TRACE EVIDENCE 2

➔Mitochondrial DNA is extracted from hair shaft and transmitted from mother to child. It is found in the cytoplasm. It can't give individualisation

Story of Anastasia

➔Nicholas, his wife, 4 girls and a son captive after the 1917 February revolution, they were held in captivity until the Bolsheviks seized power in the October Revolution

➔Just after midnight on July 17, 1918, the family and four family associates were ordered to dress quickly and go down to the cellar

➔Under the implication that they were to be transported to another location

➔Instead they were shot execution style by a firing squad

➔Those who were still breathing when the smoke cleared were stabbed

First it was said only Nicholas was executed but then it was confirmed that entire family had been murdered. Rumor started that Anastasia, a Romanov child was alive, who had survived the carnage.

• In 1920, an apparently suicidal young woman was pulled from the Landwehr Canal in Berlin

• She refused to tell authorities her identity and was committed to the Dalldorf Asylum, where she lived in anonymity until 1922

• In 1922, she announced that she was the Grand Duchess Anastasi

➔Supporters rallied for recognition of her birth right

➔Critics, including Anastasia's uncle didn't believe Anna's claim and hired a private investigator who contended that Anna Anderson was in fact a Polish-German factory worker, Franziska Schanzkowska, from Pomerania (part of Poland) who disappeared in 1920

➔Schanzkowska had a history of mental instability and was injured in a factory explosion in 1916, which accounted for the scars. These findings were published in German newspapers but evidence was not definitive

The woman who became known as Anna Anderson continued her fight for recognition, losing several court cases as the decades passed

In 1968, Anna Anderson married an American history professor, J.E. Manahan, and moved to the United State

In 1970, she lost her last major suit, and the remaining portion of the Romanov fortune was awarded to the Duchess of Mecklenberg

• Anna Anderson Manahan died in 1984

• In 1991, Russian authorities found the presumed burial site of the Romanovs' and exhumed the human remains

➔The Russians sent samples to the U.S. and Britain for DNA analysis. It was determined that the remains consisted of five females and four males

➔Samples from other relatives were also assessed and it was determined that the remains where that of a father and mother and three daughters. The four other remains were unrelated

➔The son Alexei and one daughter were missing

➔To prove the identity of Alexandra and her children, the scientists took blood from Prince Philip, the consort of Queen Elizabeth II and the grand nephew of Alexandra

➔Because they all share a common maternal ancestor, they would all share mitochondria DNA (mtDNA)
➔The comparison between the mtDNA in Philip's blood and in the remains was positive, supporting the conclusion that the bodies were those of the Romanov

➔To prove the Czar's identity, who would not share this mtDNA, the remains of Grand Duke George, the brother of Nicholas, were exhumed allowing confirmation through a separate mtDNA lineage

➔ A Romanov daughter was missing from the burial site

➔ Could Anastasia have escaped and resurfaced as Anna Anderson?

In 1994, American and English scientists used a tissue sample of Anderson's recovered from a Virginia hospital and compared her mtDNA with that of the Romanovs

Simultaneously, an American team compared the mtDNA found in a strand of her hair

• Both teams came to the same conclusion: Anna Anderson was not a Romanov

• Later, the scientists compared Anna Anderson's mtDNA with that of Karl Maucher, a great nephew of Franziska Schanzkowska.

• The mtDNA could not be distinguished from the reference, supporting the theory put forth by a German investigator in the 1920s that Anna Anderson = Franziska Schanzkowska. ……

• A new grave not far from the first Romanoov grave, was found 2007 and two additional bodies who were Romanov's – Coble et al 2009 PLOS one 4(3):e4838 – using mtDNA, autosomal STR and Y-STR testing

• STR = Short tandem repeat

Mitochondrial DNA comes from mom and Y-chromosome, from dad.

Trace evidence on PAINT, GLASS, SOIL

Paint :

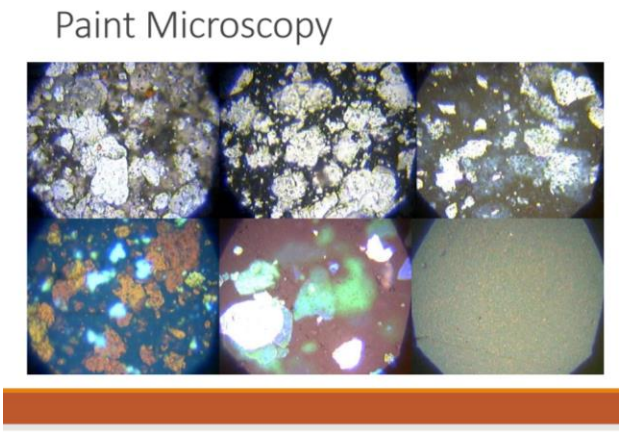
➔automobile paint is the most talked about in forensics. The paint dried on a hard film consists of pigments and additives suspended in the binder.

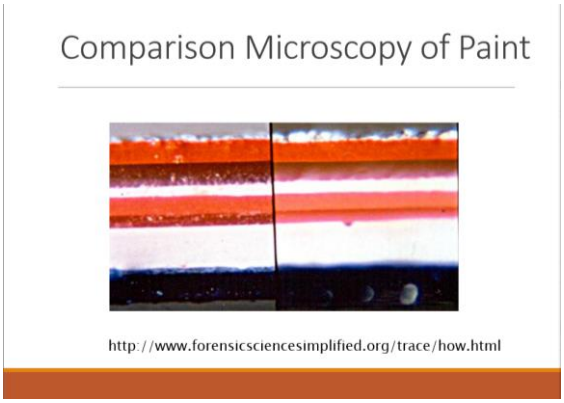
➔The coatings of paint from automobiles may include electrocoat primer, primer surfacer, basecoat, and clearcoat.

Methods of paint comparisons

➔Chemical analysis : pyrolysis gas chromatography (GC), infrared spectrophotometry : valuable technique for distinguishing most paint binder formulations, adding further significance to a forencsic paint comparison.

➔Questioned and known specimens are best compared side by side under a stereoscopic microscope for color, surface texture, and color layer sequence.





➔While examining paints, we do “Morphological comparisons” : piecing together the unknown paint chip with a reference.

➔When doing paint comparisons, solid paint may be heated and pyrolyzed to high temperatures so that they decompose into numerous gaseous products to flow throw the GC column.

➔Crime laboratories are often asked to identify the make and model of a car from a small amount of paint and will make use of color charts for automobile finishes or the PDQ database.

➔if two cars collide, the area where the two cars hot is the crime scene as there is a possibility of finding reference paint in that area.

Collection and preservation of paint :

➔paint chips are likely to be found on or near person or objects involved in hit-and-run incidents.
➔Paper druggist folds and glass or plastic vials make excellent containers for paint
➔Paint smeared or embedded in garments or objects require the whole item to be packaged and sent to the laboratory.
➔Uncontaminated standard/reference paint must always be collected.
➔Tools used to enter buildings or safes often contain traces of paint, requiring the tool be collected, along with reference paint samples.

Glass

Glass is hard, brittle, amorphous substance that is composed of silicon oxides mixed with various metal oxides.
Amorphous solids have their atoms arranged randomly, unlike crystals.
Tempered glass is stronger than normal glass due to rapid heating and cooling.
Laminated glass found in car windshields has a layer of plastic between two pieces of ordinary window glass.

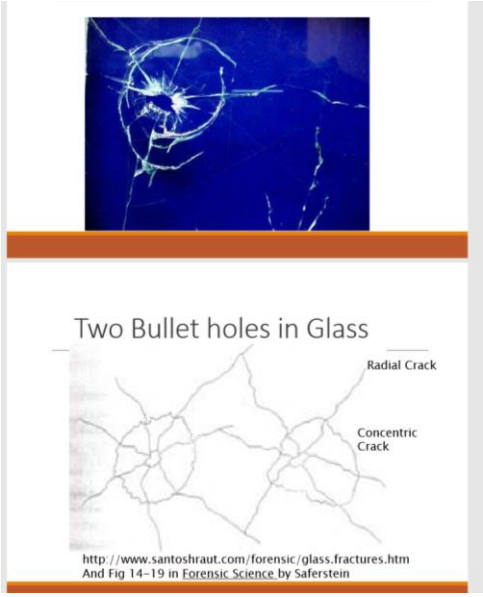
➔glass comparison has problems when there is a need to find and measure those properties that will associate one glass fragment with another while minimising or eliminating other sources.

When analysing glass, we need to find characteristics of glass to identify. **: density and refractive index**

1) Floatation method : rapid method to compare glass densities.
   ➔the glass is immersed in a liquid and density of liquid is adjusted by the addition of small amounts of an appropriate liquid until the glass chip remains suspended in the liquid medium.
   ➔At this point the glass density will be same as to compared to other relevant pieces of glass which will remain suspended, sink or float.
2) Immersion method : best method to find the refractive index of the glass
   ➔involves immersing a glass particle in a liquid medium whose refractive index is varied until it is equal to that of glass particle
   ➔ At this point, known as the match point, the Becke line disappears and minimum contrast between liquid and particle is observed.

➔The Becke line is a bright halo near the border of a particle that is immersed in a liquid of a different refractive index.

3) Glass refractive index measurement (GRIM) : oil changes refractive index with temperature. So we use oil and heat it until the glass disappears and then determine the glass' refractive index using the temperature at which the glass disappeared.
4) Analysing cracks : analyse the radial and concentric fracture to determine the direction of impact



The bullet in the left went through first, since the one where it went through second, that crack would terminate at a crack that happened first 3-R rule : Radial cracks form a Right angle on the Reverse side of the force. : radial fracture, right angles, rear surface

Collection of glass

➔fitting things together gives us a lot of information. Re-assembling is really helpful. Therefore, try collecting as much glass as possible. Lot of glass needs to be collected from the crime scene.
➔the glass fragments should be packaged in solid containers to avoid further damage to them.
➔If found on shoes/clothing, they are to be wrapped individually in paper and transmitted to laboratory.

Soil

Because of gross appearance, it is easy to differentiate soil and their properties.

The value of soil as evidence rests with its prevalence at crime scenes and its transferability between the scene and the criminal.

Comparing soil : Considering the vast variety of minerals and rocks and the possible presence of artificial debris in soil, the forensic geologist is presented with many points of comparison between two or more specimens

➔the mineral content is also used to differentiate and identify soil

There are microbes in soil which found then we can isolate DNA from it. Then we can get a microbial fingerprint : this is called as Metagenomics

Collection of soil :

➔Standard /reference soils are to be collected at various intervals within a 100-yard radius of the crime scene, as well as the site of the crime, for comparison to the questioned soil.

➔Soil found on the suspect, such as adhering to a shoe or garments, must not be removed.
➔Instead, each object should be individually wrapped in paper, and transmitted to the laboratory