

Bloodstain-Pattern Analysis

The Discipline Everyone Should Understand

Written by Dale Garrison

Photos by Ross Gardner

Bloodstain

VIRTUALLY EVERYONE in law enforcement should know the basics of bloodstain-pattern analysis. At least, that is the opinion of Captain Tom Bevel, retired from the homicide unit of the Oklahoma City (Oklahoma) Police Department, and Special Agent Ross Gardner, retired from the United States Army Criminal Investigation Command. Both individuals spend time talking to law-enforcement professionals across the country about the importance of understanding how to correctly recognize, document, and evaluate bloodstain patterns.

"Anyone who walks into a crime scene has to do bloodstain-pattern analysis," said Gardner. "If a police sergeant walks in, he has to make a decision whether to call an analyst. The sergeant may not be the guy you put on the stand, but he has to understand what those blood patterns are telling him so he knows whether or not to make the call to the expert."

Bevel explained that knowing how to recognize bloodstain patterns is more than a benefit for law-enforcement professionals. It can also be considered a responsibility. "They are not doing their job if they don't have some knowledge of bloodstain-pattern analysis," he said. "If they don't have the knowledge, they are really not able to meet the needs of the job as it exists today."

Introducing bloodstain patterns

Even though the topic of bloodstain-pattern analysis can be complex, most law-enforcement personnel can achieve a working knowledge through a relative-

ly brief introductory course. In fact, as he was interviewed for this article, Gardner was preparing a basic, eight-hour presentation for the Rocky Mountain Association of Bloodstain Pattern Analysts, a meeting where the participants would range from beginning law-enforcement officers to forensic investigators seeking expertise in an area outside of their specialty. All can benefit by understanding the dynamics of blood.

"We teach people the basic tenants so they can recognize the basics of bloodstain-pattern analysis," Gardner noted. "I have seen detectives looking at a wall saying, 'I wonder where the perp was standing when he hit her?' But if you know what to look for, you can see it right there, on the wall."

Even with very basic knowledge, a person can begin to see a tell-tale story develop from the patterns of blood on a wall or floor. Curvilinear patterns of blood droplets on a wall or floor, for example, are caused by movement. These patterns differ from those of blood that has been projected from an arterial source. And both of those are different from a passive pattern, which forms when blood pools in one spot.

"If you can differentiate these basic patterns and the way they are disrupted, you can tell a lot," Bevel said. "If you can look at these in a very common-sense way, it is going to either refute or corroborate what you're being told at a crime scene. And this is applicable not only at cases involving death, but also at assaults or accidents. The idea is applicable to almost anything."

Locating the evidence at the crime scene

Both Bevel and Gardner emphasize that the work begins when any officer approaches the scene of a crime or accident. Many of the concepts they teach are nearly as old as crime-scene investigation itself. First, they say, one should visually examine the scene and use care to make no assumptions.

"Finding the evidence is so important," Bevel said. "It is very common for students to overlook blood spatter. But it's important to look for it, because if you don't find it, you can't use it."

Gardner advises law-enforcement personnel to take their time when first arriving at a crime or accident scene. "Walk in and get familiar with the location," he said. "What's in the scene that could be relevant? Look around before you jump to conclusions."

Bevel noted that this examination should include the obvious signs as well as the more subtle clues.

"Searching for blood stains is very critical," he said. "One of the most common mistakes occurs when blood is plentiful and easily observable at a scene. That is all they tend to look at. They may spend too much time with the large, visible amount of blood and, as a result, they don't look for the smaller drops that have been broken up. Those bloodstain patterns may be smaller and harder to see, but they could tell you more about what happened."

Gardner is especially interested in blood-contact patterns—areas at a crime scene where blood has been left because a bloodstained object came into contact with a surface of some kind. The most dramatic example

might be a case where a bloodstained weapon left a visible pattern on a table or floor. But even less obvious cases can be significant.

“Contact patterns tell us that certain objects have been stained and where they have been,” Gardner said. “Many analysts concentrate on the spatter pattern and, as a result, they may miss information that could either refute or corroborate certain testimony. The main thing is to look. You don’t know what you’re going to find until you look.”

Documenting bloodstain patterns

Along with careful observation, crime-scene investigators must make careful use of documentation, whether it is with handwritten notes and sketches, photography, or video.

“Document, document, document!” Bevel emphasized. “It’s like the real-estate motto about ‘location, location, location,’ except that for bloodstain-pattern analysis, it is ‘documentation’.”

Proper documentation is needed to accurately work with other investigators, including specialists. And, ultimately, proper documentation is needed when it comes time to make a convincing presentation to the jury.

“Lack of documentation—and even improper documentation—are the most common mistakes I see,” Bevel said. “People send me material that simply doesn’t have sufficient documentation

Even with very basic knowledge, a person can begin to see a tell-tale story develop from the patterns of blood on a wall or floor. If you know the difference between the patterns, you can tell a lot.

and there is not much I can say about it. If it is documented properly, then I can go a long distance. The documentation determines what the investigator on the scene or an expert down the road can do. If you don’t document it, you simply don’t have it.”

It can be challenging to capture the level of detail needed for effective pattern analysis. For example: Many photographers tend to make an error by immediately taking close-up photographs of the bloodstain pattern. While these are certainly important to take, they may ultimately prove useless if there are no middle- and long-range images. Why is that? It’s because those general photos provide context for the more detailed close-ups.

“We frequently see great close-ups that are unusable because you have no

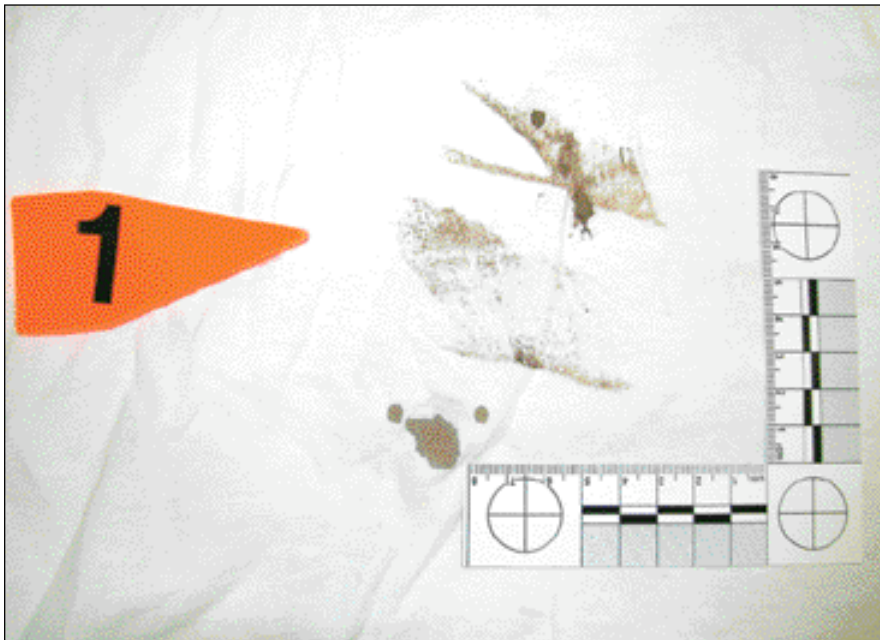
idea where they are located in a room or their positions in relation to each other,” Bevel explained. “If you can’t tell where it is situated in the overall scene, then it’s not worth much.”

Photographic procedures to consider

The correct procedure is to begin with long-range, orientation photographs that will provide a framework for intermediate and close-up work. In a room, for example, take photographs from the doorway, being certain to include visible blood patterns as well as all nearby furniture and other key points of reference.

Next, intermediate photographs bring the camera closer. If a wall is stained with three bloodstain patterns, the intermediate photograph would be close enough so that details of each group are visible, yet all three patterns would still be included in one frame.

For close-ups, the photographer would finally move close enough so that each stain fills the camera’s field of view. Beside the bloodstain pattern, the photographer should place a scale of reference, preferably an ADFO ruler. If the evidence is on a wall, a wall arrow or bubble level should be used to indicate vertical up. If it is on a horizontal surface, such as a floor or table, the photograph should have an arrow denoting magnetic north.



CONTACT STAINS can result from a variety of actions, such as a bloody object coming into contact with an unstained area. Or an unstained area wiping through a pre-existing bloodstain. Or the transfer of the image of a bloody object—or some characteristic of that bloody object—when it is placed against another surface.

“With those items in place, I have measurements of each stain with a fixed object and direction,” Bevel said. “I have reference.”

Perhaps most important, make sure you can identify the photographs. For example, a group of bloodstain photographs might include an intermediate image with the group name, such as Group A. Photographs of individual stains within the group would be A1, A2, A3, and so on.

In photographs of cast-off blood or projected blood patterns, a 360° protractor in the image is used to indicate the direction of travel for the blood. Zero is always aligned with magnetic north, while the protractor indicates the direction of travel.

Do not overlook a person-of-interest’s clothing

While there are few hard-fast rules that fit every situation, one rule worth considering involves clothing. “I would encourage all investigators who have a person of interest to collect that person’s clothing,” Bevel said. “Even if it is not evident to the unaided eye or even a flashlight, that doesn’t mean blood is not there. And that includes not just their shirt and pants, but also footwear and socks.”

Bevel explained that the reason for such thorough scrutiny of the clothing is because blood on cloth can be difficult to see. He noted that in a 40-hour course that he teaches on bloodstain-pattern analysis, one lesson includes examination of a white, cardboard test strip and dark denim material.

“Ninety-nine times out of 100, the students won’t see blood on the denim jeans,” Bevel said. “They’ll see it on the white cardboard. The problem is, white cardboard is not usually found at crime scenes. But you always find items like jeans.”

Another common mistake involves reading too much into the physical evidence. Gardner noted that while immense information is often available through good use of bloodstain-pattern analysis, it is not a time machine that takes investigators to the moment of the crime or accident.

“It can be difficult to tell from bloodstain patterns if someone was hit

The Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN) was formed to establish a standard of working guidelines and terminologies for bloodstain-pattern analysis.

by a fist or hit by hammer,” Gardner noted. “You might not even be able to differentiate a gunshot from some other force. New people, especially, may take this information too far. They’ll say, ‘This pattern may be from this event,’ when—in reality—you may not really be able to safely say that.”

Avoiding these mistakes starts with good methodology. This includes:

- ❑ Enter the scene, such as a room, and first become familiar with the overall area and contents.
- ❑ Identify the discrete bloodstain patterns on the surfaces and attempt to categorize them. Are bloodstains categorized as contact, pooling, cast-off, or some other pattern?
- ❑ Evaluate the bloodstain-pattern features such as direction, motion, relationships, or impact angles.
- ❑ Consider how this evidence could have been produced. What kind of wounding mechanisms were involved?

“A cast-off pattern is a good example of how you should use your methodology,” Gardner said. “A novice might immediately associate a cast-off pattern with a weapon, but that’s not necessarily the case. It could be caused by a defensive mechanism—bloody hair swinging, for example. You can’t take the evidence too far. Don’t overanalyze; just look for an explanation that could fit what you’re seeing.”

The courtroom is the ultimate test

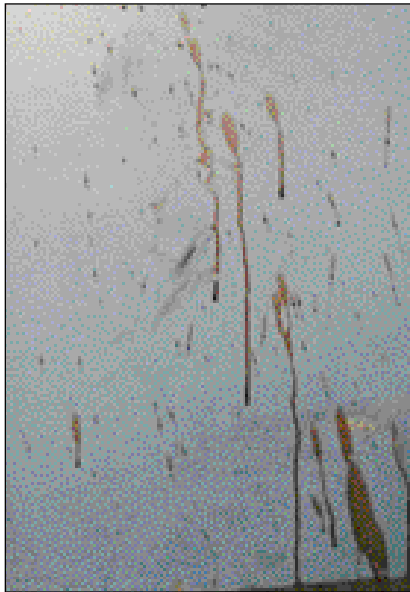
Bevel noted that of all the media, video is especially prone to error, perhaps



IMPACT SPATTER results when a blood source is broken up at a point (a blow to an exposed wound, for example) and the blood is forced out into the surrounding area as small circular and elliptical stains that radiate from a central point. Using mathematical analysis of stains in the pattern, bloodstain-pattern experts can define the area of origin in three-dimensional space.



CAST-OFF PATTERNS result when an object becomes bloodied and is then put into motion. Droplets detach due to inertia throughout the movement (a swing, for example). This results in linear and curvilinear orientations. In the above photograph, the pattern moving right to left is impact spatter. The pattern moving up and down is a cast-off pattern.



ARTERIAL PATTERNS result when a stream of blood is projected under pressure. The specific orientation is very much a function of how the stream is directed at the target. Arterial patterns can present distinctly different orientations. In this photo, the stream was directed obliquely and downward. A hallmark of an arterial pattern is the large volume of evidence in the individual stains.



PASSIVE STAINS result when gravity is the primary force of break-up. The resulting stain sizes are much larger than those found in typical impact spatter and cast-off patterns. In this photo, the blood drops are almost circular in nature.

Proper documentation is needed to accurately work with other investigators... and proper documentation is needed when it is time to make a convincing presentation to a jury in a courtroom.

because videographers assume that the camera does all the work for them. To be effective, all forms of documentation must provide the information an investigator or prosecutor needs—and must also serve to communicate that information to a jury.

“The courtroom is the ultimate test,” Bevel said. “That’s why, if you haven’t documented the evidence—and documented it well—you don’t really have it.”

Court evidence rules have changed and it is important for investigators to be familiar with acceptance tests. After a virtual parade of decisive court cases in recent years, evidence requirements now stipulate similar standards for all forensic work, although that is likely to change with future rulings.

“The most important point is that you document what you have,” Bevel said. “As long as your documentation is good, then the person who is testifying can work with it.”

Gardner noted one area that is confusing to almost everyone, from rooky police officers to judges: terminology. While this particular issue is not limited to bloodstain-pattern analysis, it is especially evident here because the science behind the field grew from multiple law-enforcement sources, rather than a single scientific source.

“This discipline developed within the law-enforcement services, instead of being developed in the scientific community,” Gardner explained. “As a result, there may be different ways to describe the same pattern. That can cause a problem as juries hear different things from different experts.”

One group, sponsored by the FBI, is currently working to clear up this issue. The Scientific Working Group on Bloodstain Pattern Analysis—usually known by its acronym SWGSTAIN—was formed to establish a standard of working guidelines and terminologies. Gardner is chairman of the group’s taxonomy and terminology committee.

“We’re wrestling to get everyone on the same page,” he said. “You read different books and they will agree almost absolutely on facts, but there are differences of terminology. We need to find functional agreement.”

This discipline is not “as seen on TV”

Both Bevel and Gardner expressed some disappointment over the portrayals of their science as seen on popular television shows. They appreciate the increased awareness among the public and law-enforcement personnel. But they explained that, all too often, the assumptions planted in the mind of the public lead to problems in the courtroom.

“But anything that helps or forces police to be more energetic can’t be all bad,” Gardner said. “We don’t always like it because it requires extensive resources, but our communities expect good investigation. Unless you’re doing the proper work in the field, you won’t get that level of investigation.”

The two veteran officers also are not bothered when their science is utilized by the defense as well as for prosecution.

“Right is right,” Bevel concluded. “If you don’t have the evidence, then you don’t have the case.”

FOR MORE INFORMATION

Tom Bevel and Ross Gardner wrote a book on this subject: *Bloodstain Pattern Analysis*. The book is currently in its second edition and can be obtained from CRC Press: www.crcpress.com

ORGANIZATIONAL CONTACTS

Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN)

www.fbi.gov/hq/lab/fsc/backissu/july2002/swgstain.htm

International Association of Bloodstain Pattern Analysts
www.iabpa.org