

Incriminating marks

No witnesses. No fingerprints. No footprints. No DNA. A skilled, smart, and methodical criminal knows just what investigators are looking for, and works hard to stop them from finding it. However, even the tools used and the gloves worn can leave subtle marks behind. Investigating these marks can help police link a suspect with a crime scene.

Tools feature in many different crimes. They can be used to force open a door or window, break a padlock, or even to cut up a corpse. By cutting, striking, and scraping, tools can leave marks on every surface they touch. These marks, if clear enough, have identifying features that can be matched to the tools that made them.

Types of tool marks

There are two basic kinds of tool marks—multiple and single contact marks. Multiple contact marks occur when a surface is repeatedly sawed. They have limited value as evidence, and may only demonstrate what class of tool was used, such as a saw or knife, and its general size and shape. Single contact marks occur when a surface is struck once. They can be either impressions, such as when a hammer dents a metallic surface, or striations, such as when a screwdriver scrapes against a window frame to prize it open. Striation marks are parallel indentations left on a surface, as shown in the above right-hand image. Their unique pattern can provide proof that a particular tool produced a mark. However, the tool's owner may not have committed the crime, since tools may be stolen, borrowed, or simply found at the crime scene.

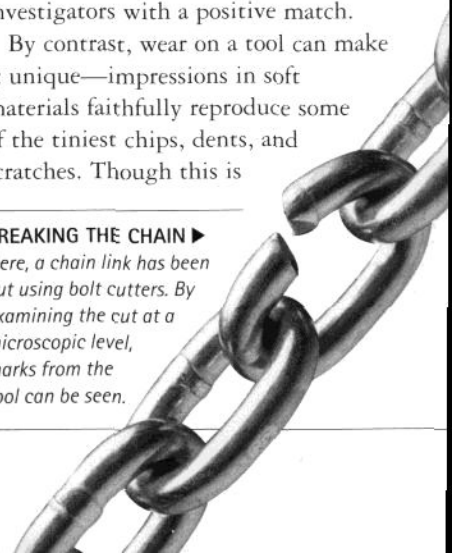
Making their mark

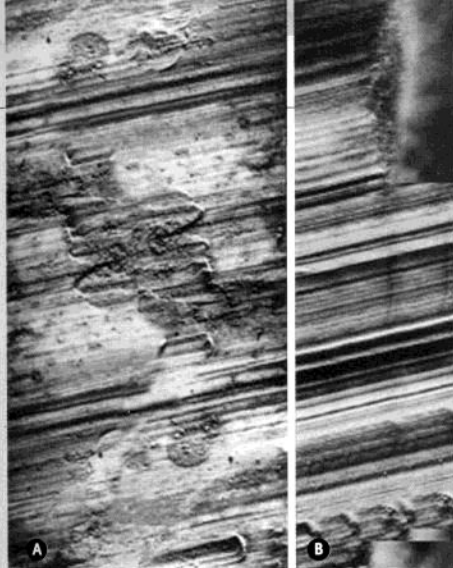
Tool marks may show tiny surface imperfections of a tool's working edge. These imperfections are created both during manufacturing and through general wear and tear while the tool is in use. Manufacturing defects may appear on every tool of the same batch, so although they can help to trace a tool's source, they cannot necessarily provide investigators with a positive match.

By contrast, wear on a tool can make it unique—impressions in soft materials faithfully reproduce some of the tiniest chips, dents, and scratches. Though this is

BREAKING THE CHAIN ►

Here, a chain link has been cut using bolt cutters. By examining the cut at a microscopic level, marks from the tool can be seen.





BOLT CUTTER MATCH ▲

Microscopic ridges, known as striae, are left on a cut chain link at the scene (A). The suspect's bolt cutters, pressed into soft lead, match these marks exactly (B).

one of the principal advantages of tool marks, it can also be a limitation. If a tool is in regular use, its value as evidence falls with each day that passes after the crime is committed. Eventually, new marks obliterate old ones, so many crime bureaus delete tool-mark evidence from their databases after six months.

If imperfections in a tool are very pronounced, they can leave clear traces even on multiple contact marks. For example, a saw with a broken tooth will leave a characteristic gap when it cuts.

Finding and recording tool marks

By their very nature, tool marks occur where force has been used. Investigators look for them at a crime scene's point of entry—a forced window or door, or a cut padlock on a perimeter fence. They also find them wherever damage has been done or a tool was obviously necessary—such as on the limbs of a dismembered corpse, or in the slash in a vandalized car tire.

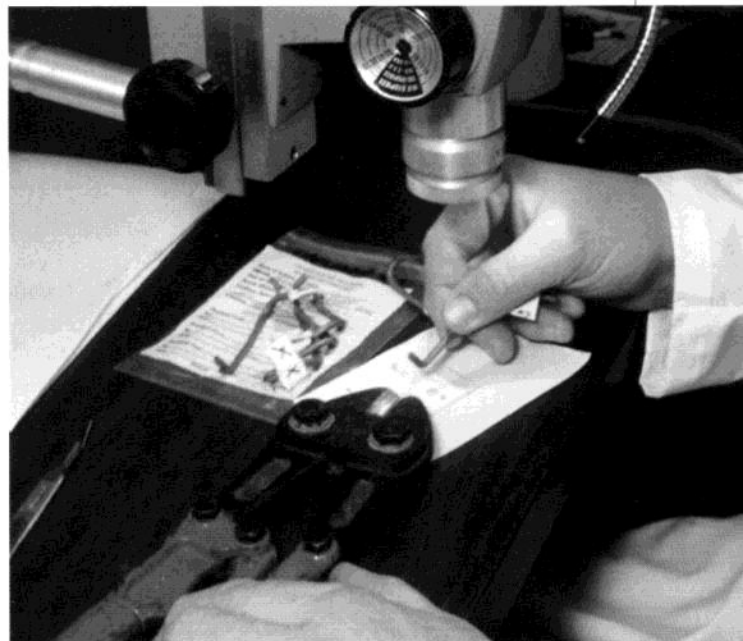
The ideal method of collecting tool-mark evidence is to remove the mark itself from the crime scene—for example by removing a forced door, or a portion of it, for later examination. If this is not practical, investigators photograph the mark, lighting it from an oblique angle to highlight the surface detail. They may also cast it using an opaque resin, which retains microscopic detail much better than the plaster or dental stone usually used when casting footprints (see p. 20).

Examination and comparison

Examiners compare tool-mark evidence with corresponding implements recovered from a suspect. An initial examination and measurement using a low-power stereo microscope (see p. 89) is usually enough to eliminate tools that clearly could not have made the mark. But if there are conspicuous similarities, these can be confirmed by using the tool to duplicate the marks found at the crime scene. For example, examiners might cut a lead or aluminum rod with the bolt cutters they suspect a criminal used to open a padlock. (By cutting a soft metal, they reduce the risk of marking the tool itself, but since damage is always possible, this is the last test examiners carry out.) The more points of similarity there are on the two marks, the more compelling the evidence that the same tool made both.

Investigators rarely study tool marks in isolation. Instead, they analyze the marks in conjunction with other trace evidence from the scene that may have transferred to the tool. This helps to interpret the marks and often results in a more convincing case. For example, when bolt cutters shear through

a chain, only a small portion of the blade actually cuts the metal. Using trial and error it would be difficult to find the correct portion of the blade to match with marks on the chain. However, chemical spot tests can reveal traces of the chain's metal, and pinpoint a region of the blade for comparison. Other traces left on tools can help to prove guilt. Pliers used to cut telephone cable, for instance, may retain traces of the plastic insulation.



LAB ANALYSIS ▲

Bolt cutters recovered from a suspect are analyzed in the lab. As well as looking for striation marks, technicians examine the tool for any trace evidence.

FABRIC PRINTS

Marks from fabrics can be collected and compared in ways similar to fingerprints and footprints—by dusting, tape lifts, and electrostatic lifts (see p. 20). Marks are more distinctive if the material is coarse, and are commonly made from gloves. The prints of brand-new gloves at a crime scene provide few clues. However, like tools, gloves accumulate unique features with use. In this image, a glove is compared to a mirror-image of a print. The rips and dried paint on the glove's fingers help match it to the distinctive print. Fabric prints also occur in hit-and-run road accidents. The textured weave of a victim's clothing can leave a patterned imprint on the vehicle's hood.

Glove prints left on a window pane are recovered using fingerprint powder.

The paint on this finger leaves a distinct pattern break in the glove's print.

