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OREGON STATE POLICE

Forensic Services Division Newsletter

TRACE EVIDENCE EDITION

HIT & RUN INVESTIGATIONS? TRACE PAINT EVIDENCE CAN HELP.

What type of evidence can help solve a hit-and-run fatality? When a vehicle makes an impact with a pedestrian, bicyclist, another vehicle, or any another object, trace evidence is transferred between them. Since vehicles are painted surfaces, the transfer of paint is very common, especially in a high-speed impact.

Paint can be an important investigative tool in hit-and-run cases. If loose paint chips are found at a scene, or smears of paint are transferred to another vehicle, clothing, or object, that paint can be used to conduct a Paint Data Query (PDQ) search. A database of automotive paint samples can be searched to narrow down the possible source of that paint to a list of vehicle makes, models, and years. A PDQ search is only possible if the questioned paint contains layers of original factory paint; however, paint that is part of a repair can still be extremely useful once a suspect vehicle is located.

When a painted object hits another painted object, paint may transfer in both directions. Two-way transfer is very powerful evidence that the two objects came into contact with each other. When vehicles are involved in collisions, both glass and paint are often damaged and transferred. If both the glass and paint evidence can link a vehicle to a crime, the strength of the association is further increased. Fibers from clothing can also be transferred from people to vehicles, sometimes melted into the painted or plastic surface. The physical links that can be made by the analysis of Trace Evidence can help build your case.



Paint chip showing green paint transfer on a white vehicle



PDQ SEARCHES EXPLAINED:

A PDQ search is the analysis of a vehicle paint sample so that each paint layer can be searched through the PDQ database. This generates a list of the make, model, and years of vehicles that have that type of paint. There are almost 20,000 samples in the database, making this a useful investigative tool when the suspect vehicle is unknown.

The PDQ database is maintained by the Royal Canadian Mounted Police. OSP paint examiners must submit 60 database samples each year to use this tool.



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Q: WHAT IS TRACE EVIDENCE AND HOW DO I COLLECT IT?

A: Trace Evidence is evidence that is passed from one person, object or place to another through physical contact. The analysis of Trace Evidence is based on the Locard Exchange Principle: ***Every contact leaves a trace.***

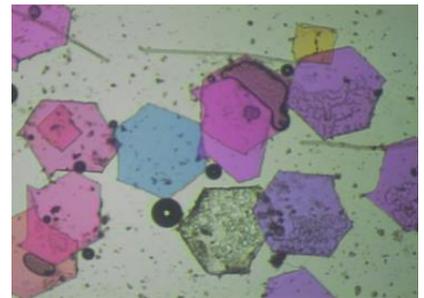
OSP can provide expert analysis and testimony in the fields of Paint, Glass, Fibers, Hair, Explosives, Arson, Footwear and Tire Impressions, and Miscellaneous other materials (including cosmetics, adhesives, poisons, lubricants and more). Analysis of these types of evidence can help answer questions about whether a suspect and victim were in contact with one another, whether someone was at the scene where glass was broken, whether a tool could have been used to pry open a painted door, and many others. Although trace evidence analysis usually can't conclusively link two items to the exclusion of all others, it can establish strong links between people, scenes and events. The more types of trace evidence that are linked, the less likely it is that its presence is merely coincidental.

Trace Evidence analysis is typically based on the comparison of a known sample with a questioned sample. For example, if someone shoots through a glass window to gain entry to a building, they may have glass embedded in the soles of their shoes, as well as tiny glass fragments on their clothing and hair. The shoes, clothing, and hair-combings can be screened for the presence of broken glass. But a glass standard from the broken window is critical. A glass standard allows OSP Glass Examiners to conduct tests using extremely sensitive instruments to compare glass found on the suspect with glass from the broken window.

When collecting paint, glass and fiber evidence, always use clean tools to collect each sample and package each separately to prevent loss or cross-contamination. Avoid using tape or strong adhesives that may stick to the evidence. Post-it-type notes or paperfolds are preferred. A police report that describes the source of each evidence item is required with submission. **For further guidelines and help, refer to the online OSP Physical Evidence Manual:** [https://www.oregon.gov/osp/FORENSICS/docs/Physical%20Evidence%20Manual%20\(3940_2\).pdf](https://www.oregon.gov/osp/FORENSICS/docs/Physical%20Evidence%20Manual%20(3940_2).pdf)



Tempered glass is found in vehicle and building windows. Fragments can transfer to shoes and clothing, and then to vehicle interiors.



Some cosmetics contain glitter, which can be transferred from person to person.



Duct tape analysis involves testing of the adhesive, the polymer backing, and the woven fibers.



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GLASS AND PAINT AT A HOMICIDE SCENE

In 2015, OSP personnel were called to assist at a homicide scene in a parking lot. The victim, killed in his vehicle by a bullet, had used a shotgun to return fire toward the suspect vehicle. The suspect vehicle was unknown and had left the scene. It appeared that windows from both the victim and suspect vehicles had been broken by gunfire. Since there was no known physical contact between victim and suspect, neither DNA nor latent print work held much promise.

Trace evidence observed and collected at the scene included:

- Broken glass believed to have fallen from the suspect vehicle as it drove away
- Small red paint chips that (mixed with the glass above)
- A plastic shotgun wad with tiny chips of red paint, believed to have come from the victim's gun and to have made contact with the suspect vehicle



Glass collected from the scene and later from the suspect vehicle

Investigation led to the development of a suspect vehicle. There was still broken glass inside the vehicle; it was collected and compared to the glass from the crime scene. In all measured characteristics (color, manufacture type, thickness, elemental composition, and refractive index), these glass samples were the same.

Paint standards were also taken from the suspect vehicle. These were compared to the loose paint chips and the paint on the shotgun wad. The paint standard from the suspect vehicle had three layers and was typical of original factory paint: a clear coat, dark red metallic topcoat, and a grey primer. These layers were also seen in the paint chips from the scene. When analyzed and compared, the corresponding layers of these two samples were also consistent with one another in chemical and elemental composition.

Although the tiny chips of paint seen on the shotgun wad also showed clear, dark red metallic, and grey layers, these paints were chemically different from the others. They are indicative of repaired or aftermarket paint. To determine whether repaired paint of that type was present on the suspect vehicle, more comparison standards would be needed from other areas of the vehicle.

The association of both paint evidence and glass evidence between the homicide scene and the suspect vehicle provided strong support for the theory that the suspect vehicle was at the scene and sustained damage there. If further work could have shown the shotgun wad made contact with that vehicle, it could have placed it there at the time of the shooting.



Paint standard from the suspect vehicle



Paint chip found at the scene



Tiny paint chips adhering to shotgun wad



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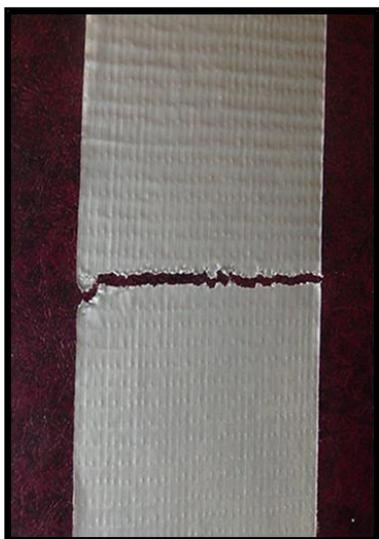
PHYSICAL MATCH: AS GOOD AS IT GETS

When the unique edge contours between two items of evidence line up and fit together, a physical match is made. Sometimes this is called a puzzle fit. In the lab, Trace Examiners look at the broken edge features under the microscope and with specialized lighting to ensure it is an exact fit, and photographs are taken to demonstrate that the pieces line up. **A physical match is one of the strongest links that can be made to prove that two pieces were once part of the same item.**

Awareness and collection of broken items at the scene is crucial—you never know what you'll find later that may make a perfect match! Some examples we have seen in the lab are: paint chips left at a crash scene that fit exactly into the damage on the later-recovered suspect vehicle, cut power cables from stolen construction equipment, broken beer bottles, and torn pages from a spiral-bound notebook. But the most common objects submitted for physical match analysis are vehicle parts. Headlights, taillights, and side mirrors are frequently broken in vehicle collisions, whether that impact is with another vehicle, a person, bicyclist, or a stationary object. By collecting the pieces that are left at the scene, they can be used to attempt a physical match when the suspect vehicle is identified.



Parts of this housing were found at the scene (marked "4") while the others were taken from the suspect vehicle (marked "3"). They fit together to make multiple physical matches.



Tapes are good candidates for physical match and other analysis.

In addition, some broken vehicle parts have imprinted manufacturer's codes that can help narrow down the type of vehicle they came from. Parts such as bumper fragments and side mirror housings have painted surfaces that can be searched via PDQ (see page 1). Once a suspect vehicle is developed, paint analysis and comparisons can be performed even if no physical match is found.

Even if an exact physical match cannot be made, we may be able to provide information about whether two (or more) items share class characteristics such as manufactured features, elemental composition, and/or chemical composition. With items that are produced in rolls (such as tapes, paper towels and plastic bags) we may be able to support or disprove whether a given roll was the source of a particular portion torn or cut from that roll.

Advanced Trace analysis is performed at the OSP Portland Metro and Springfield Forensic Laboratories. If you have questions about collection of trace evidence or the types of testing we can perform, contact Kris Gates or Celeste Grover at 971-673-8230.

Online info about the collection and submission of forensic evidence of all types is available in the OSP [Physical Evidence Manual](http://www.oregon.gov/osp/FORENSICS) via <http://www.oregon.gov/osp/FORENSICS>