

ATLAS

Terminology is the basis of a discipline's work. How to pretend to implement a discipline, whatever it is, without knowing its specific terminology?

This specific terminology, which must be common, allows communication between peers despite the barrier of the spoken language.

Thus, in **BPA**, as in any other forensic discipline, how can one envisage a review of the analyzes conducted by another expert, if the terms used are not the same for two colleagues, or if they are not defined in the same way?

Terminology is therefore essential for our work and our exchanges. That is why the SWGSTAIN group proposed, in 2008, an English terminology¹ today approved as the norm². This work, which I had the privilege of participating in, is the result of three years of discussions on each of the 800 terms used in the United States at the time, for which there were 255 definitions.

1. Altered Stain

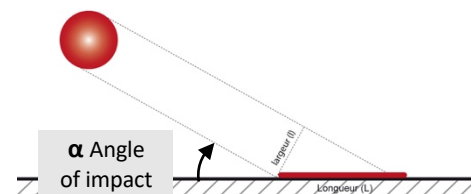
A **bloodstain** with characteristics that indicate a physical change has occurred.



CRITERIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	This bloodstain may correspond to all patterns of bloodstains. It indicates only a lack of some criteria allowing an objective classification.				

2. Angle of Impact (α)

The acute angle (alpha), relative to the plane of a **target**, at which a blood drop strikes the **target**.



3. Area of Convergence

The area containing the intersections generated by lines drawn through the long axes of individual stains that indicates in two dimensions the location of the blood source.

4. Area of Origin

The three-dimensional location from which spatter originated.

5. Bloodstain

A deposit of blood on a surface.

¹ <http://www.swgstain.org/resources>

² <http://www.iabpa.org/bpa-resource-links>

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6. Bloodstain pattern

A grouping or distribution of **bloodstains** that indicates through regular or repetitive form, order, or arrangement the manner in which the pattern was deposited.

7. Bubble Ring

An outline within a **bloodstain** resulting from air in the blood.

8. Directionality

The characteristic of a **bloodstain** that indicates the direction blood was moving at the time of deposition.

9. Directional Angle (γ)

The angle (gamma) between the long axis of a **spatter stain** and a defined reference line on the **target**.

10. Edge Characteristic

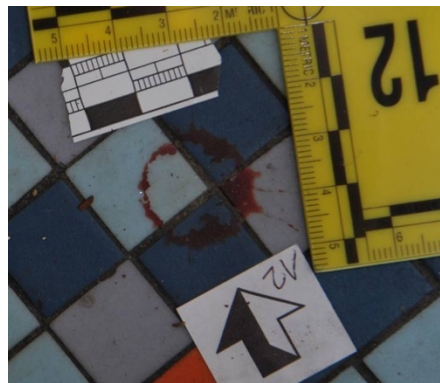
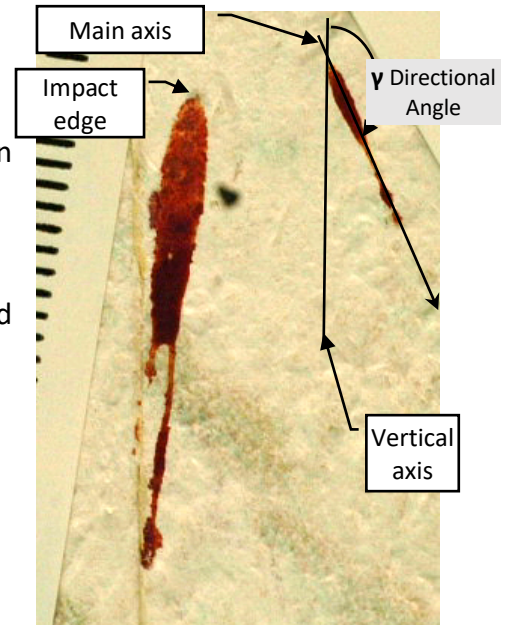
A physical feature of the periphery of a **bloodstain**.

11. Parent Stain

A **bloodstain** from which a **satellite stain** originated.

12. Perimeter Stain

An **altered stain** that consists of the peripheral characteristics of the original stain.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Net outline	Not applicable	Not applicable	Not applicable	Possible for all patterns of bloodstains but more common for drip bloodstains

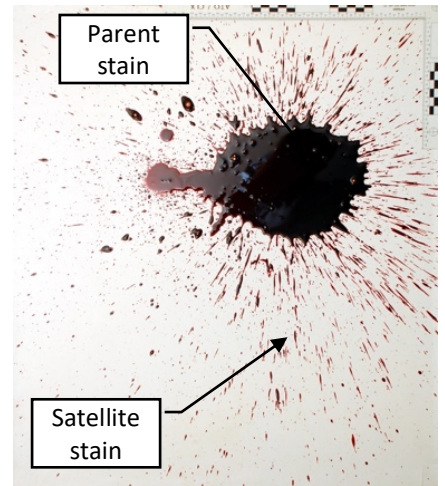
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13. Satellite Stain

A smaller **bloodstain** that originated during the formation of the **parent stain** as a result of blood impacting a surface.

14. Target

A surface onto which blood has been deposited.



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The Bloodstain Pattern Analysis is the **examination** of the shapes, size, distribution and dispersion of blood traces in order to give an interpretation of the events at their origin.

The first role of the BP Analyst is thus the examination of the **edge characteristics** mentioned above. That is why, it seems to me indispensable that there exists a collection of the whole of the patterns of bloodstains identified by our community. It also allows to see the variety of shapes that can match a pattern of bloodstain.

Such atlas makes it possible to verify through the parameters determined by the description, whether the trace studied corresponds to the identified pattern. It is the reference as are the "Types" in biology. It is also the basis for an **objective classification**, considering only the visible morphological parameters of the trace studied.

Each bloodstain must be described rigorously. It is then possible to extract **specific criteria** to identify each pattern from the others, to name it and associate the mechanism that caused it. We then have a morphological identification card for each pattern template.

The patterns of bloodstains are all defined by their mechanism of creation. This makes it possible to make the link between the **identification** criteria of the studied model and the analysis that will be made thereafter through the mechanism that produced its existence. It is then easy to understand the importance of each of these terms and to use the correct term for each trace studied.

This association bloodstain studied / pattern identified is achieved through the classification which, to be as objective as possible, is based on specific **morphological characteristics** to classify the bloodstain.

At the time of our intervention, these patterns of bloodstains are most often altered by various factors:

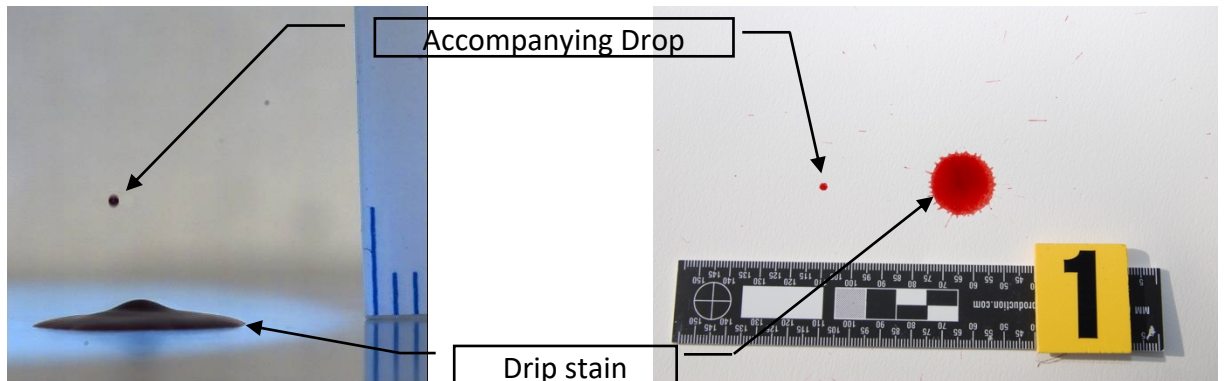
- The alteration of the bloodstains during the sequences of events and / or during the displacement, voluntary or not, of the victim. Other models of traces can be added which will be transfers.
- Overlay, where different patterns of blood traces interact by partially overlapping. This makes it difficult to identify them.
- The time between the events and our intervention will first cause the formation of the blood clot with the appearance of the serum trace. Dehydration will follow within a time, depending on external factors. Then the trace disintegrates very easily, and a movement of air is sufficient.
- During the observations, the spill will be systematically altered when the victim is found on the same site. The examination of the body on site causes manipulations of it which, not only, can create traces, but alter others. The lifting of the body requires the taking in hand of the victim and therefore the movements thereof, most often in contact with the target surface.

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1. Accompanying Drop

A small blood drop produced as a by-product of drop formation.

It is the rupture of the capillary link which links the drop to its origin surface. It follows the drop and is most often included in the drip stain, but it can be disjointed and form a trace in itself.

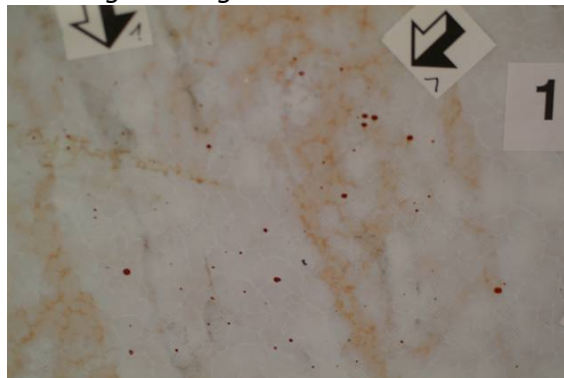


CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Circular	~1 mm	Systematically close to a drip stain	Not applicable	Can be confused with a spatter

2. Backspatter Pattern

A **bloodstain pattern** resulting from blood drops that traveled in the opposite direction of the external force applied; associated with an entrance wound created by a projectile.

Their presence and quantity depend on the weapon / ammunition pair. Their presence is not systematic when shooting with a gun.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Mostly circular	<1 mm (~0,1mm)	Concentric	Not tight	//

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3. Blood clot

A gelatinous mass formed by a complex mechanism involving red blood cells, fibrinogen, platelets, and other clotting factors.

The action of these active factors remains partly related to environmental factors such as the nature of the substrate, the temperature, the volume of blood present and the humidity. These mechanisms lead to a retraction of the solid part of the blood, causing its separation from the liquid part (plasma become serum).



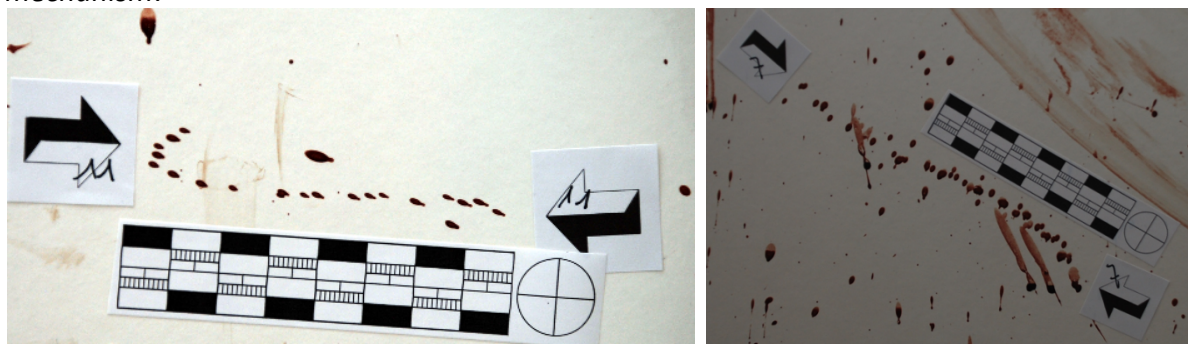
CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Linked to the target	Linked to the volume of blood available	Linked to the roughness of the target	Concentrate stain	Darker color and thick consistency

4. Cast-off Pattern

A **bloodstain pattern** resulting from blood drops released from an object due to its motion.

This pattern is typical of projecting mechanisms. It is found most often when blows are preferably worn with a blunt object. Its visualization requires a 3-dimensional observation of the crime scene knowing that some of the projections constituting it may be very far from the fact zone but also from the other spatters of this pattern. They can meet on the clothes of the aggressor, on the back and are, therefore, very incriminating.

Simply shaking a bloody element also creates cast-off patterns. The distribution criteria of the actual cast-off spatter may be difficult to identify, but it is the same creative mechanism.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	evolving from circular to ovoid	<3 mm	Linear or parallel axes	Not applicable	Parallel directional axis

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5. Cessation Cast-off Pattern

A **bloodstain pattern** resulting from blood drops released from an object due to its rapid deceleration.



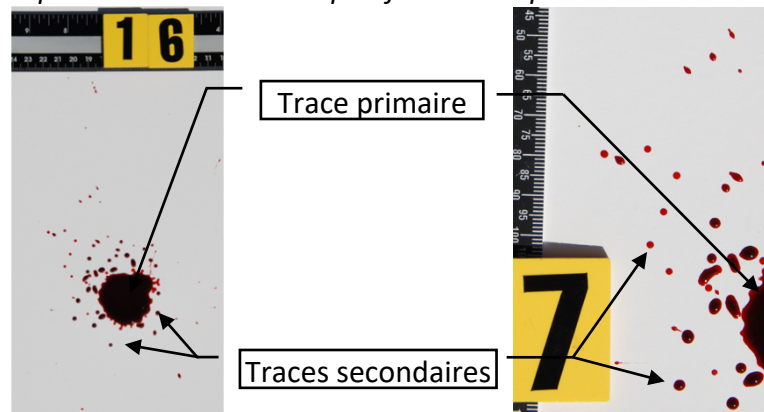
CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Ovoid stains	<3 mm	Wide cone	Not applicable	Often close to a spatters line (Cast-off pattern)

6. Drip Pattern

A **bloodstain pattern** resulting from a liquid that dripped into another liquid, at least one of which was blood.

This broad definition considers the most common cause which is drip stains falling all in one place. She then describes the immobility of a bloody element.

To date, no description indicates the shape of the same pattern on an inclined surface.



CRITÈRIA		Shape	Size	Distribution	Dispersion	Miscellaneous
	Parent stain	Net outline	Function of the amount of blood	Central	Not applicable	//
	Satellite stain	Circular	<10 mm	Peripheral	Not applicable	//

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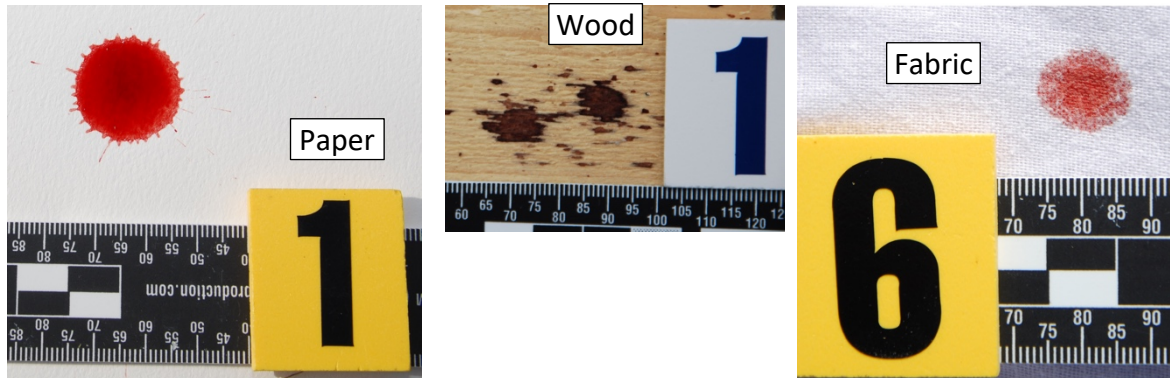
7. Drip Stain

A **bloodstain** resulting from a falling drop that formed due to gravity.

Despite a common origin, the drip stain may have various shapes depending on the type of target surface but also on the angle of impact (fall on a horizontal support or not) even if the circular shape is most often associated with this pattern. Its diameter (circular trace) is a function of the volume of the drop and its height of fall. The roughness of the target surface is an essential factor in modifying the stain shape. To this roughness is added a phenomenon of impregnation when the support is porous as a fabric. The angle of impact is a factor that can disturb the analyst even if these consequences are only observable for angles less than 60 °. Although well known, the angle of impact is most often associated with impact projections and its effect on drip stain is often obscured.

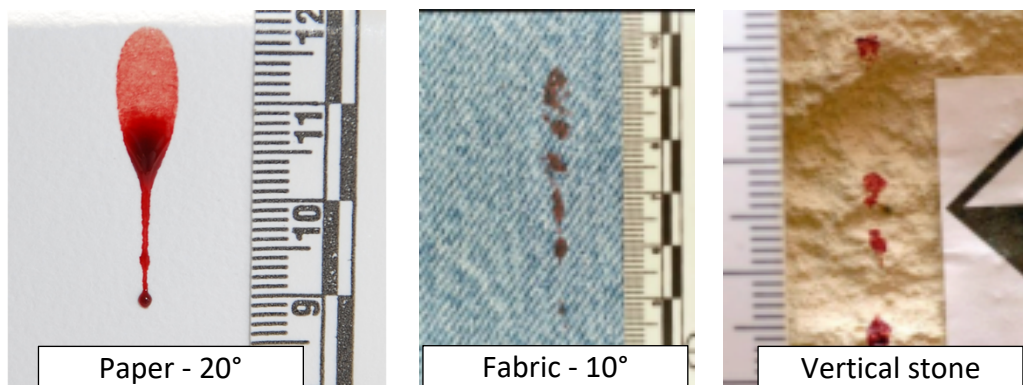
These factors make the drip stain, a pattern of bloodstain much more complex than it seems. Being by far the most frequently encountered model on a bloody crime scene, it requires special attention.

7.1. Horizontal target



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Circular	>3 mm	Not applicable	Not applicable	Deformation depending of the target

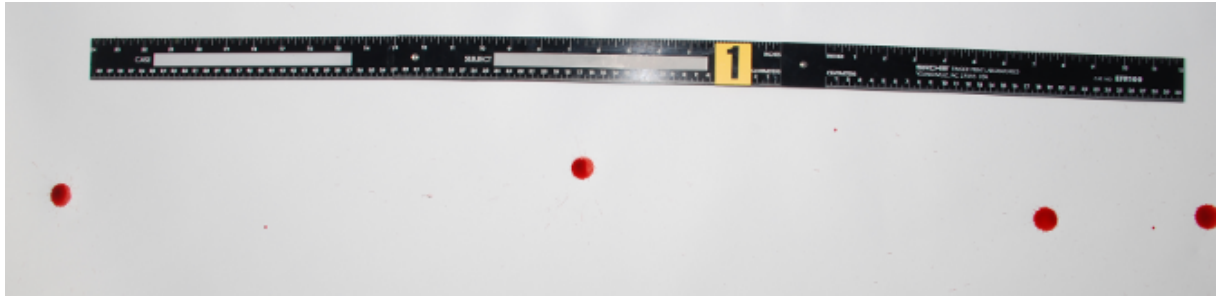
7.2. Non horizontal target



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Ovoid	>3 mm	Not applicable	Not applicable	Deformation depending of the target

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8. Drip Trail

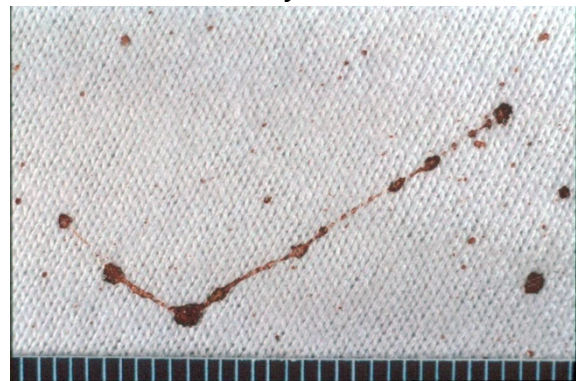


CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Each stain is circular	Each trace >3 mm	Linear set	Not applicable	Deformation of each bloodstain, depending of the target

9. Expiration Pattern

A **bloodstain pattern** resulting from blood forced by airflow out of the nose, mouth, or a wound.

This pattern can be identified on its morphological characteristics but sometimes, the nature of the support makes difficult their observation. This is why it is always useful to learn about the presence of blood in the upper airways or an injury to the airways. Some use an amylase test (present in saliva) to corroborate their identification.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Circular to ovoid	Heterogeneous	Concentric	Not applicable	Presence of air bubbles, mucus, saliva, dilution

10. Flow Pattern

A **bloodstain pattern** resulting from the movement of a volume of blood on a surface due to gravity or movement of the **target**.

This pattern indicates that the amount of blood on the target surface is such that gravity can play its role by attracting some of this amount to the ground, following the shape of the target surface. The volume of blood plays a vital role in the creation of one or more flows and their size.

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The movements and / or changes of position of the target including the skin's victim are then indicated by changes in the direction of the flows (eg a person standing and lying down). Thus, on the body of the victim, they are important source of information about his mobility while already injured. Source of information that is difficult to save because these models of traces will be altered during the transport of the body to the Forensic Institute and cleaned before the autopsy.



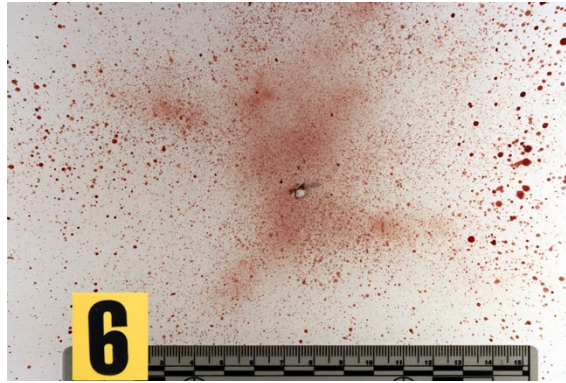
CRITÈRIA	Forme	Taille	Distribution	Dispersion	Divers
	Regular and parallel edges	Linked to the amount of blood source	Not applicable	Not applicable	Deviation due to target and / or movements

11. Forward Spatter Pattern

A **bloodstain pattern** resulting from blood drops that traveled in the same direction as the impact force.

An exception to this existence is a sore gunshot wound where the existence of a true exit wound is not obvious. Like all traces of firearm use, their presence and quantity are dependent on the weapon / ammunition pair.

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CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Mostly circular	<1 mm	Concentric	Wide and foggy dispersion in the vicinity of a ballistic orifice	//

12. Impact Pattern

A **bloodstain pattern** resulting from an object striking liquid blood.

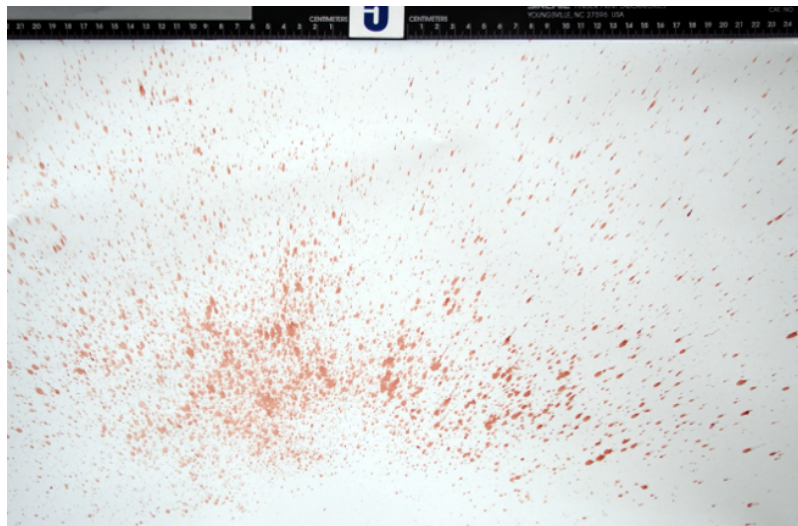
This pattern can be met in criminal facts or not since it applies to all percussions. It gathers very different acts since we find there the fact to hit a blow but also the fact of violently striking a support and the shock resulting from the contact between the guard of the knife or the hand holding it during a stabbing. In the case of a ballistic injury, the forces involved are such that it is not easy to identify an impact pattern.

It is important to note that in real facts, it is very rare that a single shot is enough to create this pattern. When studying the distribution of the spatters of this pattern, it is important to have a 3-dimensional view of the places and to keep in mind that if the spatter does not encounter a target surface at a sufficient distance, it will fall to the ground in a more or less parabolic trajectory.

It is important to also specify that the spatter is not necessarily ovoid. Its location in relation to the target surface is decisive for its shape.

The nature of the shock, the volume of the weapon used, the nature of the wound, its location, the amount of blood already present are factors that influence the dispersion of these traces.

The morphological criteria defining this impact pattern make it possible to carry out a study of trajectories.



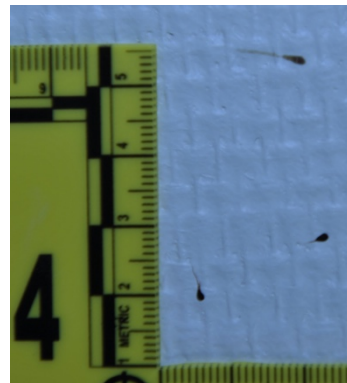
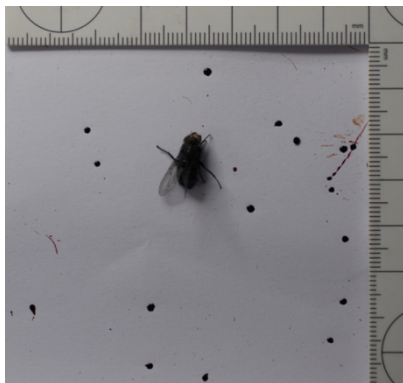
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CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Ovoid to circular	<3 mm	Converging	Wide dispersion with possible void zones	Convergence to a group of circular spatter

13. Insect Stain

A **bloodstain** resulting from insect activity.

This pattern is the result of entomological activity on the crime scene. The flies of the first squad (Calliphora sp.) plays the most important role but we must not omit that of opportunistic insects. Flies ingest blood on a source surface and will regurgitate it in other often bright places, becoming target surfaces. Their nearness of shape with projections causes great confusion among untrained technicians.

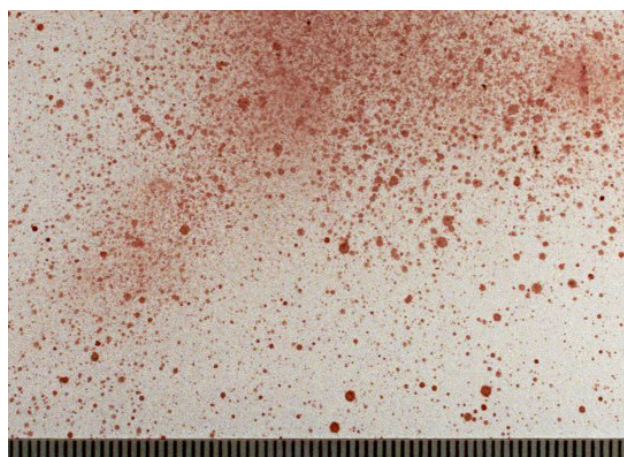


CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Circular	1-2 mm	Concentrate	On bright areas	Thickness of the periphery

14. Mist Pattern

A **bloodstain pattern** resulting from blood reduced to a spray of micro-drops as a result of the force applied.

This pattern is not exclusively related to the use of a firearm even if it refers to it frequently. It designates dense distribution spatters. These are the immediate result of the distance between the source and target surfaces. The closer they are to each other, the more this model will be visible. He can therefore be absent in the same way.

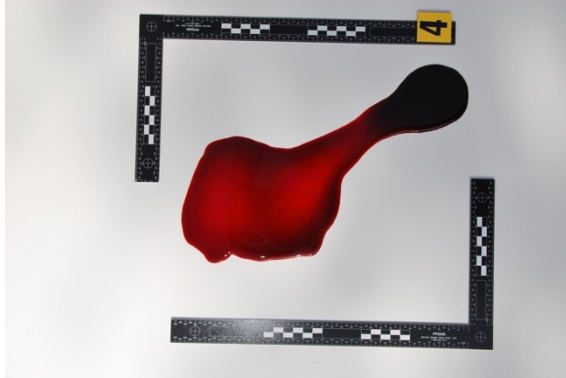


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CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Circular	<4 mm	Dense, foggy	Not applicable	//

15. Pool

A **bloodstain** resulting from an accumulation of liquid blood on a surface.



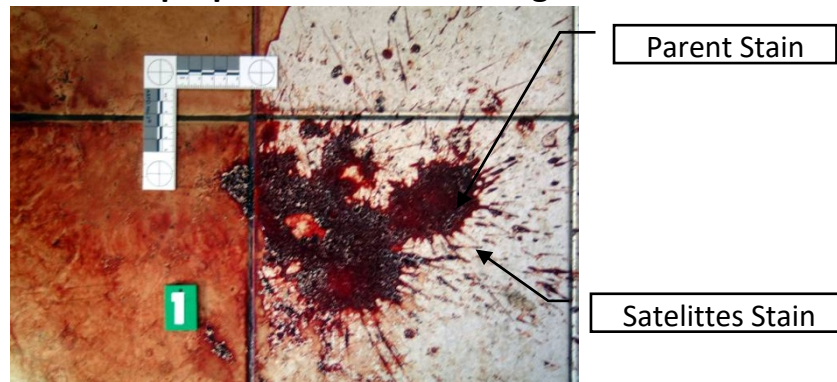
CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Regular outline related to the target	Linked to the volume of blood available	Not applicable	Not applicable	Frequent alterations following other actions. Nonporous target surface

16. Projected Pattern

A **bloodstain pattern** resulting from the ejection of a volume of blood under pressure.

It is most often associated with blood pressure and even regularly limited to blood pressure. However, Rex Sparks (IABPA 2006) demonstrated, through a real case, that a pierced varix causes the same type of pattern.

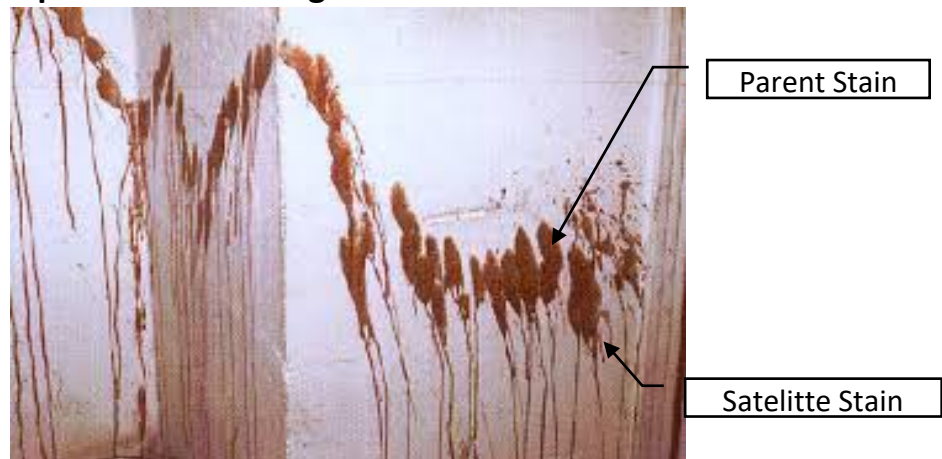
16.1. Without motion or perpendicular to the target



CRITÈRIA		Shape	Size	Distribution	Dispersion	Miscellaneous
	Parent stain	Spiny	Linked to the volume of blood available	Central	Not applicable	Spines follow the axis of fall
	Satellite stain	Ovoid, tapered	<10 mm	Peripheric	Wide	Cone follows the spines

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16.2. Motion parallel to the target



CRITÈRIA		Shape	Size	Distribution	Dispersion	Miscellaneous
	Parent stain	Ovoid	Linked to the volume of blood available	Linear or curvilinear	Not applicable	Existing flows
	Satellite stain	Ovoid	<10 mm	Conical	Not applicable	//

17. Saturation Stain

A **bloodstain** resulting from the accumulation of liquid blood in an absorbent material.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Regular but diffuse outline	Linked to the volume of blood available	Not applicable	Not applicable	Porous target surface

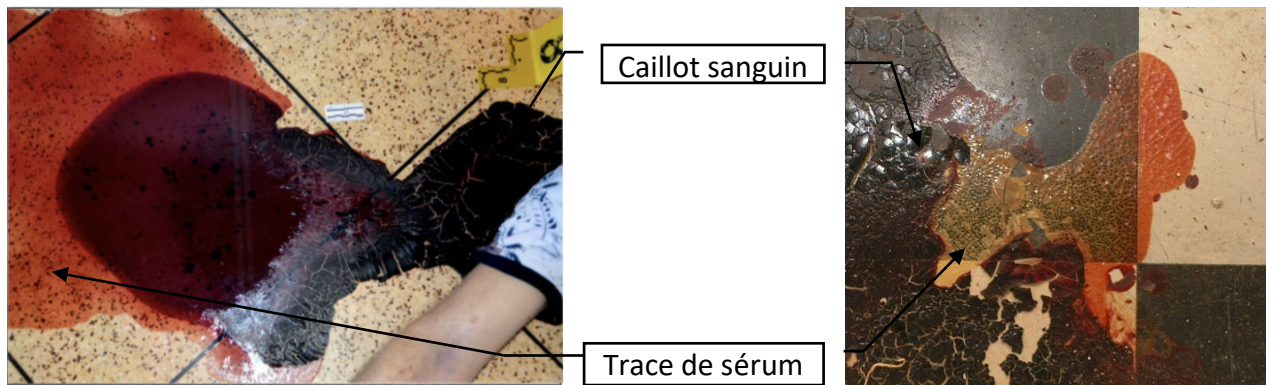
18. Serum Stain

The stain resulting from the liquid portion of blood (**serum**) that separates during coagulation.

This pattern results from the formation of the blood clot. This is the liquid part of the blood freed from its figurative elements.

From a light red to yellow color, this trace regularly causes errors in the interpretations of the detectives.

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CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Link to the target	Linked to the volume of blood available	Linked to the roughness of the target	Lateral to a blood clot	The low viscosity of the serum makes it easy to move according to the inclinations of the target

19. Spatter Stain

A **bloodstain** resulting from a blood drop dispersed through the air due to an external force applied to a source of liquid blood.

This generalist pattern identifies all the bloodstains resulting from the application of an external force. It applies to all traces or models of traces that cannot be precisely identified.



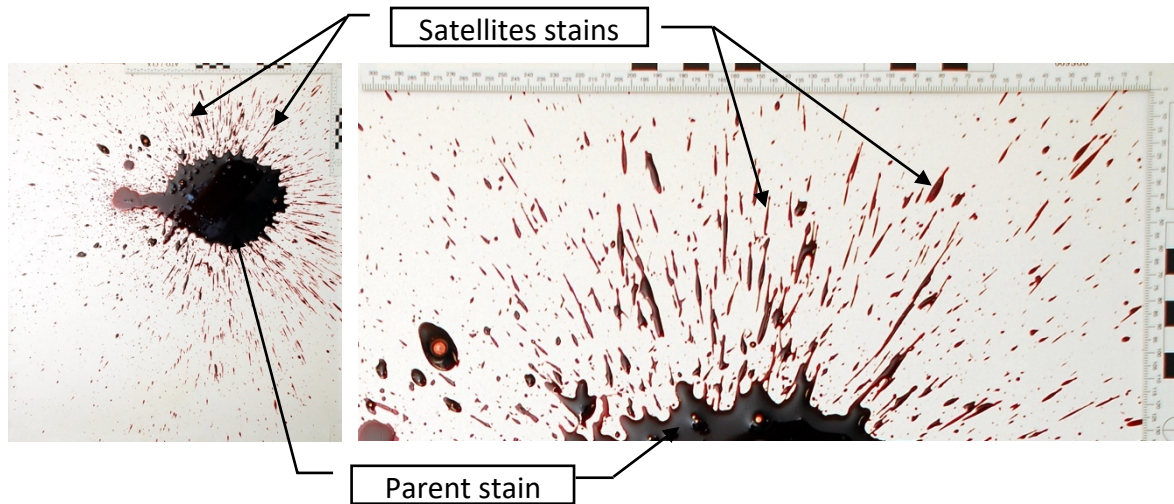
CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Ovoid to circular	<3 mm	None	Not applicable	Alteration by the target

20. Splash Pattern

A **bloodstain pattern** resulting from a volume of liquid blood that falls or spills onto a surface.

This pattern responds to the same mechanism as the drip stain. Its specificity is that it is not about the fall of a single drop.

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CRITÈRIA		Shape	Size	Distribution	Dispersion	Miscellaneous
	Parent stain	Altered outline	Linked to the volume of blood available	Central	Not applicable	//
	Satellite stain	Ovoid	<10 mm	Peripheric	Not applicable	//

21. Swipe Pattern

A **bloodstain pattern** resulting from the transfer of blood from a blood-bearing surface onto another surface, with characteristics that indicate relative motion between the two surfaces.

This pattern refers to the moving contact of a moist blood-covered element with the unscreened target surface. It is then possible to determine the direction of movement and to give morphological characteristics of the source surface.



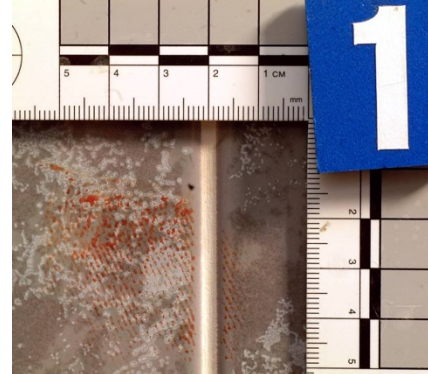
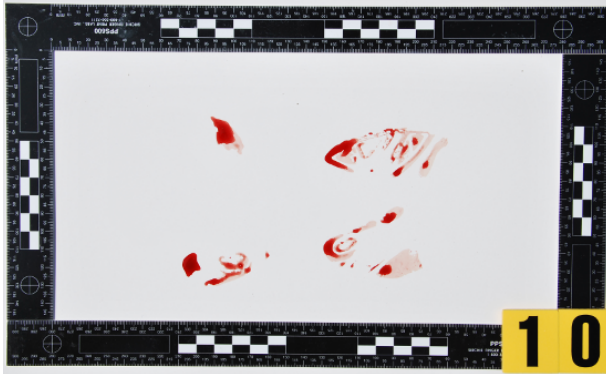
CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Irregular outline, Internal striation	Linked to the source	Not applicable	Not applicable	Heterogeneous distribution of blood showing the direction of movement

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22. Transfer Stain

A **bloodstain** resulting from contact between a blood-bearing surface and another surface.

This pattern refers to the contact of a wet blood-covered element with the target surface not yet soiled. Morphological characteristics of the source surface can then be identified.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Not	Linked to the source	Not applicable	Not applicable	//

23. Void

An absence of blood in an otherwise continuous **bloodstain** or **bloodstain pattern**.

This pattern is a form of alteration where the absence of bloodstains in a bloody area becomes a pattern in its own right. It indicates that an item (object or person) was there at the time of creating the first pattern. This void can show the complete outline of the element in question or just show us an interruption in the distribution of the bloodstains.

This pattern is often useful for inferring the position of the attacker.



CRITÈRIA	Shape	Size	Distribution	Dispersion	Miscellaneous
	Linked to the source and to the target	Link to the source	In a bloody area	Not applicable	//

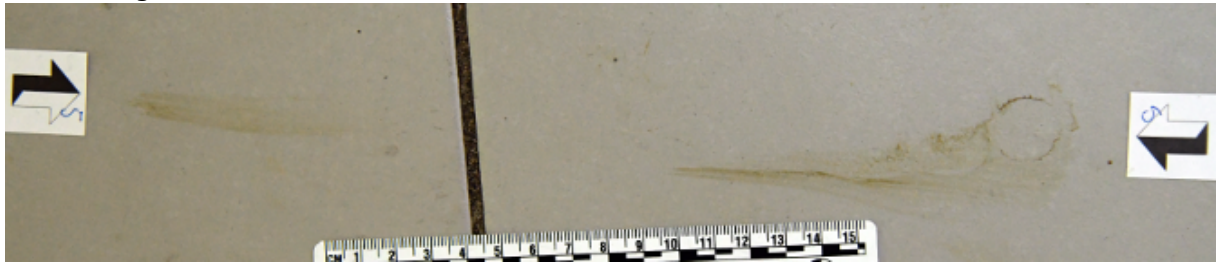
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24. Wipe Pattern

An **altered bloodstain pattern** resulting from an object moving through a preexisting wet bloodstain.

This pattern designates the moving contact of a bloody element or not with the studied surface. The recognition of this pattern is not easy because it requires that characteristics of the pre-existing pattern are still present.

In the same way as for the transfer by shifting, it is possible to determine the direction of movement and to give morphological information of the surface coming to alter the pre-existing trace.



CRITÈRIA		Shape	Size	Distribution	Dispersion	Miscellaneous
	Pre-existing pattern	Not applicable	Not applicable	Lateral arrangement	Not applicable	//
	Other	Regular outline, Internal striation	Linked to the volume of blood available	Not applicable	Not applicable	//