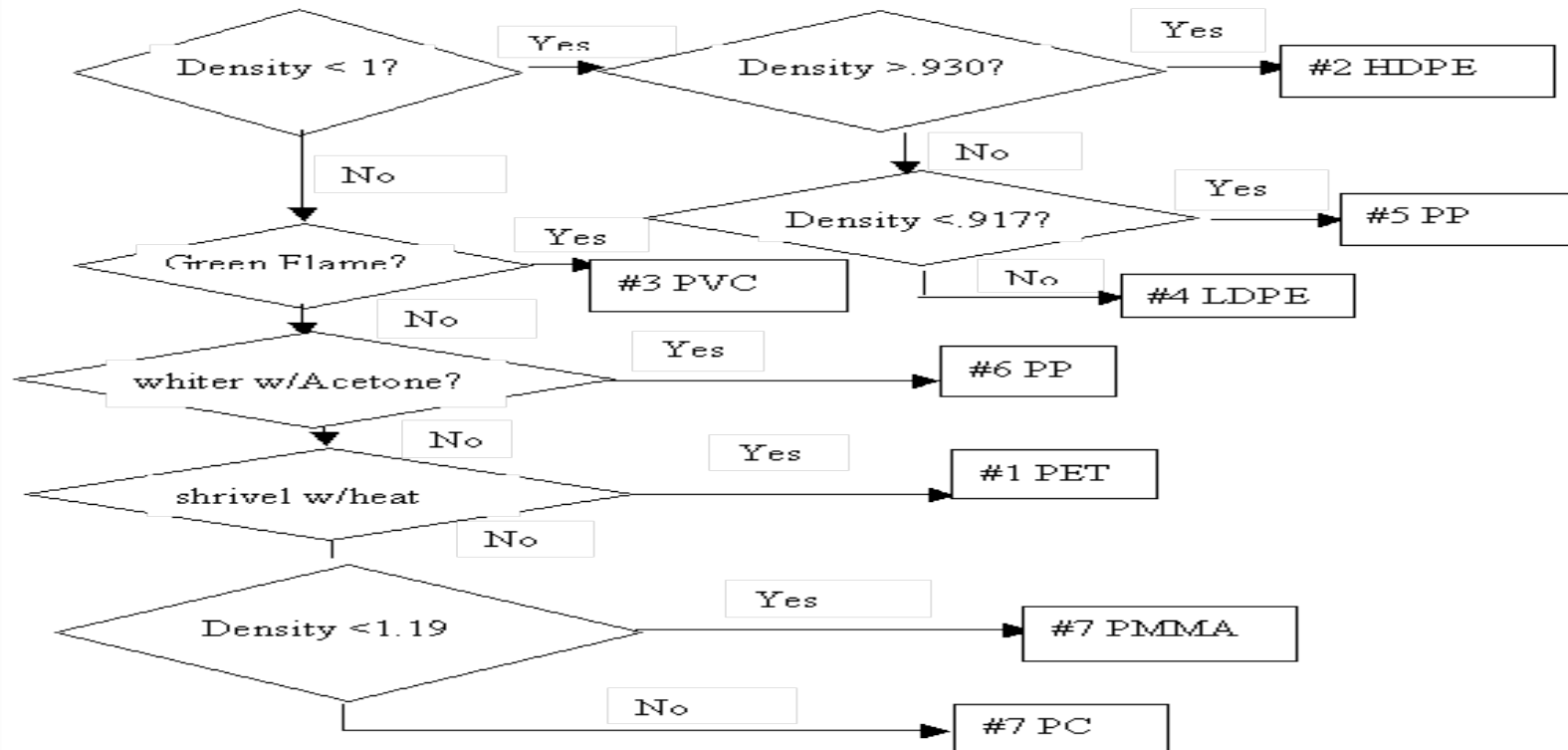
- Again need practiced dichotomous scheme



- Let us see what our metal is

Plastics

- A good dichotomous scheme needed here too.



- So what is our plastic?



Fiber Analysis

- Only need to know the difference between animal, vegetable, and synthetic fibers
- Easiest to identify with burn test
 - Animal shrivel in heat
 - Vegetable burn
 - Synthetic melt.
- So what is our fiber?



Hair Analysis

- Only allowed to use Human, Dog, and Cat
- Best identified by looking at microscope.
- Human hair thickest, no distinct cuticle
- Cat hair thinnest, distinct palm tree or braided cuticle.
- Dog hair in between thickness and in between cuticle.
- What type of hair was found at scene?

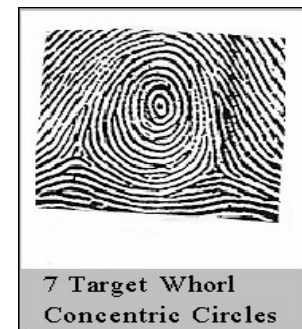
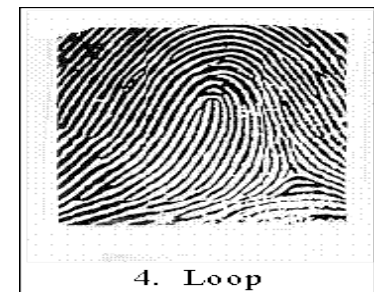
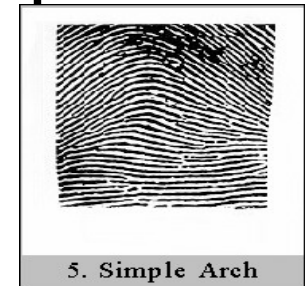


Soil Analysis

- Sand, Silt, Clay, and Loam
- Students allowed to touch soil to analyze
 - Sand-large grains, does not ball in hand
 - Clay-very small grains, forms ribbons in fingers
 - Silt-medium grains, forms ball, but falls apart
 - Loam-lots of organic material, black
- What type of soil was found at scene?

Fingerprints

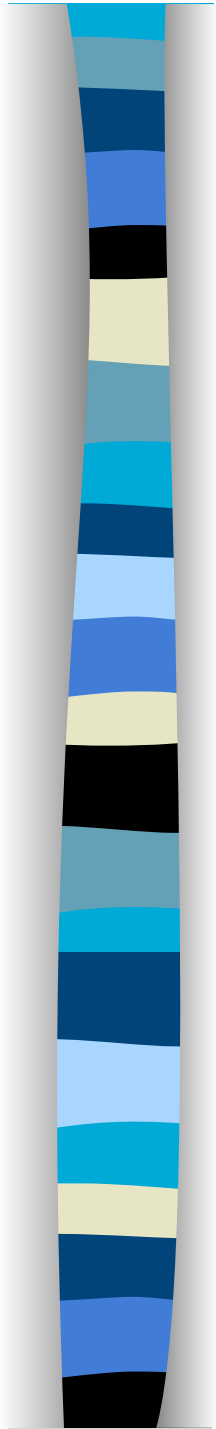
- Only need to know Whorl, Loop, and Arch
 - Arch- hill-no deltas
 - Loop – around the lake -1 delta
 - Whorl-target-2 deltas
- What type of fingerprint?





DNA

- Pretty picture matching
- Easy to make electropherograms
 - Make rectangle with drawing program
 - Use spray tool to spray in different width, density lines at various distances.



Tracks

- More pretty picture matching, but inverses.
- Bike tracks easy to get at a bike rodeo
 - Have cookie sheet filled with sand,
 - Take a picture of tire, run through sand, and take a picture of track.
- For footprints photo bottom of shoe
 - Stomp in cookie sheet of flour
 - Stomp on black construction paper
 - Photograph paper



Spatters

- NOT MEASURING ANGLES
- Should know if strait drop or angle
- Should know if spatter is high or low
- I start with red finger paint, then mix in blue and green until correct shade
- Then I dilute with water slowly until proper consistency.
- Students should put in eye dropper or use paint brush and drop straight down @ 1 cm, 10 cm. 20 cm, etc.



Solve Crime

- Now we will put all of the evidence together to solve the crime.
- It is the preponderance of evidence that is being looked for
- Please remember that the perpetrator may be one of the suspects, more than one suspect, all of the suspects, or none of the suspects.
- The event is won or lost on the basis of the analysis