Chapter 16 *Casts and Impressions*

By the end of this chapter you will be able to:

16.1 Provide examples of how impression evidence gives clues about the crime scene, person(s) at the scene, and events that occurred at the scene.

16.2 Provide well-supported arguments that evidence such as foot, shoe, and dental impressions is usually considered class evidence.

16.3 Distinguish among latent, patent, and plastic impressions.

16.4 Summarize the significance of foot and shoe impression evidence, and outline procedures for collecting impression evidence from different types of surfaces.
Chapter 16  
Casts and Impressions

By the end of this chapter you will be able to:

16.5 Describe the features of tire impressions and skid marks used to help identify tire(s) or a vehicle’s wheelbase, track width, and/or turning diameter.

16.6 Compare and contrast skid marks, including how they are produced, when they are produced, what they look like, and how they can be used to reconstruct events leading to a collision.

16.7 Summarize the methods used to produce an impression or cast.

16.8 Analyze impression evidence to determine if it is consistent with evidence from a crime scene.
Chapter 16

Vocabulary

- groove (of a tire)
- latent impression
- patent impression
- plastic impression
- rib (of a tire)
- sole
- track width
- tread
- turning diameter
- wheelbase
Types of Impressions

Figure 16-1 Examples of latent (left), patent (center), and plastic (right) impressions. The latent shoe impression (left) was made visible by dusting with orange powder and viewing with an orange filter and an alternate light source.
Shoe and Foot Impressions

- Databases contain the names of specific manufacturers and tread patterns used to identify different types of shoes.
- Crime-scene investigators can search the databases to find:
  - The manufacturer that produced the sole pattern
  - The company that purchased the sole for the shoes
- If a large number of manufacturers use the same generic sole patterns, it complicates sole identification.
Gait and Tracks

- Examining tracks can reveal:
  - If a person was running or walking
  - If someone is injured
  - The likelihood that somebody is older or disabled
Collection of Shoe Impression Evidence

Figure 16-4 Impression evidence is documented before any attempt is made at casting.
Electrostatic Dusting and Lifting

Figure 16-5 Electrostatic lifting uses a charge to hold the dust particles of a latent print in place.
Gel Lifting

- A gel lifter is a layer of gel sandwiched between paper backing and a plastic cover sheet.
- It is thick and flexible to conform to uneven surfaces, and it is best used on oily or moist prints.
Casting Plastic Impressions

**Figure 16-6** Plaster cast of a plastic impression of a shoe.

**Figure 16-7** Prints in snow must be photographed before casting.
Foot Length, Shoe Size, and Height

- The length and width of the shoe vary by the shoe type.
- There is a general correlation between height and foot size.

**Figure 16-8 Comparison of foot length and U.S. shoe sizing.**

<table>
<thead>
<tr>
<th>Foot Length (Inches)</th>
<th>9</th>
<th>9 ¼</th>
<th>9 ⅜</th>
<th>9 ½</th>
<th>9 ¾</th>
<th>9 ⅛</th>
<th>10</th>
<th>10 ¼</th>
<th>10 ½</th>
<th>10 ¾</th>
<th>11</th>
<th>11 ¼</th>
<th>11 ½</th>
</tr>
</thead>
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<tr>
<td><strong>Shoe Size</strong></td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>3 ½</td>
<td>4</td>
<td>4 ½</td>
<td>5</td>
<td>5 ½</td>
<td>6</td>
<td>6 ½</td>
<td>7</td>
<td>7 ½</td>
<td>8</td>
<td>8 ½</td>
<td>9</td>
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<tr>
<td></td>
<td>5</td>
<td>5 ½</td>
<td>6</td>
<td>6 ½</td>
<td>7</td>
<td>7 ½</td>
<td>8</td>
<td>8 ½</td>
<td>9</td>
<td>9 ½</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>
Figure 16-9 Comparison of shoe size and height.
Recording Tread Impressions

Figure 16-10  A tire tread.
Identifying a Vehicle

**Figure 16-11** Every make and model of vehicle has its own track width and wheelbase measurements.
Figure 16-12  Tread marks revealing turning diameter can help identify a vehicle. Which of these vehicles has the smallest turning diameter?

- Dodge Ram (52.3 ft)
- GMC Sierra Denali w/o 4WD (46.2 ft)
- Ford F-150 (50.4 ft)
- Toyota Tundra (44.3 ft)
- Ford Excursion (43.7 ft)
- Saturn 3-Door Coupe (37.1 ft)
### Figure 16-13  Examples from a database of automobile statistics by make and model.

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
<th>Wheelbase (mm)</th>
<th>Turning Diameter (mm)</th>
<th>Tire Size (mm)</th>
<th>Tire Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFA ROMEO</td>
<td>Alfa 156</td>
<td>2,595</td>
<td>11,600</td>
<td>185</td>
<td>Michelin Energy XH-1</td>
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<tr>
<td>AUDI</td>
<td>A4</td>
<td>2,617</td>
<td>11,100</td>
<td>195</td>
<td>Michelin Energy MXT</td>
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<tr>
<td>AUDI</td>
<td>A8</td>
<td>2,882</td>
<td>12,300</td>
<td>225</td>
<td>Michelin Pilot CX</td>
</tr>
<tr>
<td>BMW</td>
<td>3 series</td>
<td>2,725</td>
<td>10,500</td>
<td>225</td>
<td>Michelin Pilot HX</td>
</tr>
<tr>
<td>CADILLAC</td>
<td>Seville</td>
<td>2,850</td>
<td>12,340</td>
<td>235</td>
<td>Goodyear Eagle Touring</td>
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<tr>
<td>CHEVROLET</td>
<td>Blazer</td>
<td>3,122</td>
<td>12,600</td>
<td>205</td>
<td>Uniroyal Tiger Paws</td>
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<tr>
<td>CHEVROLET</td>
<td>Corvette</td>
<td>2,444</td>
<td>12,200</td>
<td>285</td>
<td>Goodyear</td>
</tr>
<tr>
<td>CHRYSLER</td>
<td>Grand Voyager</td>
<td>3,030</td>
<td>12,500</td>
<td>215</td>
<td>Goodyear NCT2 Touring</td>
</tr>
<tr>
<td>CHRYSLER</td>
<td>Neon</td>
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<td>10,800</td>
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<td>Goodyear Eagle NCT2</td>
</tr>
<tr>
<td>DODGE</td>
<td>Viper</td>
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<td>12,300</td>
<td>335</td>
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<tr>
<td>FERRARI</td>
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<td>2,500</td>
<td>11,600</td>
<td>295</td>
<td>Pirelli P Zero</td>
</tr>
<tr>
<td>FORD</td>
<td>Escort</td>
<td>2,525</td>
<td>10,000</td>
<td>185</td>
<td>Michelin MXV2</td>
</tr>
<tr>
<td>FORD</td>
<td>Focus</td>
<td>2,615</td>
<td>10,900</td>
<td>185</td>
<td>Pirelli P6000</td>
</tr>
<tr>
<td>FORD</td>
<td>Galaxy</td>
<td>2,835</td>
<td>11,700</td>
<td>215</td>
<td>Conti Sport Contact</td>
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<tr>
<td>HONDA</td>
<td>Accord</td>
<td>2,720</td>
<td>11,000</td>
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<td>Pirelli P4000</td>
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<td>HONDA</td>
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<td>9,400</td>
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<td>HYUNDAI</td>
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<tr>
<td>INFINITI</td>
<td>J 30 t</td>
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<td>215</td>
<td>Dunlop SP Sport D31</td>
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<tr>
<td>JEEP</td>
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<td>245</td>
<td>Goodyear Wrangler HP</td>
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<td>11,800</td>
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<tr>
<td>MERCEDES</td>
<td>A</td>
<td>2,423</td>
<td>10,300</td>
<td>175</td>
<td>Goodyear GT</td>
</tr>
</tbody>
</table>
Accident Reconstruction

- The goal of accident reconstruction is to determine:
  - What happened
  - When it happened
  - Where it happened
  - Why it happened
  - Who was involved
  - Who was at fault
Figure 16-14 In a multiple-car collision, skid marks can help to determine the path and speed of each vehicle.
If one or more wheels stop turning during braking, one of three basic types of tire marks are made:

1. Skid marks
2. Yaw marks
3. Tire scrubs
Types of Tire Marks

- **Skid Marks**
  - Brakes suddenly
  - Locked wheels
  - Calculate velocity from skid marks

- **Yaw Marks**
  - Produced when a vehicle travels in a curved path faster than the vehicle can handle and skids sideways
  - Tires and road surface melt from extreme temps
  - Often smoke occurs

- **Tire Scrubs**
  - Damaged or overloaded tires after impact
  - Determine curved area of impact
  - Usually curved impact or

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Figure 16-16 The difference in tooth placement is used to individualize an impression.
Collecting and Analyzing Dental Evidence

- Bite marks should be photographed as soon as possible.
- Photographs should include a ruler to establish a reference for size.
- If possible, swab the bite mark with a sterile cotton swab to obtain DNA evidence.
Summary

- There are three types of impressions: patent impressions, latent impressions, and plastic impressions.
- Generally, any impression evidence made by an object will be considered class evidence unless it has individualizing features.
- Tire impressions at a crime scene may provide information to help identify of a vehicle and provide evidence pertaining to events that occurred before an accident.
Tire impressions such as skid marks, yaw marks, or scrubs provide evidence of the car’s turning diameter, track width, wheelbase, speed, direction, and when the brakes were applied.

Dental impressions are considered class evidence, and reliability depends on the number of points of comparison and the clarity of the impression.
Impression evidence must be carefully documented before it is moved. Photographs of the original impression always accompany the cast or impression or record, such as a gel or electrostatic lift, used in court.

Impressions may be used several ways: (1) to help identify a person or object, (2) to determine actions that occurred in committing the crime, and (3) to verify accounts given by eyewitnesses.