

CASE REPORT

Bloodstains of Gettysburg: *The Use of Chemiluminescent Blood Reagents to Visualize Bloodstains of Historical Significance*

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Abstract

Chemiluminescent bloodstain reagents are regularly utilized at crime scenes to reveal bloodstain residue after cleanup attempts or other activities have reduced the visibility of a stain. High sensitivity and the ability to react with stains of extreme age have made this type of reagent an invaluable tool in the crime scene officer's arsenal.

It has been noted that traces of iron in heme can physically remain in a substrate for an indefinite period of time depending, of course, on the degree of exposure and physical wear upon such substrate. Based on the ability to react with this trace molecular material of aged stains, chemiluminescent reagents may be an aid to further expand the use of bloodstain pattern analysis into the field of historical research.

The utilization of reagents such as luminol for the purpose of visualizing aged bloodstains has previously been documented; however the employment of this type of reagent at actual historical sites requires special considerations and precautions not normally encountered at the common crime scene. This paper examines the feasibility of utilizing such reagents at historical sites and the application to historical archives and antiquities.

Introduction

Confrontations resulting in bloodshed have often affected the course of history. While bloodstain pattern analysis is generally considered a tool for crime scene and accident investigation the possible application to historical research should also be considered. The ability to locate and visualize bloodstains is, of course, the first step to any analysis. In order to determine if the use of chemiluminescent processing would be feasible in regard to historical research the traditional application of reagents to locate bloodstains in suspected areas would need to be modified. It would be necessary to perform these tests at sites that already had previous documentation of residual blood contamination. Extensive research was required to locate suitable test sites.

Due to the limited scope of this project, widespread processing at historical sites in search of latent bloodstains was deemed impractical. The application of reagents to large areas of historical sites such as military fortifications or locations of noted past crimes would have required extensive chemical exposures. Bear in mind that the application of certain reagents could permanently damage or alter historical properties of high value. Preliminary test applications of the reagent on known bloodstained samples of the same material should be conducted. The tests should reveal the accuracy and sensitivity of the reagent on known blood

traces, as well as identify any potential physical alteration to the actual substrate. Based on this, it was decided that suitable test sites would require locations with extensive historical documentation identifying the exact location of blood-shedding events and/or exhibiting known visible stains. Two suitable sites were located in the Town of Gettysburg, Pennsylvania.

History

The Battle of Gettysburg is considered by some to be the point at which the tide turned in favor of the Union Army during the American Civil War. Although other battles of the war resulted in higher single day casualties, the total of wounded and dead for the three days of battle has caused Gettysburg to be considered the bloodiest engagement to have ever occurred on the continent. The battle started on the morning of July 1st, 1863 when the Confederate division of Henry Heth marched into the Village of Gettysburg ostensibly to secure shoes for his troops. Heth's division was met by the Union Cavalry brigade of John Buford. Soon enough, Union General John Reynolds and the First Corps were engaged in a battle that raged until sometime between 5:00 and 6:00 P.M. (Standard time as daylight savings time did not yet exist). General Reynolds was shot in the head and killed during this engagement.

Ultimately, the Confederate Army pushed the Union Army through the streets of Gettysburg and occupied the town. The Union forces regrouped on Cemetery Hill and formed what is now called the "Fishhook Defensive Line" which was anchored on two hills – Little Round Top and Culp's Hill. Confederate sharpshooters were stationed in homes throughout Gettysburg, making things difficult for the Union forces.

On July 2nd 1863, General Robert E. Lee and the Confederate forces attacked Union forces on the left and right ends of the Union line. By the end of the day the Union lines had held their positions. On July 3rd, 1863, the Confederates began with what is now known as one of the largest artillery barrages ever fired. At approximately 1:00 P.M. Confederate artillery began firing at the center of the Union line in an attempt to soften their defense prior to a frontal assault. The barrage was then followed by what is commonly known as Pickett's Charge. Approximately twelve thousand Confederate infantry marched directly over one mile of hilly terrain toward the center of the Union line. By sunset, observers would comment that the ground appeared to be moving because there were so many wounded and dead men on the battlefield. The failure of the charge forced the Confederate Army into retreat. Casualties, both Union and Confederate are believed to be approximately 51,000 men.

Virtually all public and private buildings were utilized as hospitals for the wounded of both armies. Anecdotal evidence speaks of holes being drilled into the floors of the makeshift operating rooms to allow for the draining of accumulated blood. Both the Shriver House and the Lady Farm were used as hospitals as well as for other military functions. The proprietors of the Shriver House Museum located on Baltimore Street in Gettysburg and the Gettysburg Battle Field Preservation Association that maintains the Daniel Lady Farm on Hanover Street agreed to allow testing on their properties.

Shriver House

The Shriver House has been documented as a residence used as a base for Confederate sharpshooters. Prior to the battle, during the winter of 1862, it was used to house Union soldiers. During the battle the owners of the home had fled outside of the town.

A Confederate “snipers nest” was established in the attic. Bricks were removed from the attic wall to form portholes from which to fire upon the Union soldiers. A neighbor later described watching the Confederates through an attic window. According to historical records, one of the Confederate sharpshooters was apparently struck by a bullet and killed directly in front of one of the makeshift portholes. The death and removal of the body was described in detail by the witnessing neighbor. Records show that the body of at least one other sniper was later carried out of the house. The Shriver House is located on Baltimore Street and was owned by George and Henrietta Shriver. George Shriver had hoped to open a tavern and ten-pin alley before the war. After enlisting in the Union Army he was captured and died in Andersonville (the notorious Confederate prisoner of war camp). The Shriver House has been restored with great care taken to retain much of the original building materials. The Shriver House is now a private museum that features the impact of the battle on the civilians of the town (Figure 1).



Figure 1. Shriver House on Baltimore Street in Gettysburg, Pennsylvania.

Daniel Lady Farm

Daniel Lady and his family owned the Lady Farm. They also had fled to relatives during the battle. Upon their return, they discovered that their home had been used as a Confederate field hospital for Major General Edward “Old Allegheny” Johnson’s Second Division. The hospital was specifically for the artillery battery commanded by Major Joseph Latimer. The young major was known as the “Boy Major”. He was wounded during the fighting on Brenner’s hill and was taken to the Lady Farm where his brother, a Confederate surgeon, amputated his right arm. Major Latimer died during the retreat following the battle on August 1, 1863.

Subsequent to the battle, Daniel Lady found several dead bodies and wounded soldiers in his home. All of the bedding and carpets were missing with the exception of one carpet which was saturated with blood. The doors of the residence had been removed and utilized as stretchers and operating tables. Mr. Lady subsequently filed a claim with the U.S. Government for damage to his property. He received a total of \$1,251.97 for damage and loss.

The home was occupied for several years with carpets used to cover the stained floors and shrapnel from artillery shells imbedded in the walls. In 1999 the Gettysburg Battle Field Preservation Association purchased the property and has worked to restore it to its original appearance. The restoration has been done with historical accuracy with preservation of significant artifacts as a priority. Archeological excavations outside the home and barn have resulted in the recovery of additional artillery shrapnel, whole, unexploded artillery shells, bullets, uniform buttons, knives, and other miscellaneous artifacts as well as human bones. The Association intends to open the Lady Farm as a field hospital museum and a working period farm exhibit (Figure 2).



Figure 2. Daniel Lady Farm on Hanover Road in Gettysburg, Pennsylvania.

Preparation

Unlike the common crime scene, where the documentation of evidence is the priority, the preservation of historical properties is essential and therefore of greater importance. To determine if on site testing would be feasible it was first necessary to determine if the reagents would leave any type of unwanted artifacts or prove difficult to clean creating an unacceptable health risk due to chemical exposure. Material safety data sheets and precaution sections of the distributors' technical information sheets were reviewed, and preliminary tests were conducted to determine which reagent would be the most suitable.

Commercially available luminol formulas purchased from Sirchie® Finger Print Laboratories, Inc. and Evident Crime Scene Products, as well as BlueStar® Latent Bloodstain Reagent were evaluated and utilized in several preliminary tests performed on numerous wood samples (walnut, maple, oak, hemlock, and pine). The purpose of the tests was to determine which reagent would be less likely to cause discoloration to the woodwork at the historical sites. The reagents were prepared according to provided instructions and applied to the wood samples. After five minutes of exposure the wood samples were flushed with distilled water. Excess water was then removed using a wet-vacuum. Although all applications left a slight washed or bleached appearance, no significant discoloration was noted. BlueStar® Reagent appeared to show the least change from the original appearance. The two luminol products showed similar results ranging from a mild dulling and bleached appearance to no notable discoloration.

Artifact Test

In addition to the preliminary testing completed on the wood sections, an actual Civil War era rifle was treated with a luminol reagent. A collector had volunteered an 1862 Joslyn breech loading rifle for use in this study. The collector wished to know whether some dark stains on the stock were traces of blood. The rifle was treated with a luminol reagent marketed by Evident Crime Scene Products, followed by flushing with distilled water, wet-vacuuming, and forced-air drying. No chemiluminescent reaction was observed. Subsequent testing with phenolphthalein and O-Tolidine also proved to be negative. However, after the rifle had been flushed and dried it was discovered that approximately 60 percent of the original finish on the stock had been destroyed (Figure 3). Based on the results of the preliminary testing on the wood samples as well as the damage observed after the Joslyn rifle was exposed to luminol, BlueStar® was chosen for application at the actual test sites. Although BlueStar® does contain corrosives it is marketed as a nontoxic formula. This was considered advantageous because these areas would be opened to the public. Due to the emphasis on safety and physical preservation, questions regarding which reagent may have the highest sensitivity were not addressed at this time.



Figure 3. The 1862 Joslyn Breech Loading Rifle.

Site Applications

Shriver House

The first site tested was the Shriver House attic. Test applications were applied to several areas of the attic woodwork that were located away from the porthole site. Areas of plain wood consistent with that found immediately under the portholes showed no background luminescence. After five minutes the treated areas were flushed with distilled water and the water was immediately removed with a wet-vacuum unit. The application test sites were re-examined 24 hours later to confirm that no discoloration had resulted (Figure 4).

The area under the porthole was then exposed to the Bluestar® Latent Bloodstain Reagent and the results were photographically documented. A chemiluminescent reaction was observed in the area under the porthole showing a pattern consistent with a cloth or mop having been used to wipe up in the area. The reaction was clearly visible but of a lesser intensity as than previously observed with stains of modern origin (Figure 5). Also noted is that a distinct line of demarcation was observed at the edge of floorboards a few feet from the porthole. It was learned that the boards that did not react had been replaced during restoration and were not the same boards in place during the battle.



Figure 4. Attic of the Shriver House- The site of the shooting of the Confederate sniper.



Figure 5. Chemiluminescent reaction observed in Shriver House attic.

Daniel Lady Farm

In order to protect the integrity of the historical artifacts, the visible stains on the floor of the Daniel Lady Farm were covered with heavy gauge plastic sheeting. A small area at the edge of the visible stain was left exposed as a control. Test applications were conducted away from the stains (Figure 6). A light amount of background luminescence was noted in a few areas and where nail heads appeared in the wood. Most of this was very dim, whiter in color and lasted a short duration.



Figure 6. Daniel Lady Farm- Site of Confederate Field Hospital with heavy gauge plastic protecting bloodstains on floor.

It was not determined if any of the apparent-background luminescence was actually due to residual blood material that had spread into the wood grain as a result of past cleaning attempts. As with the previous test applications, the areas were re-examined 24 hours later with no significant discoloration noted.

The area surrounding the visible stains (along with the small exposed section) was then subjected to the Bluestar® Reagent with positive results. Low level luminescence observed at the Shriver House was visible at the exposed control stain area. The chemiluminescent reaction continued several inches outward from the known stain area and showed a flow pattern that followed the contours in the floorboards. This accumulated in an area with a gap opening at the end of two of the boards. A dim irregular background luminescence was observed in a widely distributed pattern around this stain (Figure 7).



Figure 7. Chemiluminescent reaction on the floor of the Daniel Lady Farm. The flow pattern has originated from the visible stains.

Historical documentation contains numerous descriptions of field hospital surgical rooms having “streams of blood” which dripped through the floors. It was now observed that the water from the flushing procedures completed after the application had run through the floorboard end gap and dripped downward. A substantial amount of water was absorbed into the wood grain on the underside of the boards. No water was seen to have permeated the tongued seams (Figure 8). This appears to be the most likely path of any blood, serum, or original blood contaminated cleaning water. The reagent was subsequently applied to the underside of the stained floorboards as well as the surrounding area and exposed beams. This resulted in chemiluminescence in the area of the water path (Figure 9). No reaction was observed in the surrounding area, within the tongued seams, or on the exposed beam directly below the floorboard end gap. This beam was a replacement and not original to the date of the Battle.



Figure 8. Basement ceiling of Daniel Lady Farm below stains on floor above. Note the capillary action causing absorption of water from the prior flushing procedures above.



Figure 9. Chemiluminescent reaction observed on the basement ceiling. No reaction was observed in the tongue and groove seams or on the replaced beam.

Conclusions

Due to the high sensitivity and the ability to react with stains of extreme age, chemiluminescent bloodstain reagents can be utilized for the visualization of stains of historical significance. However, the following should be considered prior to any application:

1. All surfaces should be tested for discoloration or any other adverse effects prior to full exposure. Many antiquities have very high values while some items of historical significance are considered priceless and irreplaceable. The prospect of visualizing a stain pattern may not justify the risk of causing irreversible damage. Although in the two test site applications no negative effects were noted this study can not be considered to encompass all possible substrates. As in the example of the Joslyn rifle, the possibility of damage can be costly. The possibility of affecting future DNA analysis should also be considered.
2. Even reagents that are non-toxic may present health risks. All applicable precautions such as protective clothing, masks, and ventilation should be utilized in the same manner as at a modern crime scene. Areas that maybe opened to the public require a thorough effort to remove any chemical residues in order to prevent unwanted exposure.
3. Cleanup efforts must also be closely monitored so that water damage does not result. An example would be the flushing of floorboards with water. Water may assist in the cleanup; however, excess water dripping down into lower floors can damage items such as old horsehair plaster or other building materials impossible to replicate. This is of extreme importance when processing upper floor areas such as in the attic of the Shriver House Museum. During the clean-up procedures it was also noted that pressing the wet-vacuum nozzle too hard against wet wood surfaces can leave unwanted striation marks. The ability to complete a thorough cleanup without causing damage should be as much a consideration as the possible adverse effects of the chemical processing itself.
4. Chemiluminescent bloodstain reactions function as a blood indicator and are therefore limited to a presumptive test. Any conclusions should be appropriately conservative and coordinated with historical research as well as results of any additional confirmatory testing.
5. In the event of a negative reaction, this should not be considered prima facie evidence to be used to bring into question previously accepted historical theory. The extended time lapse often occurring between a historically significant event and the application of a reagent can allow for any number of undocumented modifications of building materials and/or additional occurrences resulting in degradation or complete physical removal of bloodstain traces.

In closing, the use of chemiluminescent bloodstain reagents such as luminol and Bluestar®, when applied with due caution can provide potentially useful clues to past events. Under the right circumstances this type of reagent may be able to provide a glimpse into the past by visualizing historical evidence that has remained dormant and unquestioned for a significant period of time.

REFERENCES

1. Luminol 16/8 – Technical Information Sheet (© 2003/04) /MSDS. Sirchie® Fingerprint Laboratories, Inc.
2. Bluestar® Latent Blood Reagent – Technical Application Note/Safety Data Sheet/User’s Manual (rev. 8.0 – 04/07/2003) © 2003 Roc Import.
3. Luminol Technical Application Sheet - © 2001 Crime Scene Supply, Inc.
4. George Sheldon – When the Smoke Cleared at Gettysburg. Cumberland House Publishing, Inc. © 2003.
5. Kent Masterson Brown – Retreat From Gettysburg. © 2005 The University of North Carolina Press.
6. Mrs. Tillie Pierce Alleman – At Gettysburg. ©1888 New York, W. Lake Borland.
7. Gregory A. Coco – A Strange and Blighted Land, Gettysburg, the Aftermath of Battle. ©1995 Thomas Publications.
8. Gregory A. Coco – A Vast Sea Of Misery – A History and Guide to the Union and Confederate Field Hospitals at Gettysburg, July 1-November 20, 1863. © 1988 Thomas Publications.
9. Pennsylvania Historical and Museum Commission – RG-2 Records of the Department of the Auditor General – Records relating to Civil War Border Claims Applications submitted under acts passed 1863-1871.

