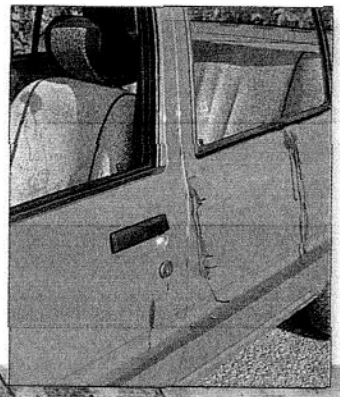
Bloodstains

At the scene of a murder, bloodstains can literally point to the killer. By analyzing their shape, size, and position, investigators can sometimes figure out not only where an assailant stood, but also their height, how many times they swung the weapon, and whether they are right- or left-handed.



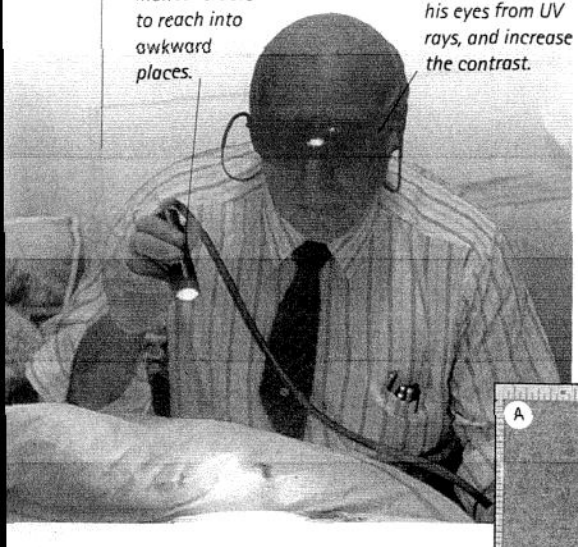
SCENE OF A SHOOTING
Bullets strike a victim with such force that blood is projected at great speed, spraying out in tiny drops. At this scene of a brutal gangland hit, however, the drops are hidden by blood that spurted on to the windshield from an artery.

Blood can spray everywhere in a violent assault, and it is not easy to remove. Even bleach cannot remove bloodstains totally. This makes blood a valuable aid for forensic scientists trying to reconstruct events.

If a suspect's blood is found at the scene, DNA analysis can identify them (see p. 60). But the blood of the victim is very helpful to investigators, too. The pattern of blood spatters at a crime scene provides important clues to the circumstances of the assault. In the simplest example, a suspect who claims only to have struck once is obviously lying if blood thrown from a weapon has marked the ceiling a number of times. When bloodstains are copious and well-defined, they allow investigators to reconstruct a detailed narrative of an attack.

Revealing hidden stains

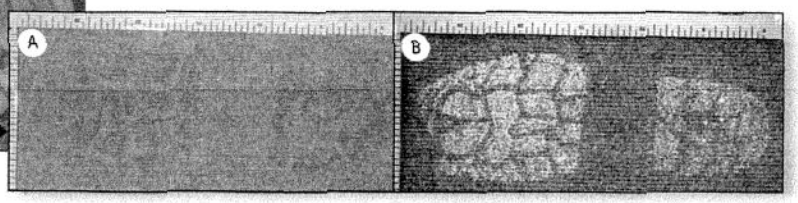
To make full use of bloodstains, though, investigators first have to find them all. A high-intensity light source, filtered to produce a violet beam, helps to locate blood spots. If this reveals nothing, or a crime scene has been cleaned, investigators use reagents that make blood visible. Luminol and fluorescin are the most widely used, and have been known to locate blood that has been diluted to 12,000:1. When luminol is sprayed in a completely dark room, it fluoresces on contact with any traces of blood. Flourescin is more sensitive, but only glows when it is illuminated with UV. They both react with the iron found in hemoglobin.



The UV light is small and maneuverable to reach into awkward places.

The investigator's goggles protect his eyes from UV rays, and increase the contrast.

BLOODY FOOTPRINT ▼
Sprayed with reagent and illuminated with UV light, a bloody footprint that was almost invisible in normal lighting stands out clearly enough to photograph as evidence.



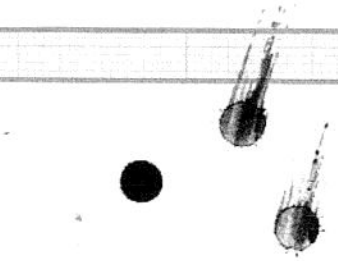
Meaningful patterns

Bloodstain analysis uses the pattern of spatter to reconstruct the action that originally spread the blood. When a drop of blood hits a surface, the shape of the mark it makes indicates the direction in which the drop was traveling, and the force with which it was projected. For example, blood dripping a short distance forms large, circular drops on the floor; but when blood is projected forcefully it breaks into much smaller drops. As they hit an oblique surface they elongate and can develop a tail that points away from the source.

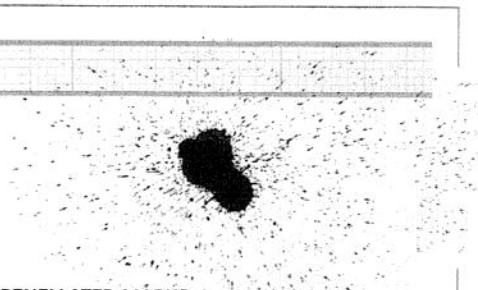
If a clear pattern of bloodstains has been thrown on to the walls, floor, and ceiling of a room, murder investigators can trace back from each mark to figure out where the victim and the assailant were standing when each

PATTERNS OF BLOODSTAINS

Scottish professor of forensic medicine John Glaister (1892–1971) was the first to describe bloodstains in the 1930s, and his categories are still in use today. On a crime scene the marks are rarely as neatly defined as those shown here, and rough, porous surfaces may make analysis impossible.



CIRCULAR MARKS *form when blood ejected with little force strikes surfaces perpendicular to its path.*

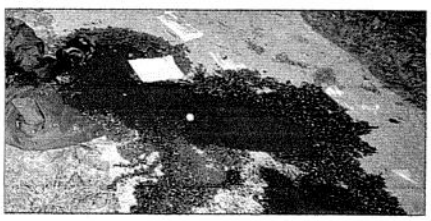


CRENELLATED MARKS *result when blood is thrown off at great speed, or falls a large distance.*

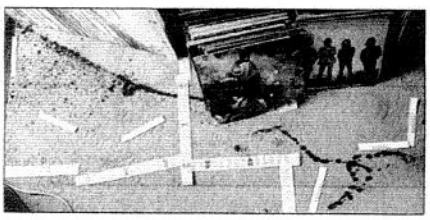
ELLIPTICAL MARKS *show drops struck obliquely. A standard formula derives angle from elongation.*

SPLASHES *with well-defined tails indicate that blood struck the surface at an angle of 30° or lower.*

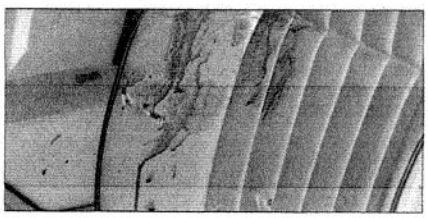
BLOOD SPURT *forms characteristic marks on surfaces when blood pumps from a cut artery.*



BLOOD POOLS *suggest that a victim was static, and still alive, since death stops blood flow.*



BLOOD TRAILS *may be surrounded by secondary spatter that shows the direction of movement.*



BLOOD SMEAR *suggests that the object pressed against the surface will also be stained.*

blow fell. Traditionally, detectives have assumed that the blood drops fly in straight lines, and used string for reconstruction. Computer programs automate the task now, and allow for gravity, charting the flight path of projected blood as a gentle arc, making the process more precise.

Use of weapons

Where spatter marks are particularly clear, it is possible to deduce even more information. The pattern of blood flung from the tip of a weapon is particularly revealing. Assailants do not swing weapons in a straight line, and whether the track of blood curves to the left or the right indicates which hand held the weapon. The width of the track hints at the nature of the weapon: a knife leaves a much narrower track than a baseball bat, for example. The cast-off blood also indicates ferocity—multiple, powerfully projected trails would be compelling evidence of a frenzied and determined attack.

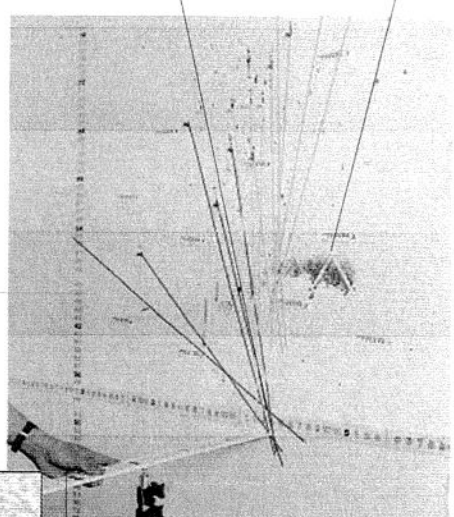
The absence of blood spatter marks can be almost as revealing. A "shadow" that is free of marks suggests that there was an object in between the source of blood and the surface on to which the drops were projected. The intervening object will carry a pattern of spatter marks that fits into the crime scene like the last piece of a jigsaw puzzle.

ANALYZING BLOOD PATTERNS ▶

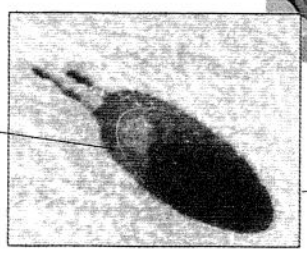
To trace the origin of a blood spatter, investigators first mark the wall with tapes or strings along the axis of each mark. To find how far the source was from the wall, they use the elongation of marks to judge the angle at which drops struck.

Red tapes converge here, showing the position of the source in two dimensions.

A bloody mattress leaning on the wall made this smear.



The shape of the ellipse reveals the angle at which the blood hit.



Elongation of drops determines the angle of the white strings to the wall, fixing the source in the third dimension.