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Charles A. Davis

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NOTES ON PHYSICAL EVIDENCE IN PEDESTRIAN HIT AND RUN ACCIDENTS

CHARLES A. DAVIS

The author holds the rank of Lieutenant in the Indiana State Police and is Director of their police laboratory. His field of specialty in the laboratory has been chemistry. Lt. Davis has contributed to this Journal on several occasions and has recently been appointed chairman of Indiana's newly organized Commission on Forensic Sciences.—EDITOR.

The pressure of public opinion generated by a hit and run accident causes an urgency on the part of the investigators which may result in the loss of vital physical evidence. This is true in cases involving fatal accidents as well as personal injury. The investigation starts with the body of the victim. If the victim is still alive, a little planning will prevent the loss of trace evidence that may be present on the body of the victim or on the victim's clothing. The trace evidence usually consists of paint chips and/or paint smears, metal fragments, glass fragments, and an assortment of miscellaneous traces.

The first loss of evidence is most often sustained when the body is first moved. The method of preservation of evidence is exactly the same for an injured victim as it is for a dead victim. Before moving the body a clean sheet should be placed on the cot or stretcher which must be as close to the victim as possible. After placing the body on the sheet, the sheet should be wrapped around the victim. The purpose of the sheet, of course, is to catch any particles that may fall from the victim or his clothing. To prevent the loss of evidence in the receiving room of the hospital or at the mortuary, the attendants must be acquainted with the investigator's problem.

The second loss of evidence is usually sustained when the clothing is removed from the body. When the body is transferred from the stretcher or cot to the examination table, the sheet should be kept wrapped about the body. During removal of the clothing, the sheet should be held out on each side of the body as far as practical; the edges of the sheet must be held high enough so that a pocket is formed, catching the debris from the clothing as it is removed. Never permit clothing to be cut through a hole that already exists. Later, a piece of cloth or a few threads may be located on the suspect's car which could be fitted into the hole if it remains intact. As the clothing is cut or otherwise removed from the body, it should be kept over the

sheet. Any visible dirt on the body should be brushed onto the sheet before the body is moved. After the body has been lifted from the sheet, the four corners can be gathered together and tied; all of the dirt, debris, and the victim's clothing are ready to be taken to the laboratory for examination.

At the laboratory the sheet must be spread out to dry immediately, and the clothing separated for faster drying. Clothing wet with blood or water should never be kept in a package for more than an hour. It should be spread out to dry as soon as possible by the investigator if immediate delivery to the laboratory is impractical, and when dry, again packaged to prevent loss during transportation.

At the laboratory after the debris is removed from the clothing by careful brushing over the sheet, there is usually a sizeable pile of sand, earth, dust, fibers, vegetation, glass, and metal fragments on the sheet. The gross pieces are removed for possible comparison with like material which may have broken from the suspect's car with the impact (figure 1). Care should be taken to protect the fragile detail on the fractured edges so that they will be suitable for jigsawing into pieces from the suspect's car. Since headlamps on modern vehicles are interchangeable units, the make of the vehicle usually cannot be determined from fragmentary remains of headlamps. The lenses of the parking lamps can usually be associated with certain makes and models of vehicles as may decorative chrome strips, hood ornaments, headlamp rims, and door handles. All glass, metal, and plastic fragments found at the scene should be preserved for future comparison. Even though the headlamp fragments cannot lead the investigator to the make and model of the vehicle involved, it may be possible to identify a fragment found at the scene as having come from the suspect's car if broken pieces are found on his car for comparison.

A detailed examination of the fine debris from

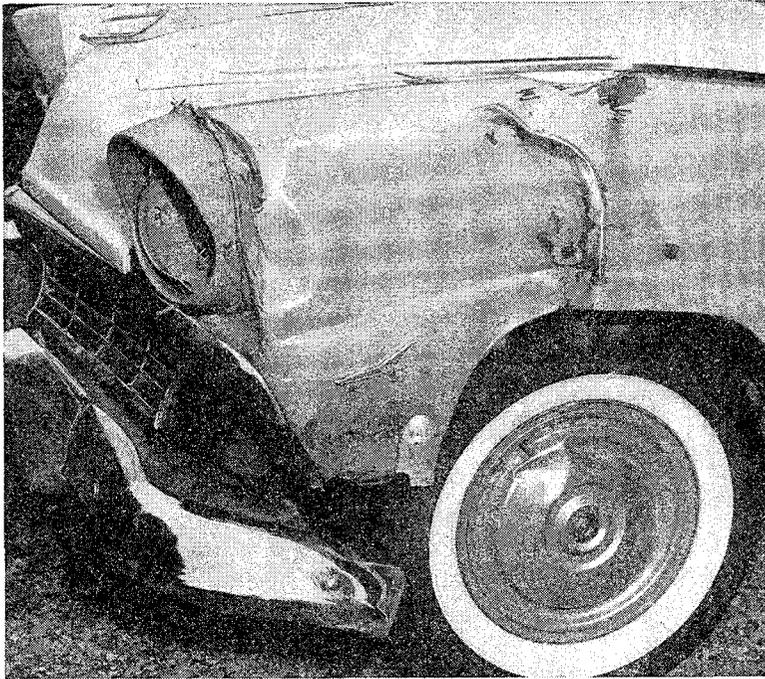


Figure 1

Typical damage to vehicle which struck pedestrian. Note area where paint is chipped free from metal.

the clothing is conducted with the stereoscopic microscope (figure 2). The principal object of the microscopic search is for paint chips. The paint chips on the victim's clothing come from places

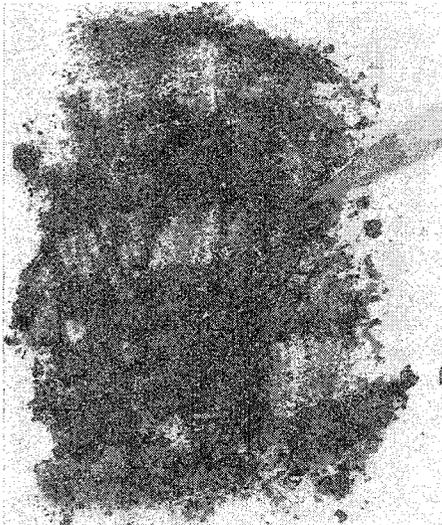


Figure 2

Debris removed from victim's clothing. Paint chips visible only with microscopic aid.

where the impact buckled the metal at a sharp angle. This bending of the metal causes the paint to craze and chips break free from the supporting surface leaving the metal bare. Paint chips freed in this manner are often very small and may even be subvisible; yet with the aid of a microscope layer structure, layer sequence, color, and even inclusions may be observed (figure 3). The softer or woolier surfaces of the clothing are likely to retain paint chips in greater quantities than harder surfaces.

When paint samples from the suspect's car are collected for comparison purposes, they should be collected from *each* place where the metal has been



Figure 3

Paint chip comparison as seen through compound microscope.

bent and the paint has crazed leaving the metal bare. Fenders are often repainted, and during the repair process, paint is sanded off completely in only a few places; a fender so repaired and repainted will have different layer structures at different places on it. Paint also varies in thickness at various places on the vehicle and for comparison purposes should come from the same vicinity on the vehicle as the chips that may be found on the victim. If chips are collected from all places on the suspect's vehicle where bare metal is observed, the investigator then is assured of having some chips from the same vicinity as any found on the victim or at the scene. The chips collected from different places on the suspect's car may be placed in one container; a small vial with a screw cap is ideal. One case comes to mind in which an investigator found a large chip or scale of paint at the scene which was jigsawed into a sample piece removed from the suspect's car for comparison purposes. Search for large chips or scales of paint at the scene should not be neglected.

Paint chips from the suspect's car are best collected by using a knife blade to loosen chips from the edges of paint at the location of bare metal. Paint scraped from a flat surface by a knife is not so valuable as chips pried loose where they have already been partially separated by the bending of the metal. Two chips may be mounted together on a microscope slide for study with a compound microscope; one chip recovered from the victim and one chip from the suspect's car may be mounted on the same slide. When properly prepared, a photomicrograph of the slide in color projected on a screen in court makes a very good demonstration.

The slide may be prepared by building it "upside down." Place a square cover glass on the table. Affix with permount a piece cut from the end of a regular microscope slide; the length of this piece should be half the width of the cover glass. Place the ground edge (the end of the piece of slide) in the middle of the cover glass. These can be prepared in advance so they will be dry enough to handle when needed. Apply a tiny drop of permount to the cover glass at the ground edge of the affixed portion of the slide in the center of the preparation. Immediately place a chip of paint recovered from the victim into the drop of permount with the surface layer against the ground edge and the straightest edge of the chip down against the cover glass. Next, place a chip from the suspect's car into the drop of permount,

oriented in the same manner and with one edge touching the first chip. Be sure there are no bubbles between the chips of paint and the cover glass. It is best to mount the chips under the stereoscopic microscope. Tiny chips can be handled with dissecting needles made sticky with the natural oil from the face. Allow the permount to dry; then affix another piece of slide of the same length to the cover glass with the ground edge toward the mounted chips and against them. Allow the preparation to dry enough so that it can be turned over and affixed to a whole microscope slide with permount. When viewed with a microscope, both chips will be visible and the layer structure, layer sequence, color and inclusions can be compared. This method of mounting is for very tiny chips; larger chips could be broken so that portions could be mounted in the manner described. It has not been necessary to grind or polish the edges of paint chips in order to make detailed comparisons;¹ in fact the texture left by the fracture reveals other characteristics for comparison. Larger chips of paint lend themselves to other methods of examination,² but when only a few tiny pieces are recovered, examination is often limited to the microscope. As the number of layers increases, the value of the comparison as evidence also increases, and a tiny chip of paint scarcely visible to the naked eye might have ten layers of paint; this evidence properly presented would weigh heavily in court despite the size.

If enough chips of paint are recovered from the victim, micro-chemical examinations may be conducted. The reaction of the paint chips to a series of organic solvents and corrosive acid and alkali solutions may be observed through a microscope. Slides with a series of wells on them are suitable for this type of examination. Solubility and progressive color changes may be compared by using the same kinds of solutions to treat both the chips of paint from the victim and chips of paint from the suspect's car. Spectrographic and X-ray diffraction examinations may be conducted if enough material is available.

Differences in the chemistry of the tiny paint chips may be revealed by the use of a series of filters during microscopic examination and comparison. These filters can be placed one at a time

¹ BREWER, JAMES G. AND BURD, DAVID Q., Paint Comparison, *THE JOURNAL OF CRIMINAL LAW AND CRIMINOLOGY* Vol. 40 No. 2, Page 230, July-Aug. 1949.

² WILLIAMS, JOHN, Examination of Paint Chips and Scrapings, *JOURNAL OF CRIMINAL LAW, CRIMINOLOGY AND POLICE SCIENCE*, Vol. 44, No. 5, Jan.-Feb., 1954.

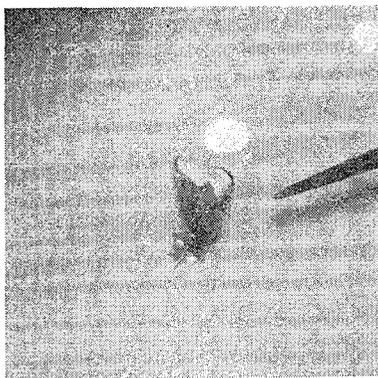


Figure 4

Tiny piece of tissue recovered from suspect's car.

between the light source and the chips of paint being compared. The series of filters should vary from the deep red end of the spectrum through the various colors to the violet end of the spectrum. Paint samples of different composition which look alike in color and hue with daylight usually can be detected by such an examination.

Visual examination of the tiny paint chips which have been mounted for microscopic study may be made for fluorescence when an ultraviolet source of light is used; visible light should be excluded when such an examination is made. Photomicrographs may be made using both an ultraviolet source and an infrared source. When making photographs on infrared film, a Wratten #87 filter will exclude light of shorter wave length than infrared; this filter should be placed between the objective lens and the paint chips being examined or between the film and the optical system.

Sometimes examination of the body will reveal marks which have been caused by the force of the body striking against the contours of the vehicle, decorative strips, insignia, or structural features which may indicate the make of the vehicle. If the victim lives, the marks will become darker with the passage of time and the outline blurred; if the victim died quickly, the bruise or extravasation will become more apparent after the embalming process is completed—formalin causes the blood to become dark brown.

Imprints of the cloth pattern of clothing worn by the victim may be observed in the paint or the chrome surfaces and the greasy portions of the undercarriage of the suspected vehicle. When the paint surface is marred with a sliding impact against the victim, a transfer of the paint to the clothing occurs. Visible smears of paint may be



Figure 5

Microscopic view of the tissue in figure 4. Note the fibers enmeshed in the tissue. The fibers came from the victim's wool shirt which was dark blue in color.

found on the clothing of the victim. Sometimes these smears, when examined with a microscope, will reveal traces of the lower layers of paint as well as the top layer; a microscopic examination of the smears should be made before concluding the color of the suspect's car by gross examination.

During the examination of the suspect's car detailed notes should be taken and photographs made of all damage to the vehicle. Careful observation should be made of all areas which have been wiped clean of road film and dust. Technical experts should be called to make a search of the vehicle for human blood stains, human hair, threads and fibers, and tissue fragments. Preliminary tests for identification of blood such as benzidine reagent should not be relied on in these examinations because of the usual presence of smashed insects which may give positive reactions to these reagents. Too little effort is usually expended in the search for biological traces other than blood on the suspected vehicles.

Tiny pieces of tissue which are just visible to the naked eye may reveal with microscopic and serologic examination information unexpected by

the investigator (figure 4). Normal saline extracts of the bits of tissue when treated with anti-human precipitin serum may reveal the human origin. Microscopic examination of the gross specimen may also reveal fibers which can be compared with fibers from the victim's clothing (figure 5); a comparison of the dye with which the fibers have been colored can be conducted by the method described for paint chips in which a series of filters is used. After extraction of the tissue with normal saline, the tissue may be fixed, dehydrated, embedded in paraffin and sectioned on a microtome with routine microtechnique. A study of the slides prepared in this manner will reveal the kind of tissue (i.e. skeletal muscle, cutaneous, brain, etc.). Even when the tissue has been dehydrated prior to discovery, fixation following extraction in normal saline and routine microtechnique ending with histologic staining of the slides usually reveals nuclei and cytoplasmic detail. Testimony in court of the finding and identification of a piece of

human skeletal muscle or other tissue makes very important evidence in the prosecution of suspected hit and run drivers.

Another important trace material which is overlooked on suspected vehicles is fluid fat. When a victim sustains a compound fracture or deep laceration, fluid fat frequently escapes from the wound. Vehicles with abundant traces of fluid fat on them have been observed when blood traces were minute. The reason fluid fat is overlooked by investigators is because it appears to be splash stains of dirty water. Since fat or oil does not dry, every particle of dust which comes into contact with it adheres to it, and by the time the investigator can examine the vehicle, the fat is so coated with dust that it does, indeed, resemble splashes of muddy water. Particles of "solid" fat may be found on or near the bumper at the site of the initial impact. Here again, careful serologic examination of these fat stains will reveal the human origin of the material.