

International Association of
Bloodstain Pattern Analysts News,
Vol 8, #4, Dec., 1992, pp 5-22.
History #1

SEGMENTS OF HISTORY IN THE DOCUMENTATION
OF BLOODSTAIN PATTERN INTERPRETATION
SEGMENT 01: 1901 - 1910

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This is the second installment in a series of Segments of History in the Documentation of Bloodstain Pattern Interpretation. The period of time covered in this segment is the first decade of the twentieth century, 1901 - 1910. The previous installment covered literature in this field up through 1900.

1901 - A. FLORENCE was mentioned by Thorwald in **Crime and Science**¹ and **The Century of the Detective**². In the former book he wrote the following: "Nevertheless, by that time a whole arsenal of methods had been developed for detecting blood. Some criminologists had even attempted to deduce the course of a crime from the location and shape of blood spatters. The French researchers, Florence and Fricon, had worked out a whole system for classifying bloodstains caused by dripping, splashing, spurting, or grazing contact. Round stains, or roundish jagged stains, for example, indicate that the blood fell vertically; oblong stains result from impact at various angles. Blood that spatters perpendicularly but with no great force against a vertical plane leaves stains quite different in appearance from blood spurted obliquely to

left or right, or up or down. Blood falling vertically upon horizontal surfaces produces different types of stains according to the height. Blood oozing out drop by drop and falling upon the same spot can easily be identified by the shape of the stain. Spurting arterial blood can be distinguished from splashed blood. The stains formed by dragging a bleeding body are quite different from those imprinted on a vehicle that has run over or hit a person or animal."

From Thorwald's book it certainly appears that the research of Florence and Fricon was highly significant. However, as yet I have been unable to locate a copy of the original reference. One of my colleagues in Paris sent me a copy of an article by Florence³ but, unfortunately, it contains nothing of blood-stain patterns but discusses the spectroscopic examination of blood. All we know about this missing article is that it apparently was published by both Florence and Fricon around the turn of the century and quite likely it appeared in the journal **Archives D'Anthropologie Criminelle de Criminologie**. If someone finds the correct reference please send it to me so I can review it in detail.

1901 - EDWARD S. WOOD ⁴ was a Professor of Chemistry at the Harvard Medical Society. He made a detailed study of blood-stain patterns as well as many excellent observations on the drying of blood and its change in color as a function of time. Dr. Wood outlined the importance of a preliminary examination

during which he suggested "a very careful observation of the gross appearance of the stains. This may throw a great deal of light on the case, particularly with reference to the age of the stain and the direction from which the blood came which made the stain."

"In the first place, the color of the stain should be observed. A blood stain, when exposed to the ordinary action of light and air, grows perceptibly darker for a period of about 10 days. The blood color changes from the bright light red of a fresh stain to a distinct brownish color at the end of 10 days, as may be seen from these specimens (exhibits shown)."

Wood discussed the correlation between bloodstain diameter and the volume of liquid blood that would be required to produce it. He stressed the systematic examination of bloodstains using: 1) chemical tests, 2) optical methods, and 3) microscopic examination for the detection of the red blood cells.

More specific examination of bloodstains is discussed. The types of tests covered include: chemical, guaiacum, hemin, sodium tungstate, spectroscopic, microscopic, and agglutination. Dr. Wood also discussed whether bloodstains were pure or stains that contained blood contaminated with foreign substances. He characterized stains of this type such as nasal or menstrual blood. Washed bloodstains are mentioned when an attempt was made to wash out bloodstains with water.

As one of the earliest references in this discipline it is appropriate to quote more from Wood's 1901 text:

"The next point of importance is the exact form of the blood stain. In some cases, after the blood has been spattered, the shape of the stain will sometimes show very accurately the direction from which the blood came, with reference to the object upon which the blood stain is situated. When a drop of blood strikes upon a smooth surface at an angle more or less acute, the form of the stain assumes more or less the shape of a pear, - the portion furthest away from the source of blood forming the stem of the pear, while the broader end of the stain, corresponding to the body of the pear, will be nearest the point from which the blood came. Thus, when the surface upon which the blood drop impinged be horizontal, the larger amount of the blood will be found at the stem end of the pear-shaped stain, so that the dried stain will be thicker at this end than at the broader end. If, however, the surface upon which the blood impinged be vertical, then the fresh stain is influenced by the force of gravitation, and the bulk of the blood will gravitate back to the lower part of the stain, in case the point from which it came is below the point upon which it has been formed. If the surface upon which it has impinged is a very rough surface, it will coagulate so quickly that, even though the surface be vertical, the bulk of the blood will remain at the stem end of the pear-shaped stain, and will not gravitate back to the broader end, in the case

the direction of the blood drop was from below upwards. This point has been very important in some cases, as, for instance, when the blood has spattered from a body lying on the ground, the striking upon the surface of a shaggy overcoat, or other garment, worn by the person committing the assault. If the drop of blood strikes any object at right angles to the object, the form of the stain is usually round."

Dr. Wood mentioned his participation in the celebrated Borden case by reference to the drying time of blood. He concluded that some one to two hours must have elapsed between the death of Mr. Borden and Mrs. Borden based upon the nature of blood-clotting and drying. He observation that, "A drop of blood dries much more slowly than a drop of water of the same size. The drying of the blood stain will be influenced somewhat by the condition of the atmosphere, but only within comparatively narrow limits."

This relatively short article by Dr. Wood contains much worthwhile information on bloodstain pattern interpretation. He demonstrated a good knowledge of the scientific method and may be regarded as one of the first, if not the first, American who conducted meaningful experimentation in this discipline.

1901 - ZIEMKE STRASSMAN⁵ discussed blood volumes in general terms. He also described methodology for quantitative blood examinations.

1902 - JOHN GLAISTER⁶ was a physician who had great appreciation for the value of bloodstain pattern evidence. He wrote, "The examiner must expect to meet every possible variety of stains, both in respect of character, incidence, and magnitude; as (a) sprays, spirts, or jets; (b) smears of various forms; or (c), pools of blood." In his chapter Blood-Stains, and Examination of Blood, he continued, "The relation of the direction of spray of blood to the position of a wounded body when found, and the presence of such in the vicinity of the body or the place where the body is found, ought to be carefully noted on a rough plan sketched upon the spot, after measurements have been duly taken, because such may indicate the position of the person at the time of wounding, or the place where a given wound might have been caused."

Dr. Glasiter noted that the color of blood stains varied because of a number of circumstances and listed the following:

- 1) age of the stain
- 2) amount of blood composing it
- 3) nature and color of the material upon which it has been effused.

He also discussed reasons for the "feel" of garments that were stained with blood as follows: "By reason of their albuminous composition, blood-stains, when dry, impart a stiffened or starchy feel to thin fabrics, such as those composed of

cotton, wool, silk, or linen; and even on thick worsted or woolen tweek-stuffs, blood mats together the fibers, as seen through a hand lens. On iron, steel, or metal generally, they look like dark, shiny spots or smears, and when desiccated, are often found to be fissured or cracked."

Dr. Glaister described how the physical examination of bloodstains ought to be conducted. He proposed solvent systems for the removal of bloodstains from various surfaces and suggested that the best solvent should "simulate as nearly as possible the specific gravity of the *liquor sanguinis*. The best solvent for this purpose is one composed of seven parts of water and one part of glycerine."

Cloth fabrics: it is necessary to digest the cloth in either a weak solution of citric acid or of ammonia.

Wood: the kind of wood may be important, usually the glycerine solution is adequate but with oak a 2 percent solution of hydrochloric acid will be required.

Plaster: scrape off plaster with stain, and proceed as for cloth or wood.

Metal: Heat the side of the object, such as a knife blade, with an alcohol lamp flame. The bloodstain will

probable peel off. This should be done with great care. The same end may be attained without the risks attending the foregoing, by scraping the stain off into a watch glass. He suggests that if the bloodstain is placed on a watch glass placed over a piece of black paper, "then to a drop on the scrapings, after adding a drop of water made feebly alkaline, a tiny drop of hydrogen peroxide, and watch the result. If blood be present even in the slightest trace numerous comparatively large bubbles of gas are developed, which, gradually becoming more numerous, give a white, beady appearance to the surface of the material..Should the above reaction not take place on the addition of the peroxide, then it can safely be affirmed that no blood is present."

Additional chemical tests are discussed wherein the reaction of a stain to ammonia giving the following options:

- 1) color disappears
- 2) color becomes milky from coagulation
- 3) a precipitate falls, which may vary in color.

This reference is a valuable contribution to the early literature on bloodstain pattern examinations. It not only covered the geometry of patterns but also provided more chemistry than other articles of the period.

1904 - HANS GROSS⁷ This book is essentially the same as the earlier edition of 1893. Very little was changes. Gross did add an interesting comment attributed to the forensic chemist Schauenstein, who pointed out emphatically, how often the most important traces are destroyed by curious bystanders.. whether they occurred afterwards due to coincidence or clumsiness.

1905 - A. SCHULZ⁸ briefly discussed an impractical method for the determination of blood volume.

1905 - HENRY FAULDS⁹ Regarding bloody fingerprints Faulds states, "Blood usually gives rather bad impressions, tiny clots blocking up the furrows, but watery blood may often give very good ones, as when a culprit has been attempting to wash his hands."

1907 - W.D. SUTHERLAND¹⁰ Schmidt adversely criticized the experiments conducted by Chevallier and gave the following as being the chief points of difference. Vibert stated that flea stains are 0.5 to 3 mm in diameter, and very similar to bloodspatter. I conceive it to be very likely that, if only a few droplets of blood be present on he clothing of an accused person... the allegation of the defense would be that these droplets were due to insect stains. Sutherland also discussed the spectrum of blood and particularly the crystals of hematin chloride.

1908 - J. DIXON MANN¹¹ did not discuss bloodstain patterns in detail. He did, however, point out that it was "of the greatest importance to determine whether stains on the clothing of the accused, or on a knife or other weapon found in his possession, are or are not due to blood." He recommended three methods useful for the examination of bloodstains which are: Microscopical, Spectroscopical, and Chemical.

1908 - HANS GROSS¹² believed that the search for bloodstains is the work of an expert in the area. He made note of the importance of bloodstains (traces) in a systematic manner:

1) The searching of blood traces:

- Traces of blood destroyed by curious bystanders or unskilled police officers. They create blood artifacts in their ignorance.
- Inform police that nothing should be touched until an expert arrives.
- Bloodstains have the first priority at a crime scene.
- Aware that bloodstains may appear as many different colors other than red, brown. Lassaigue said, "that once a large bloodstain on pavement outside, after a few weeks, appeared to be green, pave tendre en gris."
- Better to identify too many spatters as blood and latter say it is not blood, than to ignore the spatters.
- Sun light on blood soaked linen turns it gray.

- Stains from citric acid and from the source of fruit juices can look deceptively blood-like.
- Bloodstains at a crime scene are never unimportant but they have to be:
 1. found
 2. described
 3. taken off or drawn

The use of a magnesium light is suggested when taking photographs of poor bloodstains. Several case examples are given illustrating correct decisions on what occurred based upon bloodstain pattern interpretation.

- Cases where there is no or very little blood spatter on the assailant.
- Blood fell onto bare ground.

"In such cases twice I sought the help of an experienced hunter, instead of a medico. The hunter is accustomed to follow the blood traces of a wounded animal and indicated with certainty what is blood, and what isn't"

- The use of tracking dogs in outside scenes.
- Says you should avoid identifying blood initially with chemical substances but instead, identify blood by eye only.
- ? guajak tincture as Dragendorf described it.

Each drop falling from some height, causes side spatter. Doesn't take in consideration surfaces blood has fallen on yet. Uses direct comparison of experimental blood spatters with actual scene blood spatters.

2) Description and sketching of bloodstains. Tracing bloodstains for reconstruction purposes. Dr. Gross described movement as a function of directionality. "We will find the rule: the longitudinal axis of the longish stain is situated in the direction of the movement and the side spatter also are only in that direction, of that means the one who caused the stains was into the direction indicated by the side spatter. The stain will grow longer, as the moving speed is increasing."

3) Removing Bloodstains: "the rule is to take possibly every stain in it's natural size and condition."

- Take bloodstained objects when ever it is applicable
- Bloodstains on live plants
- they should cut the stained area and put it into
glycerin water for preservation
- Always try to take what the bloodstain is on rather than
removing it from the object

He was very extensive in when and how to remove bloodstains in the best ways of his time period.

4) The search for bloodstains which were subjected to removal efforts.

- Suspects rarely get all of the blood cleaned out of their nail beds.
- Referring to the red-brown color of blood, they called it "foxy-red."

[Note: no #5 is listed in the text]

6) The storage of blood stains

- Treating of bloodstained items with extreme care.
- Mark all objects clearly, that you plan to keep.

In section headed, "The Removing of Bloodstains", he states the importance of saving blood soaked into the ground. This could be useful in determining the amount of blood lost and whether or not a crime was committed in a specific location. Dr. Gross warns that from a single drop of blood, nobody will draw any meaningful conclusion.

Also discussed is the search for bloodstains which had been subjected to removal efforts. Gross wrote, "Blood easily can be removed with cold water, especially with longer maceration. If warm or hot water is used the blood pigment will be fixed to the target, getting nearly permanent." Bloodstains are set with warm/hot water in much the same manner as egg albumen is set during cooking. This is a very worthwhile reference.

1909 - OTTO LEERS¹³ as yet I have been unable to locate a copy of this reference.

1909 - DR. KENYERES BALAZS¹⁴ wrote a classic forensic text for the period in which he described how to process crime scenes. He included considerable information and diagrams on the value of bloodstain pattern interpretation. He described the value of fold-out cardboard models of rooms, including their ceilings, as a better replica of a crime scene than the more conventional flat, two-dimensional diagrams. He used grid networks of scene objects, such as a fireplace, to show directionality of bloodstains and how they could establish origin of spatter. Balazs discussed many of the classic bloodstain pattern types including expired blood, drip patterns, impact patterns and transfers. [At this time I do not have a word for word translation for this early forensic text which was printed in the Hungarian language]

1909 - MITA¹⁵ This article reportedly describes chemical testing for blood. It also discusses how the volume of a bloodstain may be determined from the weight of a dry bloodstain. As yet, a copy of this article has not been located.

1910 - OTTO LEERS¹⁶ wrote that, "At the scene of the crime it is possible to draw important conclusions from the topography of the traces, that is from the number, the extent, the

position and the clustering of blood traces; otherwise these traces would be lost or the expert would get the knowledge about them at a time, when he wouldn't be able any more to interpret them correctly." He continued, "Sometimes the whole proceeding of the crime can be read from the blood traces, the directions of movement of the victim and offender. These traces answer also the question, whether the place where the victim was found, was the place of the crime."

Leers gave suggestions for the proper packaging of various types of evidence and cited the rule, "Nothing to destroy, before it was exactly examined and described." A good, large loupe is suggested for visual examination. "Blood traces do not always have brown-red coloring; they can assume all possible aspects depending upon their age, target, temperature, sun light, moisture; they can be brown-red, brown, brown-green, olive-green, bright finky (sic), and also colorless grey, as Liman has shown. Washed out blood stains have a wide halo around, which can be colored more intensely than the stain itself.

Leers described the importance of the geometry of bloodstains. He wrote, "The form and shape of blood stains is often very characteristic and offers clues indicating the way of their appearance. Therefore, there are to be distinguished: Stains caused by projection, dropping, wiping, hitting, tapping, and

bloody prints. Blood from a cut open artery, being projected against an object, are often producing stains in the shape of exclamation marks, showing with its round end toward, and with its point away from, the source." Further, "The longer the stain is, the sharper is the angle under which the drop fell onto the target." Although he has many classic bloodstain pattern figures in his book (his Fig. 1 - 5), Dr. Leers also included several interesting examples of his examination of somewhat unusual evidence. For example, he recognized the imprints of knives and hatchets from cloth that was used to wipe these weapons (his Fig. 7). Dr. Leers even described stains from wiping knives and hatchets as being sufficiently characteristic to allow identification of such objects in a general, class manner. In one case he described how he differentiated between blood vs. Tobacco stains on a handkerchief (his Fig. 11). He discussed friction ridge detail on garments and commented on fingerprint identification (his Fig. 8 and 9).

Regarding cast-off patterns, Leers wrote, "such exclamation marks may also be cast off from a bloody instrument, when it is being reversed for a second blow. Here it is important to know, that from the direction of the exclamation mark the position of the offender towards the victim, and the direction of delivering the blows, can be deducted." Consistent with the findings of gross, Leers described the shape and

directionality of blood falling from a bloody hand while the person was walking. Both felt that the directionality of such bloodstains will be opposite the direction of travel. I have never seen a case wherein this phenomenon is known to have occurred and question whether any directionality, forward or reverse, can be observed from a person who is walking. In fact, the very figure he uses to illustrate this event, (his Fig. 6), Does not show evidence of two directionalities!

Dr. Leers discussed proper photographic procedures that are as valid today as in 1910. He wrote, "the kind of the target is decisive for the choice of the plate: the normal plate is suitable only for light-blue, light grey and light-green targets; when the target is dark-blue, dark-grey or black a blue filter is needed; for saturated yellow and green, and for red targets an orthochromatic plate with a yellow filter has to be chosen." If the photograph did not show sufficient contrast he advocated tracing bloodstains. He conceded, "the photographic plate is, in any case, much more efficient than the human eye and moreover, the unbiased photograph is much more convincing, than the long explanations, which are nothing, but subjective." From this statement one might conclude that Dr. Leers had spent some time in court?

Throughout his book leers stressed the preservation of all bloodstains whenever possible, but also believed that a good

photograph could be helpful if carefully prepared.

1. Thorwald, Jurgon, Crime and Science, Harcourt, New York, 1966, p. 24.
2. Thorwald, Jurgon, Century of the Detective, Harcourt, New York, 1965, p. 235.
3. Florence, Prof., Les Taches de Sang au Laboratoires de Medicine Legal de Lyon, Archives de Anthropologie Criminelle, 16, 1901, p. 255-269.
4. Wood, Edward S., Medico-Legal Examination of Blood Stains, Boston Medical and Surgical, v. CXLV (20) 1901, p. 533-537.
5. Strassmann, Ziemke, Qualitative Blutuntersuchung, Vjschr. Gerichtl. Med., 3F, v. 21. 1901, p. 211.
6. Glaister, John, Medical Jurisprudence, Toxicology and Public Health, Edinburg, 1902, p. 234-241.
7. Gross, Hans, Handbuch fur Untersuchungsrichter als System der Kriminalistik, Munchen, J. Schweitzer, 1904, p. 102-
8. Schulz, A., Vjschr. Gerichtl. Med., v. 29, 1905, p. 1.
9. Faulds, Henry, Guide to Finger-Print Identification, Hanley, Wood, Mitchell & Co., 1905, p. 64.
10. Sutherland, W. D., Bloodstains: Their Detection, and the Determination of their Source, London, Bailliere, Trindalland Cox, 1907, p. 58-65.
11. Mann, J. Dixon, Forensic Medicine and Toxicology, London, Charles Griffin & Co., Ltd. 1908, p. 70.
12. Gross, Hans, Kriminalistische Tatigkett und Stellung des Arztes, Wien, Leipzig, 1908, p. 219-277.
13. Leers, Otto, Zur Quantativen Blutbestimmung, Vjschr. Gerichtl. Med., (3F), 1909, p. 37,39.
14. Balazas, Kenyeres, Torvenyszeki Orvostan, Budapest, 1909, p. 476-503.
15. Mita, Mitt. Med. Fakultat Tokyo, v. 13, 1909, p. 328.
16. Leers, Otto, Die Forensische Blutentersuchung, Berlin, von Julius Springer, 1910, p. 1 -21.