# Table of Contents

2014 IABPA Officers ........................................ 1

President’s Message ........................................ 2

Newly Elected IABPA Vice-President Region IV Eastern .... 3

The Use of Tinks Starlight® Bloodhound Trailing Aid Luminol Preparation to Determine the Detection and Persistence of Blood at an Outdoor Crime Scene
*M. Dawn Watkins and King C. Brown* ................................................ 4

The 2014 ANZFSS 22nd International Symposium on the Forensic Sciences Feedback on the Bloodstain Pattern Analysis Discipline Stream
*Edmund (Ted) Silenieks* .................................................. 9

Abstracts of Presentations from the 2014 ANZFSS 22nd International Symposium on the Forensic Sciences ........................................ 14

Poster Presentations from the 2014 ANZFSS 22nd International Symposium on the Forensic Sciences ........................................ 22

The Fifth European IABPA Conference in Rome, Italy 2015 ........ 27

Abstracts of Presentations from The Fifth European IABPA Conference in Rome, Italy 2015 ........................................ 29

The 2016 ANZFSS 23rd ANZFSS International Symposium on the Forensic Sciences to be held in Auckland, New Zealand ........ 47

Recent BPA Articles in the Scientific Literature .................. 48

In Memoriam – Anita Y. Wonder ........................................ 49

Organizational Notices ........................................ 50

Training Opportunities ........................................ 50

Editor’s Corner ........................................ 53

Publication Committee/Associate Editors .................. 54

Past Editors of the IABPA News/Journal of Bloodstain Pattern Analysis ........................................ 54

Past Presidents of the IABPA ........................................ 54
2015 IABPA Officers

**PRESIDENT**

Patrick Laturnus  
pat.laturnus@rogers.com

**Vice President - Region I**  
Pacific

Don Schuessler  
dschuessle@msn.com

**Vice President - Region II**  
Mountain

Richard J. Tewes  
rich.tewes@pioneerforensics.com

**Vice President - Region III**  
Central

DeWayne Morris  
DeWayne_Morris@isp.state.il.us

**Vice President, Region IV**  
Eastern

Gord Lefebvre  
Gord.Lefebvre@opp.gov

**Vice President - Region V**  
European

Martin Eversdijk  
martin.eversdijk@lociforensicproducts.nl

**Vice President - Region VI**  
Pacific Rim

Ted Silenieks  
Ted.Silenieks@sa.gov.au

**Secretary / Treasurer**

Norman Reeves  
norman@bloody1.com

**Sergeant at Arms**

Jeffrey Scozzafava  
scozzafava@co.somerset.nj.us

**Historian**

Stuart H. James  
jamiesforen@aol.com
President’s Message

Each year we find ourselves looking forward to good cases and an opportunity to grow. I suspect it begins with being well informed. By reading the "Journal of Bloodstain Pattern Analysis" you're off to a good start. So many things to do.... so little time.... and never enough money to do it all.

As you know this Journal is made available on our website and is there for anyone who wishes to become better informed. We know that when you run into a question the answer can be found through the many articles on record here. It's a great resource and I hope that you will spread the word as well as join your colleagues who have contributed in the past. Information is power and by sharing your research or discoveries you're not only empowering yourself but strengthening our discipline. Our editor, Stuart James, devotes a lot of energy to the Journal. He's doing a great job, but can't do it alone.

Our website is all things BPA. As you plan your year you will find several training opportunities. In addition you can keep up to date on what's in the news for BPA. Whether you're looking for something specific or just taking a moment to poke around to see what's up.... check out the IAPBA website. Our webmaster, Joe Slemko, is open to any request you might have. He is a dedicated professional who maintains a high standard that we're all proud of. We certainly appreciate all the work he does. Too often we forget how people like Joe have careers and do all of this work on their time off.

The "5th European IAPBA Conference" in Rome, Italy was an outstanding success. Many thanks to Andrea Berti and his colleagues from the “Arma dei Carabinieri - Forensic Department HQ”. It's exciting to see how this conference has grown through the years. The European venue allows many of our colleagues a training opportunity that they might not get otherwise. I was so pleased to have had an opportunity to attend, along with 5 other Executive Board members. The conference content was excellent in an impressive venue and then there was the food.... the food was.... well incredible.

As you know our annual training conference has been scheduled again for this Fall. We keep the same dates each year and as close as possible to the first week of October. That should help with your schedule and budget plan. This year promises to be another excellent opportunity. Mark your calendars for September 29th to October 2nd, for the training conference at Fort Worth, Texas. Plans are well underway with Cele Rossi and DeWayne Morris as our hosts. So far the infrastructure is excellent and any of you who have considered presenting should make plans now. Cele and DeWayne would be pleased to hear from you and to add your contribution to the list. Just as important is the effort it takes to attend, please include this important training conference in your plans.

2015 is well underway. Here's wishing you the best that this year has to offer.

Pat Laturnus
President
IAPBA
Gord Lefebvre Elected IABPA Vice President, Region IV Eastern

Gord Lefebvre

Gord became a member of the IABPA in 2003. Since that time he has attended many of the IABPA training conferences, where he has delivered presentations as well as providing workshop training. This is the first position he has held within the IABPA.

Gord has 30 years policing service with the Ontario Provincial Police. He has spent the last 20 years of his career within the forensic identification program. He currently holds the rank of Identification Staff Sergeant and is the Regional Manager for the O.P.P. East Region Forensic Identification Services. He is responsible for the delivery of forensic services from three deployed FIS units located at Belleville, Smiths Falls and Long Sault. He is also the BPA Program Manager for the O.P.P.

He began his involvement in BPA with a basic course in 2000, following that he began a BPA understudy in 2002 and was certified as a BPA by the Ontario Police College in 2003. Since that time Gord has contributed to several investigations involving bloodstain pattern analysis. He has qualified and offered expert evidence in many Canadian criminal court proceedings. He is a strong advocate of training and has presented many lectures on BPA, as well as delivery of training in Basic, Advanced and Math and Physic courses. His training experiences have included visits to the Netherlands Forensic Institute to deliver BPA courses. Gord has also participated and supports research opportunities to strengthen the BPA discipline. He was a member of SWGSTAIN from 2010-2014 serving on the Quality Assurance subcommittee. Gord is also a member of the Canadian Identification Society, and the International Association of Identification.
TECHNICAL NOTE

The Use of Tinks Starlight® Bloodhound Trailing Aid Luminol Preparation to Determine the Detection and Persistence of Blood at an Outdoor Crime Scene

M. Dawn Watkins¹ and King C. Brown²

Introduction

The recovery and detection of possible blood stains at the crime scene can make or break a case, especially with the advent of and perfection of DNA testing. When a crime scene is cleaned up or subjected to environmental conditions, this technology becomes even more important. Review of the scientific literature revealed that significant studies were performed using luminol to detect blood in soil up to eight years after deposition.¹⁻⁵ There was also a study involving the chemical detection of blood after dilution by rain over a 72 day period.⁶

On Saturday, June 11, 2014, the deceased body of a white 35-year-old female was discovered in a wooded remote area behind one of two large cement culverts in Palm Beach Gardens, Florida. Rain had fallen on the day she was discovered and continued intermittently for several days (Figure 1). The decedent had sustained severe blunt force trauma to her head and body at the scene. There was a distinct blood trail that led from a saturation stain of blood where the initial assault occurred to the location of her body behind the culvert, which was rapidly disappearing due to the rain. On the day of the discovery of her body the normal crime scene investigation was conducted; however, due to the rain no bioluminescent techniques were used to visualize the blood trail.

On June 24, 2014, nineteen days after the incident we were requested to determine if there was any way to conduct further testing in an attempt to visualize the blood trail. The investigators wanted to know if it could be determined if the decedent was carried or dragged to the location where she was found. It had rained almost every day since the incident and approximately seven inches of rainfall was recorded during that time period. This was coupled with the hot and humid conditions and the environmental exposure of the scene to these elements.

Figure 1. General view of the area of the remote scene.

¹ M. Dawn Watkins CLPE, CSCSA, CFPH, MS is a Crime Scene Investigator III, Senior Latent Fingerprint Examiner at the Palm Beach Gardens Police Department, Palm Beach Gardens, Florida.
² King C. Brown CLPE, CSCSA, CFPH, MS is a Commander of the Crime Scene Unit at the West Palm Beach Police Department, West Palm Beach, Florida.
Discussion

Crime scene investigators responded to the scene, took initial photographs before darkness and prepared a secondary diagram. After darkness, the area was sprayed with Tinks Starlight® Bloodhound Trailing Aid in an attempt to visualize the blood trail (Figure 2). This luminol preparation is primarily used for the location of blood trails by hunters seeking an animal that was not killed immediately.

After nineteen days of weather, rain, humidity and sun the luminescence of the saturation stain and the path the suspects carried the victim to her final position behind the concrete culvert was clearly visible (Figures 3 and 4). Photographs were taken using a tripod mounted, Nikon D7100 camera at manual setting mode utilizing various time exposures with ISO set at 3200.

Figure 2. Components of Tinks Starlight® Bloodhound Trailing Aid Luminol Preparation.
Figure 3. View of the luminescent blood pool in front of the concrete culvert and the path indicating the direction that the decedent was carried between the concrete culverts.

Figure 4. View of the luminescent blood pool where the head of the victim rested on the ground behind the culvert.
The use of experimentation in forensic analysis is a very important developmental technique and the question was raised as to the length of time that Tinks Starlight® Bloodhound Trailing Aid would react with the exposed blood stains. This was unknown at this point and it was decided to conduct a later examination.

On October 7, 2014, 122 days after the initial incident during which there was approximately 35.60 inches of rainfall and exposure, crime scene investigators responded back to the initial scene. The objective was to determine if there would be any remaining bioluminescence at the scene between summer and the fall. The initial blood pool, the nearby underside of plants at the scene and the area where the decedent’s head rested on the ground behind the culvert all produced a positive bioluminescent reaction (Figure 5). During the initial application of Tinks Starlight® Bloodhound Trailing Aid the concrete culverts displayed a positive reaction. However, during the second application they did not react.

Conclusions

Tinks Starlight® Bloodhound Trailing Aid has demonstrated excellent reliability in the visualization and recovery of bloodstains after an extended period of time of being exposed to excessive rain and hot humid South Florida weather conditions. This luminol preparation does not destroy or inhibit DNA recovery. It was noted however that if a secondary presumptive blood test such as Phenolphthalein you will get a negative reaction, due to the chemical components.
References


Late last year the Australian and New Zealand Forensic Science Society (ANZFSS) held its biennial Symposium in Adelaide, the picturesque capital city of South Australia. This is an important event for bloodstain pattern analysts “down under”. Themed *Adelaide Twenty14: Detect, Decipher, Deliver – The Future of Evidence*, the symposium hosted approximately 850 delegates from 26 different countries over four days. The Symposium has a strong reputation for delivering both a quality scientific program and an outstanding social program, and Adelaide Twenty14 certainly delivered. Eighteen different discipline streams were represented, with seven concurrent sessions delivering 325 oral presentations and 145 posters, with a total of 13 workshops presented either immediately before or after the Symposium. The trade vendors also supported the Symposium, with over 50 booths displaying all the latest wares and technology in forensic science and crime scene investigation.

The Symposium started each day with two international plenary speakers delivering first class lectures designed to provoke thought and discussion amongst delegates. Plenary speakers included Christophe Champod (Switzerland), Bryan Found (Australia), Kimmo Himberg (Finland), Professor Niamh Nic Daeid (UK), Liesl Chapman (Australia) Sebastian Marino (New Zealand), Max Houck (USA) and Dr. Mark Reynolds (Australia). None were more successful than Dr. Reynolds who delivered a talk titled: *The Future of Trace Evidence: Are we wasting our time?* Dr. Reynolds’ talk controversially challenged the worth of DNA evidence, particularly in cases where the individuals involved were known to each other, and called for a renewed approach and assessment of the value and importance of activity evidence. Trace evidence, as does BPA evidence, gives insight into the activity related to a crime, and Dr. Reynolds highlighted the importance of activity evidence in providing investigative leads and that, in some cases, this importance outweighs the importance of DNA or fingerprint evidence. The impact DNA evidence has made on an investigation is of great importance, but skills in activity evidence need to be maintained to ensure the future of trace evidence.

The Symposium has become an important event for bloodstain pattern analysts in the Australasian-African Region, with the bloodstain pattern analysis discipline featuring for just the second time since its inaugural presence at the 2012 Hobart Symposium. The discipline built strongly on the 2012 ANZFSS symposium, with the number of BPA presentations increasing from twelve oral presentations, three posters and a workshop to twenty oral presentations and eleven posters, supported with a workshop on Contextual Bias. All oral BPA presentations were well attended, with up to 120 people attending various sessions, which is a compliment to the quality of the research and presentations, given that BPA was competing with six other concurrent disciplines. The increased attendance and number of presentations hailed well the continued development of BPA in Region 6, with the ANZFSS symposium now successfully supplementing both the annual IABPA Training
Conference and the biennial IABPA European Conference. See the abstract published in this edition of the Journal for details of all BPA presentations.

The IABPA had a presence at the ANZFSS Symposium, and IABPA President Pat Laturnus penned the following welcome letter to all bloodstain pattern analysts attending:

G'Day!

I bring greetings and wishes for great success from the IABPA to the ANZFSS Symposium.

We realize that this conference is a very beneficial mix of all forensic disciplines. As you know the IAPBA is an association focused on Education and Research in Bloodstain Pattern Analysis. As I heard my Aussie friend, Mark, say "If it ain't Spatter, it don't Matter". It was my great pleasure to attend the 2006 edition of the ANZFSS Symposium held in Fremantle, Western Australia. That occasion provided great learning opportunities as well as a chance to meet so many quality professionals.

To the IABPA members, who are in attendance, I'm especially pleased that you are taking part in ANZFSS. Please take this opportunity to advance our position as an international organization interested in maintaining the scientific aspects of our discipline.

Bloodstain Pattern Analysis is now generally accepted in all Courts due to the quality of the analysts presenting the evidence. Australia and New Zealand offer great leadership in this area. We have seen both training and research developed here that has quickly been recognized internationally. The scientific approach to pertinent areas of interest has made all of us sit up and take notice.

Australia and New Zealand IABPA members are well represented in our leadership roles. We hope that by their example, others will seek membership in our association. If you're not a member please take a moment to consider joining, talk to one of our members present who will be happy to greet you.

The IAPBA hosts annual training conferences in North America as well as semi-annually in Europe. This year we meet in Portland, Maine, USA. In 2015, we'll be meeting during the month of
May in Rome, Italy and during the first week of October we’ll meet in Fort Worth, Texas. In addition we offer a website and Journal and welcome everyone to check them out. The website and the "Journal of Bloodstain Pattern Analysis” are where you will find the latest research and most interesting articles concerning Bloodstain Pattern Analysis.

I appreciate this opportunity to say Hello and look forward to any comments you might have.

All the Best!

Pat Laturnus
President, IABPA

The presentations in the BPA stream covered many aspects of the discipline. Of note was the increase in research done into understanding how blood interacts with fabric. Five oral and six poster presentations related to research into this topic, including work done in understanding how near infrared visualises bloodstains on dark coloured clothing. Quality Assurance and Education relating to BPA also featured strongly, with five presentations covering topics from Math and Physics for bloodstain analysts to implementing a sound QA BPA program.

The IABPA was well represented at Adelaide Twenty14 by LeeAnn Singley, who was awarded the inaugural IABPA Travel Award and made two well received presentations. I congratulate her on promoting the IABPA both through the quality of her presentations and in an open panel discussion. Brian Yamashita chipped in with a keynote presentation and an oral presentation (supplemented with that famed Yamashita humour). Two other keynote presentations were given by Gerda Edelman and Niki Osbourne. The New Zealanders contributed strongly to the symposium as did the Netherlands Forensic Institute (NFI), with several other IABPA members also making valuable contributions, which highlighted the true international nature of the symposium. I believe the attendance of experienced IABPA members such as LeeAnn Singley and Brian Yamashita added enormous value to the ANZFSS BPA discipline stream and contributed to the success of the BPA steam in Adelaide. Bringing the North American experience “down under” allowed local practitioners to benefit from their experience and understand the true international aspect of the discipline. I encourage practitioners to consider attending the next Symposium to be held in Auckland, New Zealand in 2016.
The BPA presentations concluded with an open panel discussion consisting of BSgt David Veldhoen (Australian BPASWG), LeeAnn Singley (USA and past IABPA President), Gerco Kramer (NFI), Dr. Elizabeth Williams (NZ), Dr. Karla de Bruin (NFI) and Ted Silenieks (IABPA VP Region 6). Topics discussed included the use of the international (SWGSTAIN) terminology list, the development OSAC BPA Subcommittee and the approach used for BPA training by different countries across the globe. Australia and New Zealand formally adopted the SWGSTAIN terminology last year, so this was topical as with the recent demise of SWGSTAIN, practitioners were concerned whether the new OSAC BPA Subcommittee would maintain the list. The panel fielded a few tough questions from the audience on this topic and highlighted the need for an international approach to maintaining our discipline. The discussion on education and training gave great insight into how different countries across the globe approach training and maintaining recommended training levels.

The ANZFSS Symposium social program is second to none. The social events are always a lot of fun and allow delegates to network and connect in a relaxed fashion. The week began with the traditional Welcome Drinks, included a happy Hour at an Aussie Pub and a Public Night featuring a presentation titled Underbelly Uncovered by Detective Inspector Gary Jubelin of Strike Force Tuno. The Inspector provided first-hand accounts of the kidnappings, murders and drug deals he encountered during his nearly 10-year involvement with this investigation. This was later made into one of the Underbelly television series – “Underbelly: Badness”. Well worth a look if you can find it online.

The symposium features two main social events, the Tuesday Extreme Night Out and the Symposium Dinner, both of which were enormous successes. The Extreme Night Out was themed 1920s Gangsters and Moles and was the social highlight of the week and wow, bring back the Roaring 20’s as everyone looked fantastic.
BPA delegates get into the Roaring 20’s theme

The week concluded with the Symposium Dinner and the presentation of awards for best oral and poster presentation for each discipline. There were many worthy presentations and the awards in the Bloodstain Pattern Analysis discipline were as follows:

3. Highly Commended: Niki Osborne, “How Reliable are Current Methods for Bloodstain Pattern Analysis on Fabric?”

The BPA Award Winners: From left to right, Nick Laan, Natasha Garcia, Niki Osborne and Patrick Geoghegan (on behalf of Michael Taylor)
The Adelaide Twenty14 Symposium was arguably the best ANZFSS Symposium so far. Certainly from a BPA aspect, the discipline has firmly established itself as a fixture at future ANZFSS Symposiums, and as such now offers IABPA members another option for attending a world class training event. I would like to thank all those delegates who made oral and poster presentations in the BPA stream. I would also like to thank those who joined me on the BPA Discipline Sub-committee: the BPA Discipline Chair, David Veldhoen (South Australia Police) and Dr. Andrew Donnelly (Forensic Science SA), in helping ensure the quality of the BPA presentations and the BPA program ran smoothly.

Plenary Speaker, Max Houck challenged delegates to detect, decipher and deliver

BPA Abstracts of Presentations from the Australian and New Zealand Forensic Science Society’s 22nd International Symposium on the Forensic Sciences held in 2014

Oral Presentations

Bayesian Approach to Interpreting Bloodstain Patterns

Bart Blankers and Marjan Sjerps

Netherlands Forensic Institute

A forensic expert has a duty to the court to provide robust and objective information that may help decide on crucial issues in the case. An increasing number of forensic disciplines provide this information by means of a likelihood ratio. A likelihood ratio follows from an evaluation of the findings under competing propositions. For most blood pattern analysts it is not yet common practice to interpret their findings by means of a likelihood ratio. This approach however has important advantages when compared to traditional ways of interpreting the results. We show the problems that can arise when using traditional methods and the advantages the Bayesian approach holds. Both will be demonstrated using case examples.
Comparison between Drip Stains and Impact Spatter Stains on Different Fabrics

Russell Cook

Forensic Science SA,
Adelaide, South Australia
russell.cook@sa.gov.au

Interpretations of bloodstains on fabrics can be difficult due to variables relating to stain formation produced by fabric effects as well as droplet volume and impact velocity. Variables associated with fabrics include the type of construction (weave or knit), yarn construction as well as the type of fibre used (staple or filament). The way these variables influence the formation of spatter and drip stains on six common cotton and polyester fabrics has been investigated.

Three different volumes of blood at fixed height were used to create ten drips stains and two mechanisms were used to create impact spatter using a constant force and fixed distance to the test fabrics. The mean stain sizes of impact spatter stains were compared with the mean stain size of drip stains on the test fabrics. The correlation of stain size to droplet volume of drip stains was also assessed for each fabric. Physical pattern assessment and features of stains were analysed on the different fabrics tested. Results indicated polyester knit and weave could provide interpretational challenges if both spatter and drip stains are present.

Spreading Behaviour of Blood Drops on Fabrics

Karla de Bruin¹, Nick Laan², Noushine Shahidzadeh³, Daniel Bonn⁴

¹ Netherlands Forensic Institute, Laan van Ypenburg, Den Haag, The Netherlands, k.de.bruin@nfi.minvenj.nl
² University of Amsterdam, Science Park, the Netherlands, n.laan@uva.nl
³ University of Amsterdam, Science Park, Amsterdam, the Netherlands, n.shahidzadeh@uva.nl
⁴ University of Amsterdam, Science Park, Amsterdam, the Netherlands, d.bonn@uva.nl

In almost all bloodshedding cases an important question is if the suspect was involved in the crime. In court, it is relevant whether the suspect was only in (helping) contact with the victim, whether the suspect was only a bystander or whether the suspect may have been present during the blood shedding event. One possible way to distinguish between these two is to look at the kinds of bloodstains present on the suspect’s clothing.

Transfer stains may indicate that direct contact between a suspect and a bloodied object or victim existed whereas spatter stains do not necessarily. These stains may indicate the presence of the suspect at the crime scene during the event.

Previous research has shown that spatter stains and transfer stains may have similarities and sometimes cannot be distinguished by means of their appearance, even with highly discriminating optical techniques. We therefore focus our study on droplet spreading and absorption, on and into porous media. We investigated the spreading of blood droplets on various fabrics to determine the spreading width and absorption depth for droplets with and without initial velocity. We show how the spreading behaviour can be described for model porous media and a number of textiles.
Scientific Fundamentals of Passive Bloodstain Formation on Laundered Shirting Apparel

T.C. de Castro¹, D.J. Carr², M.C. Taylor³, J.A. Kieser⁴

¹ Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand
dech881@student.otago.ac.nz
² Impact and Armour Group, Cranfield University, Defence Academy of the United Kingdom, Shrivenham, Wiltshire UK, and Sir John Walsh Research Institute, New Zealand
d.j.carr@cranfield.ac.uk.
³ Institute of Environmental Science and Research (ESR) Ltd, Christchurch, New Zealand
michael.taylor@esr.cri.nz
⁴ Sir John Walsh Research Institute, University of Otago, Dunedin, New Zealand
jules.kieser@otago.ac.nz

Bloodstain pattern analysis (BPA) is critical to many serious crime investigations due to the common occurrence of blood shedding. Clothing is often submitted to forensic laboratories and therefore an understanding of the formation of bloodstain on fabrics is of vital importance for the forensic community. In this work, the fundamental properties of blood stains caused by passive drops [Weber (We) number=0.25, 1.6, 4.1; impact angle=90°, 45°, 15°] interacting with 100% cotton, plain woven apparel [laundering regime = 6, 26, 52 cycles] typically used to manufacture shirting apparel, were investigated. High-speed video was used to investigate the interaction of the blood-fabric at impact, and digital photography was used for documentation. To demonstrate the effect of fabric texture and laundering, the We number and impact angle on the formation of passive bloodstains was investigated using image analysis, statistical tools and microscopic examination. Because visual differences among these fabrics were noted, fabric properties must be considered when conducting BPA on apparel fabrics.

Bloodstain Age Estimation

Gerda Edelman¹, Maurice Aalders², Elisa van den Heuvel³

¹ Netherlands Forensic Institute, The Hague, the Netherlands
g.edelman@nfi.minvenj.nl
² Academic Medical Center, Meibergdreef Amsterdam, the Netherlands
m.c.aalders@amc.uva.nl
³ Netherlands Forensic Institute, The Hague, the Netherlands,
e.van.den.heuvel@nfi.minvenj.nl

DNA in bloodstains can provide valuable information about the identity of the donor, while bloodstain patterns can give insight in the activities taken place. Knowledge about the age of a blood stain is interesting additional information, useful to create a timeline of events, or to determine whether certain stains are related to a crime. We demonstrated a method for the age estimation of bloodstains using hyperspectral imaging. By measuring the reflectance spectra of bloodstains, we are able to determine their chemical composition. The relative amount of haemoglobin derivatives can in turn be used to calculate the age of a bloodstain.

In 2014, the project “Bloodstains in the spotlights” started, which aimed to validate the method for age estimation of bloodstains and to implement it in regular crime scene investigations. A new custom-made hyperspectral camera will be developed, which will meet the needs of forensic practitioners (e.g. wireless, user friendly, fast). The technique will be thoroughly tested in simulated crime scenes, and finally in casework. The theoretical background of bloodstain aging and hyperspectral imaging, the current status of the project, and future plans will be presented in this talk.
Visualising Blood Spatter on Dark Fabrics

*Tess Mercer and S. M. Fergusson*

RMIT University, Melbourne, Australia
mac.fergusson@rmit.edu.au

The use of NIR (Near Infrared) and Ultraviolet (UV) light enables the human eye to see bloodstains on a substrate where the bloodstain would normally be invisible. It has become evident that in certain circumstances and on some fabrics, particularly those coloured black or navy, the bloodstain is not always visible when screening a dark coloured textile using NIR. This presentation seeks to identify the reasons why the blood spatter is not observed on certain fabrics coloured black or navy. The influence of the dyes used to colour the textile material have been evaluated and it has been found that certain dyes containing metal atoms counteract the visualisation of bloodstains when using NIR. Other factors such as the finish applied to a fabric may have a contributing effect and will be the subject of further investigation.

Impact Velocity of Blood Droplets for Crime Scene Reconstruction

*Nick Laan¹, Karla G. de Bruin², Daniel Bonn¹*

¹Institute of Physics, University of Amsterdam, Amsterdam, the Netherlands
n.laan@uva.nl
d.bonn@uva.nl
²Netherlands Forensic Institute, The Hague, the Netherlands
k.de.bruin@nfi.minvenj.nl

Bloodstain Pattern Analysis (BPA), is a forensic tool for determining, amongst others, the position of a victim at a crime scene where blood has been shed. Forensic experts commonly use the stringing method, based on a straight line approximation of the blood droplet trajectories to determine where the source of a bloodstain pattern was. However, by ignoring gravity, errors as large as 45 cm may arise when inferring the 3D-location of the wound. Accordingly, it is impossible to discern, e.g., between a standing or sitting position of the victim. To reconstruct the trajectories correctly, the impact velocity of the droplets need to be determined. Here we show how this can be done directly from the shape and volume of dried bloodstains. We use a balance of inertial, viscous and capillary forces, which goes beyond commonly used approximations. In this way, we are able to determine the curved trajectory by taking gravity into account. With a proof-of-principle experiment we show that our method reduces the uncertainty in the reconstructed height of the origin of the bloodstains significantly, making it possible to determine the position of, e.g., a victim much more accurately.

Bloodstain Pattern Analysis in an Extreme Outdoor Environment

*John David North*

Tasmania Police, Launceston Police Headquarters, Launceston, Tasmania
david.north@police.tas.gov.au

The discipline of bloodstain pattern analysis (BPA) attempts to explain and provide investigators with the events that occurred at or around the time of blood shedding incidents. Scenes associated with these investigations are often challenging. For a typical indoor crime scene, documentation and recording of bloodstains may account for the majority of an investigators effort. The question is what happens when the scene is outside and better yet when the scene is in an extreme alpine environment? A study of the current literature identifies limited information on documentation of BPA in snow and ice. In August 2013 a series of BPA reconstructions were carried out on Ben Lomond, in Northern Tasmania. This area is covered in snow during winter and is subject to less than ideal weather conditions for forensic investigations. This presentation will highlight the challenges faced when attempting BPA in atypical outdoor scenes involving snow, ice and wind. The efficacy of performing accurate documentation and possible reconstruction will be addressed.
A Mixed-Methods Approach to Understanding Decision-Making and Context Integration in Bloodstain Pattern Analysis

Osborne, N. K. P.1, Taylor, M. C.2, & Zajac, R.3

1 Psychology Department, University of Otago, Dunedin, New Zealand
nosborne@psy.otago.ac.nz
2 Institute of Environmental Science and Research (ESR), Dunedin, New Zealand
michael.taylor@esr.cri.nz
3 Psychology Department, University of Otago, Dunedin, New Zealand
rachelz@psy.otago.ac.nz

Bloodstain pattern analysis can be a valuable and informative tool in crime scene investigations. Little is known, however, about the way in which bloodstain pattern analysts reach their conclusions, or how they integrate contextual information into their analyses. We explored these issues using a mixed-methods approach. Twenty bloodstain pattern analysts from New Zealand and Australia were shown photographs from two homicide cases and, in a face-to-face interview, were asked to think out loud as they classified the bloodstains present and provided a confidence rating for their classification. Analysts first classified the bloodstains with no contextual information. Then, if the analysts believed it would assist with their analysis, they could ask for contextual details surrounding the case, and reclassify the patterns in light of each piece of new information. Interview transcripts were coded for consistency across examiners, changes in confidence and classifications as a function of the contextual information, and the methods used to reach a classification. Preliminary analysis indicates considerable variation in the methodology used and in the conclusions reached, and that contextual information is used both to increase confidence in one’s hypotheses and to create alternative hypotheses. A complete analysis of the findings will be presented.

How Reliable are Current Methods for Bloodstain Pattern Analysis on Fabric?

Osborne, N. K.P. 1, Taylor, M. C.2, Kish, P.3, Laber, T.4 and Owens, G.5

1 Institute of Environmental Science and Research (ESR), Christchurch, New Zealand
niki.osborne@esr.cri.nz
2 Institute of Environmental Science and Research (ESR), Christchurch, New Zealand
michael.taylor@esr.cri.nz
3 Forensic Consultant and Associates, Corning, New York
paulkish@stny.rr.com
4 Minnesota Bureau of Criminal Apprehension, St Paul, Minnesota
terry.laber@state.mn.us
5 Department of Psychology, University of Auckland, Auckland, New Zealand
g.owens@auckland.ac.nz

Bloodstains found on clothing and fabric can provide valuable evidence in a forensic investigation. Despite the widespread use of bloodstain pattern analysis (BPA) on fabric, very little research has been conducted to determine how reliable and accurate these methods are. In the current study, we aimed to calculate a baseline rate for accuracy in pattern classification on fabrics, and determine the factors that may influence this. Thirty experienced BPA experts were asked to classify a series of patterns covering a range of pattern types, while we manipulated the amount of pattern present, the type of fabric, and the contextual information that was available. Analysts were provided with a list of possible pattern mechanisms and were required to respond in two parts. Part 1 asked the analyst to identify the one mechanism that best described the target pattern, based on his or her initial thoughts. Part 2 allowed the analyst to choose any number of mechanisms that could account for the target pattern, but this conclusion was what he or she would be prepared to state in Court. The results of this unique and comprehensive survey, and the implications for BPA experts, will be presented and discussed.
Bloodstain Pattern Analysis Downunder – a Discussion on the Status of BPA in the Australasian Region

Edmund Silenieks (IABPA Vice President, Region VI)

Forensic Science SA, Adelaide, SA
Ted.Silenieks@sa.gov.au

BPA continues to evolve as its own discipline in the Australasian region. Much has been done to underpin the education of practitioners, ensure a high quality product and develop a common terminology list. This session will give feedback on developments from the Bloodstain Pattern Analysts Scientific Working Group (BPASWG), the International Association of Bloodstain Pattern Analysts (IABPA) and the Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN).

A panel consisting of local and international delegates representing these organisations will provide insight into an international approach to strengthening the discipline and will be available to field questions from the audience.

The Interaction of Blood with Fabrics

Edmund Silenieks¹, Dr. Andrew Donnelly¹, Christopher Peters², Dr. Mark Reynolds³

¹ Forensic Science SA, Adelaide, SA
Ted.Silenieks@sa.gov.au

² Flinders University, Bedford Park, SA
Chris_peters665@hotmail.com

³ West Australia Police, Midland, WA
mark.reynolds@police.wa.gov.au

Work conducted at Forensic Science SA has shown that bloodstains on different fabrics generated by the same mechanism may exhibit different visible features, dependent in part on the fibre compositions of the fabrics. Blood will diffuse through different types of fabrics at different rates, which affects the appearance of the resultant bloodstains. The length and orientation of fibres used in yarns within a fabric will also influence the diffusion of blood through a fabric. Long filament fibres, typically synthetic or silk, allow for greater diffusion of blood compared to short staple fibres, typically cotton. Blood will diffuse between the filament fibres within a yarn, resulting in bloodstains that appear dilute.

Some synthetic fibres, such as polyester, are hydrophobic and do not absorb blood, rather they adsorb blood. For woven synthetic fabrics in particular, adsorption rather than absorption, will affect the resultant appearance of bloodstains as it facilitates the diffusion of blood through the fabric. "Absorption" describes the phenomenon where a liquid (i.e. blood) will penetrate the fibre and "adsorption" describes the phenomenon where a liquid coats a fibre. Absorption generally applies to natural fibres, and adsorption generally applies to synthetic fibres.

A “Bloody Good” Product – Development and Implementation of a Quality Assurance Program in Bloodstain Pattern Analysis

LeeAnn Singley

Grayson Singley Associates, LLC, Duncannon, Pennsylvania, USA
lsingleygsa@msn.com

The National Academy of Sciences Report: Strengthening Forensic Sciences in the United States: A Path Forward has challenged agencies, be they forensic laboratories or police departments, to review the quality of the forensic services they provide. This has not just applied to agencies in the USA, but around the world. A documented Quality Assurance program is the formal response to the question of whether or not forensic disciplines in these agencies are being performed to the highest standards.

This presentation will address the need to establish a sound Quality Assurance program as it relates to the discipline of Bloodstain Pattern Analysis. Hence, the components of a Quality Assurance program (e.g., validation, equipment maintenance, reagent testing, personnel qualifications, assessments, report writing and review, etc.) and Standard Operating Procedures will be discussed in detail.

Quality Assurance is the promise to the customer that protocols are in place to ensure a quality product had been produced. With a documented program, forensic laboratories and police departments performing Bloodstain Pattern
Analysis will be held accountable, and furthermore, will demonstrate a commitment to strengthening the discipline and the forensic sciences as a whole.

Shedding Light on “The Dark Side” - Views from a Forensic Bloodstain Pattern Analysis Consultant

LeeAnn Singley

Grayson Singley Associates, LLC, Duncannon, Pennsylvania, USA
lsingleygsa@msn.com

Perceptions of defence experts range from “renowned expert in the field” to “liar for hire”. Experts hired by defence attorneys, and particularly those previously affiliated with police agencies, have been labelled as “going to the dark side”. But what is the defence expert’s role in reviewing case materials? What are they really looking for?

This presentation aims to ‘shed some light’ on those questions. As a private forensic consultant performing casework analysis for defence and prosecuting attorneys, the author has been exposed to the challenges presented from both ‘sides’. In a typical case review, one function of the forensic consultant is to ensure the opposing expert’s opinions have scientific foundation based on sound analysis and interpretation of the data.

Brief excerpts from a homicide case, including photographs and written opinions by the opposing expert, will be offered to the audience to allow them to ‘play defence expert’. Was there scientific foundation for the opinions rendered? You be the judge – or the expert - as the case may be. Although this presentation comes from a USA perspective, the lessons learned also apply to Australian jurisdictions. After all is said and done – it really is just all about the science.

A Realistic Simulant for Ballistic Penetration of Human Brain

M. S. Lazarjan¹, P. H. Geoghegan², M. C. Jermy³, M.C. Taylor⁴

¹ University of Canterbury, Christchurch, Canterbury, New Zealand
milad.soltanipourlazarjan@pg.canterbury.ac.nz
² University of Canterbury, Christchurch, Canterbury, New Zealand
patrick.geoghegan@canterbury.ac.nz
³ University of Canterbury, Christchurch, Canterbury, New Zealand
mark.jermy@canterbury.ac.nz
⁴ Environmental Science and Research Ltd (ESR), Christchurch, Canterbury, New Zealand
michael.taylor@esr.cri.nz

Understanding the formation of the back spattered bloodstain patterns is a key factor in investigations of cranial gunshot fatalities in ascertaining the scenario leading to death. Backspatter is the projection of blood and tissue back toward the firearm. In this study, ballistic responses of gelatine (3, 5 and 10% (w/w)) and a new composite material based on glycerol, starch and fibre are compared to bovine brain using high speed camera and image processing. Two series of experiment were performed using .22 LR and a .22 air rifle. Expansion rate, kinetic energy absorption and the form of the deformation were analysed. The results indicate that the gelatine samples exhibit elastic recoil and return to their original shape after the projectile passes through. The bovine brain and the composite material exhibit more plastic deformation. Kinetic energy absorption in all the materials are within their uncertainties of the measurements, which shows that energy absorption mainly depends on the density of the material not the elasticity. However, by changing the elasticity of the material the form of the fragmentation is changed. The response of the materials when fronted with plates of various bone-like simulants is also tested.
The Use of a Novel Physical Model for Gunshot-Related Blood Spatter Simulation

M. C. Taylor\textsuperscript{1}, K. Winer\textsuperscript{2}, R. Skebutenas\textsuperscript{3} and Patrick Geoghegan\textsuperscript{4}

\textsuperscript{1} ESR, Christchurch, New Zealand
michael.taylor@esr.cri.nz
\textsuperscript{2} Kansas City Police Department, MO, USA
Kevin.winer@kcpd.org
\textsuperscript{3} ESR, Christchurch
Rebecca.skrebutes@esr.cri.nz
\textsuperscript{4} Patrick Geoghegan

The study of gunshot-related blood-spatter is a common and often critical task for investigators. Simulating the formation of this spatter to answer case-related questions is complex and the mechanism of spatter projection is not well understood. Because tests on human subjects are not possible; modelling techniques are required. Anatomically accurate dimensions and the best available simulant materials were used to produce an adult human head model. The objectives for this study were:

- To find materials that will adequately simulate the relevant anatomical features of the human head
- To construct a physical model that will permit the visualization of intra-cranial dynamics and external spatter formation
- To demonstrate the use of the model for studying critical cranial mechanistic components.

A model was built and tested using .22 and 9 mm ammunition. A high speed digital camera was used to measure bullet movement, the deformation of the brain simulant and behaviour of spattered material during controlled shooting experiments. Partial validation was achieved by comparisons with ballistics tests using pig heads. In the course of testing the model, a set of high speed video clips was collected. These demonstrated cranial gunshot wounding and associated spatter formation.

When One Blow is Enough

\textit{David Veldhoen}

South Australian Police

Conventional reasons tell us that when confronted with a spatter pattern suitable for 3-D reconstruction that there has been a minimum of two blows to produce said pattern, the first blow, to create the liquid blood source, the second to distribute that blood source on the surface.

As bloodstain pattern analyst we apply this conventional reasoning with our observations of the size, shape, location and distribution of bloodstains and bloodstain patterns, to reconcile the events, more often than not without the opportunity of 20-20 hindsight.

Take a walk through this crime scene, and follow the story through to the development of the interpretation, though a 3D reconstruction through to reconciliation and finally the court room, with the luxury of 20-20 hindsight and see how an impact pattern can result from a single blow.

Modelling the Impact Dynamics of Small, Upward-Projected Blood Droplets for Quantitative Crime Scene Reconstruction

Elisabeth Williams\textsuperscript{1,2}, Michael Taylor\textsuperscript{3}, Natalia Kabaliuk\textsuperscript{3}, Mathieu Sellier\textsuperscript{3}, Mark Jermy\textsuperscript{3}

\textsuperscript{1} ESR Forensic Science Research Program, Christchurch Science Centre, Christchurch, New Zealand
\textsuperscript{2} Department of Sport and Exercise Science, University of Auckland, Auckland, New Zealand
\textsuperscript{3} Department of Mechanical Engineering, University of Canterbury, Christchurch, New Zealand

The dimensions of bloodstains are dependent on the relative balance of inertial and viscous forces (characterised by the Reynolds number) and inertial and surface tension forces (Weber number) during droplet impact. Existing models to calculate blood droplet diameter and impact velocity from stains are based on large droplets (> 3 mm diameter), falling under the influence of gravity. These models, in which Reynolds number typically dominates over Weber number, have not been validated over a wide range of impact conditions. In this study, a mechanical device was used to generate blood droplets over a range more relevant to crime scenes (droplet diameters 0.3 to 1.6 mm and impact velocity 2.5 to 7.5 m/s).
Droplets impacted upwards and downwards on vertical surfaces with droplet flight and impact dynamics captured using high speed cameras. The results of correlations with models based on velocity and diameter will be discussed.

**Physics and Mathematics in Bloodstain Pattern Analysis**

*Dr. Brian Yamashita*

Royal Canadian Mounted Police, Ottawa, Canada  
Brian.Yamashita@rcmp-grc.gc.ca

Certain aspects of bloodstain pattern analysis are better understood by analysts if some of the underlying background science is known. This presentation will discuss some of the fundamental physics and mathematics that underpin the discipline and assist the analyst to better understand the principles that contribute to the production of impact patterns. To this end, a one-week Math and Physics Course has been developed and is offered regularly in Canada and occasionally in the US. The course strengthens the analyst’s core knowledge and helps to address, to a certain extent, some of the criticisms of bloodstain pattern analysis, and perhaps forensic science in general, as not having a “scientific” foundation.

**Which Sock is Whiter? Applying the Scientific Method to Bloodstain Pattern Analysis**

*Dr. Brian Yamashita*

Royal Canadian Mounted Police, Ottawa, Canada  
Brian.Yamashita@rcmp-grc.gc.ca

Through the application of the scientific method, BPA examiners analyse a crime scene to determine possible mechanisms that have created bloodstains and bloodstain patterns. At times, experimentation must be utilized, which may allow the analyst to accept or eliminate the possibility that a particular mechanism created a bloodstain pattern. Laundry detergent commercials demonstrate in 30 seconds how to conduct controlled experiments, keeping all variables equal except the detergent, all to answer the question, “Which sock is whiter?”

In contrast to the simple television demonstration, bloodstain pattern scenes are often complex, and present the analyst with several questions to be answered. Through the application of the scientific method, the BPA examiner will first analyse the scene to determine possible mechanisms that could have created bloodstains and bloodstain patterns. If experimentation has to be carried out to test various theories, the analyst will have to identify and control variables in order to properly answer the question presented by the crime scene – and may well recall that detergent commercial.

**Poster Presentations**

**Factors Affecting the Near Infra-Red Photography of Bloodstains**

*Mark Connor*

Forensic Service Centre, Institute of Environmental Science and Research  
Porirua, Wellington, New Zealand

Near infrared (NIR) photography can be used to detect bloodstains on dark coloured fabrics, which are otherwise difficult to view with the naked eye. This technique is often successful, but may fail to detect all bloodstains that are present on a surface. Numerous pieces of bloodstained, dark coloured fabrics were photographed with a camera converted to pick up NIR radiation. The factors that determine whether NIR photography is successful or not are explored in this presentation. The type of dye used to colour the fabric will initially determine if there is enough contrast between the fabric background and the staining for blood to be visualised. The type of bloodstaining that is deposited on the fabric will have an effect as to how the blood is viewed with the NIR camera, with more concentrated staining easier to see than lighter stains. It was found that type of fabric has a minimal effect on the success of this technique. It is also shown that the use of photographic filters may be employed to remove the background of some patterned materials, allowing for bloodstaining to be better visualised on these materials.
Appearance of Small Bloodstains after Enhancement

Andrew Davison

Examination of clothing and other items such as weapons for bloodstains is a common request for a forensic science laboratory when investigating physical assault cases, in many instances dealing with very small amounts of blood that require at least low-power microscopy to be visualised. It is the aim of the scientist to evaluate whether the appearance of the bloodstains can assist in determining how the blood was deposited. In certain cases chemical enhancements, such as luminol and hydrogen peroxide, are also used to assist in locating the blood on items – see Comparison of methods for visualizing blood on dark surfaces, Science and Justice, Vol 53, Issue 2, June 2013, p178-186. In this initial further study the application of a solution was investigated to determine whether it can alter the appearance of the bloodstain.

Clotting of Blood on Various Fabrics

Christopher Peters¹, Andrew Donnelly¹,² Edmund Silenieks², Adrian Linacre¹

¹ Flinders University, Bedford Park SA
² Forensic Science SA, Adelaide, SA
andrew.donnelly@sa.gov.au

The presence of spatter stains containing blood clots at crime scenes, or on a person’s clothing, may be indicative of a prolonged or resumed assault. The rate at which blood will clot can be influenced by a number of factors. We present the qualitative results of experiments investigating the influence of fabrics on blood clotting. As expected, the more absorbent a fabric, the less likely blood will pool on the surface to allow enough time for clotting to occur. For example, cotton readily absorbed blood compared to polyester; blood fully penetrated and dried within the cotton fabric, whereas visible clots only formed on plain woven polyester fabric. Also, the drying time of EDTA-treated blood under limited laboratory conditions was compared to clotting times.

Features of Transfer Bloodstains on Various Fabrics

Christopher Peters¹, Andrew Donnelly¹,² Edmund Silenieks², Adrian Linacre¹

¹ Flinders University, Bedford Park SA
² Forensic Science SA, Adelaide, SA
andrew.donnelly@sa.gov.au

What is the effect on transfer pattern stains of various fabrics? Can stains deposited on wet fabric be distinguished from stains deposited on dry fabric that has become wet with water? We present the qualitative results of experiments conducted with EDTA-treated blood to answer these questions. Fabric construction has shown to have an influence, with knitted fabrics demonstrating the ability of a fabric to “hold” the shape of a transfer pattern compared to woven fabrics, particularly where larger volumes of blood are involved in the transfer. As expected, transfer patterns exhibited more distortion on the more absorbent fabrics.

The effect of water on bloodstain formation indicated bloodstains deposited onto dry fabric underwent less distortion when wetted than those deposited onto wet fabric, although it may be difficult to determine the deposition conditions for casework items that have been wet with water either before or after blood deposition. Interpretations will be offered regarding the effect of fibre type and fabric construction on stain formation.
Contamination of Bloodstain Patterns on Fabric: What is the Impact?

Natasha Garcia¹, Alison Sears² and Shawn Harkins³

¹Natasha Garcia, Gosford Crime Scene Section, Forensic Services Group, NSW Police Force
²Alison Sears, Case Management Unit, Forensic Biology, NSW Forensic and Analytical Science Service, NSW Health Pathology
³Shawn Harkins, Training and Development Services, Forensic Services Group, NSW Police Force

Contamination is one which Forensic Investigators are faced with daily. Sources of contamination are varied and in many cases unpreventable. Absorption of fluids by fabric post-deposit can result in stains appearing larger or misshapen, sometimes total loss of evidence due to large scale absorption. Contamination of bloodstained clothing during transportation may result in an altered perception or conclusion of deposition mechanism and patterning present; this has the potential for loss of evidence or skewed conclusions. Homicide investigations are just one example where probative evidentiary value may be lost during transportation of deceased from scene to mortuary. During the transportation phase, clothing remains in-situ in an air-restrictive plastic body bag - an avenue for contamination by blood and other post-mortem fluids. Also, removal of clothing at post mortem may also impact on the presence of patterning; often preservation of clothing is important for downstream examination. This project incorporates experimental concepts and operational case studies to look at the impact of transportation and removal of clothing post-mortem. Photographs of deceased person in-situ at twenty homicide crime scene cases were examined, noting visible clothing and bloodstain patterns. These were compared to presentation of clothing during physical examination in the laboratory. Experimental trials were set up using mannequins wearing bloodstained t-shirts and subsequent removal using either manual or cutting techniques. Results will be shown and supported by case studies demonstrating observations. Suggestions for possible alternatives to established procedures will be discussed.

An Interesting Bloodstain Pattern Attributed to a Medically Induced Arterial Breach

Merrilyn Hurst

Forensics, Australian Federal Police, Canberra City, ACT
merrilyn.hurst@afp.gov.au

In August 2013, ACT Crime Scenes were requested to attend premises in relation to a deceased female. Upon initial Police attendance, extensive bloodstaining was observed throughout multiple areas of the house and indications of possible clean-up attempts were present. The husband of the deceased was present at the scene and the matter was treated as suspicious awaiting further information.

Initial scene examination involved the assessment of the bloodstains and bloodstain patterns present within the bedroom, walk in wardrobe and ensuite of the house. An assessment of the body was conducted in conjunction with the Forensic Medical Officer and the bloodstaining was then considered in context with the information arising from this assessment. As a result of the examination and assessments, the matter was considered as non-suspicious with the likely cause of death being attributed to a pre-existing medical condition and complications arising. This finding was further confirmed through the post mortem examination.

Blood Pattern Destruction via Insect Invasion

Suzanne Mullen, Joannah Lee, Denise Grover

Forensic Biology, Northern Territory Police, Fire and Emergency Services
ForensicBiology@ntpfes.nt.gov.au

Australia’s Northern Territory presents a unique, varied and harsh environment. These factors produce a veritable wealth of insect life which can raise unusual challenges to those individuals attempting to interpret bloodshed events. We have witnessed the destruction of Bloodstain Pattern Analysis evidence by insects and in some instances, animals on a number of occasions. This can occur rapidly with a scene being radically altered in a short space of time. This project investigates the effect of insect activity on a blood pattern scene to the point that it may render the blood pattern/s uninterpretable. Furthermore, the time frames associated with the complete removal of all visible traces of blood in order that the location of a bloodshed event is completely lost, is investigated. This is examined via separate experiments; one in an uncontrolled mock BPA scene set up in a rural Darwin location and another by creating a controlled practical environment with commercially sourced insects. The insect activity, disturbance and interference to bloodstains and
Blood Pattern Analysis at Northern Territory crime scenes will be presented photographically along with other results and conclusions at ANZFSS Adelaide 2014.

Near-Infrared (NIR) Digital Photography for the Detection and Enhancement of Bloodstains and Bloodstain Patterns

Janette Psaroudis¹ and Joanna Sheree Lloyd²

¹Victoria Police Forensic Services Department (Biology Division), Macleod VIC, Australia
janette.psaroudis@police.vic.gov.au
²Victoria Police Forensic Services Department (Biology Division), Macleod VIC, Australia
Joanna.Lloyd@police.vic.gov.au

The detection and recording of bloodstains on dark coloured fabrics and other substrates, can be difficult without the use of specialised enhancement techniques. The scope of the present study was to validate Near Infrared (NIR) photography for use in the Biology Division, VPFSD. This study assessed a modified Nikon D5100 digital SLR camera and evaluated the following parameters: optimum light conditions and camera settings; robustness and reproducibility through assessing different coloured dyes, substrate types and textures; sensitivity to blood dilutions and washed bloodstained fabrics under various conditions; specificity regarding other biological and non-biological substances; a comparison to Luminol and Polilight, as well as the usefulness of the technique for Bloodstain Pattern Analysis (BPA) on dark clothing. Although NIR digital photography is not specific to blood, it provided a quick, easy and non-destructive method for detecting, recording and enhancing the definition of bloodstains on dark coloured substrates. The usefulness of the technique was found to be limited to substrates that reflected NIR light and bloodstained fabrics that had not been water affected, however the technique works well alongside other blood detection techniques. NIR photography has been introduced into routine Biology casework at the VPFSC and has proven to be beneficial.

Spatter Reassignment – When Transfer Looks Like Spatter on Fabric

Edmund Silenieks¹ and Dr. Mark Reynolds²

¹Forensic Science SA, Adelaide, SA
Ted.Silenieks@sa.gov.au
²West Australia Police, Midland, WA
mark.reynolds@police.wa.gov.au

On October 24, 2013 a jury in the USA found David Camm not guilty of murdering his wife and two children. It was Camm’s third trial and critical evidence hinged around whether the small stains located on Camm’s shirt were transfer or spatter bloodstains. The prosecution argued the stains were spatter resulting from gunshot wounds to the heads of the victims. Defence argued these stains were caused by small beads of blood present on the victim’s hair, transferred to Camm’s shirt when he went to their aid. Both sides had a battery of BPA expert witnesses to support their arguments. So is it possible for transfer to look like spatter on fabrics?

To investigate this, blood was applied to several different surfaces using different mechanisms and transfers attempted to different fabric types. For non-porous surfaces, blood tended to bead on the surface, before the transfer was attempted. In particular, a drop of blood flowing across the surface of a treated fabric left small beads in the trail behind the moving blood. Subsequent transfer stains produced from these small beads were difficult to distinguish from spatter. This poster visualises how the spatter reassignment was achieved.

The Rain’s a Pain, but Mainly for the Stain: Potential Effects of Atmospheric Moisture on the Appearance of Bloodstains

E. Sowter

Forensic Science Service, Tasmania
emily.sowter@fsst.tas.gov.au

Forensic exhibits are commonly kept in cold storage while awaiting examination for blood and other body fluids. It was observed when removing certain types of exhibits from cold storage during humid weather that condensation would often form on the surface. It was suspected this had the potential to alter the distribution and appearance of water soluble stains such as blood. To investigate further, bloodstains were made on a number of common items with different material
composition and surface characteristics. These were then placed into typical cold storage conditions in paper bags. The items were removed from storage on a humid day, and photographed to show the development of condensation, and any effects on the appearance of the item and stains. While condensation was present, exhibits were brushed with paper to simulate removal from packaging or movement on the examination surface, and the effects also photographed. Certain items were more prone than others to developing condensation on their surface. In some cases this affected the appearance of bloodstains, particularly when combined with movement. Laboratories should be aware of the potential for condensation to alter the appearance of items under certain conditions, and take steps to avoid this effect when appropriate.

**Workshop Presentation**

**Contextual Bias in Forensic Decision-making: Why Context can be Both Your Best Friend and Your Worst Enemy**

*Niki Osborne*

Institute of Environmental Science and Research, Christchurch, New Zealand
niki.osborne@esr.cri.nz

Scene investigation, pattern matching, and pattern classification in forensic contexts are complex processes that rely heavily on the training and experience of examiners. In addition to the complexities of the tasks themselves, experts are often presented with an array of contextual information relevant to the case, such as other forensic evidence, medical findings, and eyewitness reports—all of which could play a role in how conclusions are formed. Do we understand how we reach conclusions in forensic decision-making? What part, if any, does contextual information play in these decisions? How should we ultimately express our opinions?

In this workshop, you will be introduced to some of the basic principles of cognitive psychology as they apply to perception and decision-making. You will then be invited to explore the process of decision-making from the crime scene to the courtroom, and to consider how contextual information might be integrated appropriately into this process. We will use practical exercises to challenge one another in our approach to forensic decision-making.
PROCEEDINGS OF THE 5TH EUROPEAN INTERNATIONAL ASSOCIATION OF BLOODSTAIN PATTERN ANALYSTS HELD AT THE ARMA DEI CARABINIERI FORENSIC SCIENCE DEPARTMENT HEADQUARTERS IN ROME ITALY MAY 12-15, 2015
Pasquale Angelosanto – Brigadier General of the Carabinieri Scientific Headquarters gives opening welcome to delegates.

Dr. Andrea Berti – Conference Coordinator.

Dr. Andrea Berti, welcomes IABPA President, Pat Laturnus to the Conference.
Abstracts of Presentations Given at the Fifth European International Association of Bloodstain Pattern Analysts Held in Rome Italy

The Canadian Approach to BPA

*Pat Laturnus - President IABPA*

Ottawa, Canada

A large geographical area with a relatively small population provides for some unique challenges and opportunities in Canada. The discipline of Bloodstain Pattern Analysis has evolved through the Forensic Laboratory System and is now conducted primarily by Canadian police agencies. As investigator demand increased, police analysts are well located to travel and attend scenes. Discussion will review how most analyst receives the same training through two main Police Colleges. A mentorship program tied to a solid foundation of Crime Scene Investigators provides for well-trained analysts who are respected by the Courts. A case review will be offered to illustrate the approach taken by Canadian Analysts.

Bloodstain Patterns Produced in Fatalities due to Medical Conditions

*Stuart James*

James and Associates Forensic Consultants, Inc.
Fort Lauderdale, Florida
USA

There are medical conditions of individuals that can produce a variety of bloodstain patterns at a scene that may mimic a violent event and arouse suspicion of a homicide, suicide or accidental death. The patterns may include large pools of blood, splashed and projected patterns as well as impact spatters, expiration bloodstains, drip stains and drip trails. Many of these conditions are the result of massive hemorrhage as the fatal event. Other conditions can be the result of chronic bleeding over a period of time. It is important to examine the medical history and autopsy findings of the deceased since this will often reveal the mechanism(s) of bloodshed.

This presentation will discuss the bloodstain pattern analysis and the cause and manner of death in several of these types of cases including:

- Chronic debilitating conditions
- Peptic ulcer
- Lung cancer
- Esophageal varices
- Venous/arterial shunt for kidney dialysis
- Venous insufficiency syndrome (varicose vein hemorrhage)
- Nose bleed

The Italian Experience: BPA as a Useful Approach to Reconstruct Crime Dynamics

*Paolo Fratini*

Carabinieri RIS
Roma, Italy

In order to reconstruct the alleged dynamics of the various phases of a criminal event you need to consider all the objective elements inferable from the crime scene as a whole. Usually these data are acquired:

- By forensic evidence relating to the injuries suffered;
- From site survey and evidence collection of traces and / or physical evidences of interest
- Reconstructive;
- The laboratory tests on the various findings acquired during the crime scene investigation.
In fact particularly serious crime, such as the facts of blood, more significant elements for the crime reconstruction may emerge from the study of traces of blood with particular reference to their morphology and their location on the theater criminal. This branch of forensic science is known as "Bloodstain Pattern Analysis" (BPA) and studied the various physical mechanisms, used to produce the bloodstains (trajectories, projections, drips, swipes, washing, etc. ...).

The following presentation will illustrate some applications of BPA in criminal cases handled by our department who have also had a significant impact in the media nationwide.

**Surface Behaviour in Liquid Latex Lifting - Securing Bloodstains after Arson**

*Silke Brodbeck, MD*

Germany

Perpetrators often use different strategies to destroy trace evidence at crime scenes or to put suspicion onto third parties. One strategy often found is the burning of crime scenes. But burning does not destroy reliable the traces, depending on variables like temperature, surface and traces.

This presentation shows the results of the first Finnish-German arson research project and describes the liquid latex lifting as a technique for the securing of bloodstains, DNA and fingerprints after a fire at a crime scene. Because the use of latex is primarily depending upon the surface, several surfaces were tested in this project. Liquid latex lifting is a reliable method to secure bloodstains, DNA and fingerprints after arson. Its use is dependent upon the preservation of the surface and the surface material itself. This presentation gives furthermore an overview how to secure bloodstains, DNA and fingerprints after arson.

**Caseworks Presentation**

*Christian Faccinetto*

Carabinieri RIS
Parma, Italy

On the date of August 19th 2012 at approximately 10:00AM, local emergency response of Arma dei Carabinieri were called to a residence in Lignano Sabbiadoro (UD), Italy. They founded Mr. and Mrs. Burgato deceased in the secondary bathroom adjoined the garage at the subbasement level. The Burgato couple bodies were founded sprawled on the floor splattered with blood like many other surfaces in the bathroom. Many traces were found in the bathroom and in the garage’s floor in particular on the getaway from the garage to the front house garden and then to the street. Subsequent investigation indicated that the murder was probably a robbery gone wrong. The inspection of the crime scene was made in order to pick out any useful evidences and then to identify the culprit’s DNA and to make the crime scene reconstruction with BPA report. Claudia Danelon, the prosecutor in charge of this case, of the Public Prosecutor’s office at District Court of Udine, at the end of the investigation with the BPA reconstruction report together with other investigative results could arrest one of two half-brothers and charge them with murder with the aggravating circumstances of cruelty.

**BPA in a Stomping Death Murder Investigation**

*Jeffrey Scozzafava*

Somerville, New Jersey
USA

This presentation highlights the interpretation of bloodstain patterns at a crime scene in New Jersey, USA. Bloodstain patterns placed the victim near the floor of his residence during his attack by multiple attackers. The bloodstain patterns were consistent with two attacks, separated by time sufficient for blood to clot. The interpretation opinions and trial outcome will be discussed.
Unusual Staining on the Ceiling at a Murder Scene

John Hoade

Forensic Science Ireland
Dept. of Justice and Equality
Ireland

An elderly man died from multiple blows with a baseball bat. He had severe head injuries including large scalp lacerations and skull fractures. Unusually, for an assault of such severity, there was very little blood at the scene and most of the blood spatter appeared dilute.

However, there were numerous clear coloured, airborne stains, with an oily appearance, on the ceiling above where the assault took place. This staining gave a week reaction for the presence of blood and a DNA profile matching the deceased, and is most likely to be cast-off cerebrospinal fluid.

Casework Presentation

Martin Eversdijk

The Netherlands

In May 2009, a very young girl died of extreme loss of blood caused by a slashed throat in her mother’s house. The mother’s ex-boyfriend who was responsible for the cutting of the young girls’ carotid artery and jugular stated it was an accident that happened in the living room. Her mother who was present when her daughter’s throat was cut had a totally different statement on the location and manner of the fatal cutting.

This presentation will discuss the crime scene and the physical evidence in this case including issues involving bloodstain pattern analysis, the statements by the opposing sides, the highlights of the BPA report and how it was written. Also the contribution of BPA in coherence with other forensic investigations/outcomes that played a huge role during court in how the bloodstain patterns where most likely produced will be discussed.

The Use of BPA in an Episode of Aggression with Acid: The Case of Lucia Annibali

Rosario Casamassima

Carabinieri RIS
Roma, Italy

In April of 2013 in Pesaro, the lawyer Lucia Annibali, was disfigured with acid by two assassins hired by his former Luca Varani. The ambush takes place April 16 at 17:00 when, when the lawyer, in opening the door of the house, is hit in the face by a jet launched from an acid by the criminals who broke inside. BPA was used to carry out the reconstruction of the events and estimate the amount of acid used in the attack. The technique has proved useful also to verify the testimony given by the victim that often in these cases prove confusing and approximate.

Post Mortem Dismemberment by Chainsaw

Clare Knock

Cranfield University
England, UK

This work studied the use of chainsaws to dismember bodies. The results showed that the use of a chainsaw to dismember a body produces a distinctive pattern and that different chainsaws can give significant differences in the size of the pattern. Two chainsaws were used to cut the hind shank and hock joint of a pig. Each pig joint was placed on a plank and cut in three places. This gave three different sizes for the chain saws to cut through. The first chainsaw was a Stihl petrol chainsaw with semi chisel cutters and a chain velocity of 20 ms⁻¹. The second chainsaw was an electric chainsaw with a micro chisel cutter chain rotating at a velocity of 10 ms⁻¹. After dismemberment, the pig joint was removed. It was found that the two chainsaws produced a similar pattern of tissue. The pattern consisted of i) a void where the joint and plank had been placed, ii) a linear distribution of tissue in front of the void iii) pieces of tissue to the
side of the front linear distribution and iv) a linear distribution behind the void. The results showed significant differences in size for the two different chainsaws. This was particularly clear behind the joint. Behind the void, the length of the linear distribution was independent of joint size. It was 1.42m, with a standard deviation of 0.12 m for the petrol chain saw and 0.54 m with a standard deviation of 0.17 m for the electric chain saw.

All the King’s Horses and all the King’s Men Should Stay Outside of the Yellow Tape.

John Paolucci

President - Forensics 4 Real Inc.
Brewster, New York
USA

A community in Charleston, South Carolina was unsettled; protestors were claiming that a nineteen year old boy was murdered by the police who are covering it up by calling the incident a suicide. Denzell Curnell lay in the street with a perforating gunshot wound that entered the right side of his head – and Denzell is left handed. The officer who was on the scene when the shot was fired was reputed to be very aggressive, the victim had no criminal history and the toxicology analysis showed no positive findings. Upon initial examination of the crime scene photos, it was apparent that the firearm had been handled excessively several minutes after bloodshed had initiated and a piece of fabric with unknown origin, that was possibly used to move the gun, was left with the body. At first look, there appeared to be some foundation to the claim that this crime scene was staged due to excessive handling of the body and the firearm, but a more holistic analysis of the incident and all its components may have saved a police officer from a murder charge.

Shoot Down or Battered to Death? Limitations of Current Forensic Near Infrared (NIR) Crime Site Investigation Techniques

Martin Shulz

Institut für Rechtsmedizin der Universität München
Munich, Germany

The forensic application of Near Infrared (NIR, approximately between 750 and 1500 nm) photography is a quite old technique that was introduced at the Institute of Legal Medicine in Munich in 1937. It has proven to be a useful tool within criminalistic investigation but the use of NIR-sensitive film material is fraught with difficulties for example, a real-time search for evidence was impossible, which strongly limited its forensic application spectrum. Modern, digital photography has overcome these problems and some forensic applications of NIR-reflection photography have previously been described. Nonetheless, the presented case of a young man reveals, that there is room for improvement within forensic NIR-technology, especially inside crime site investigation. Possible solutions will be introduced and may be discussed.
Understanding the Visibility of Blood on Dark Surfaces

Karla De Bruin and Martine Verhoeff

NFI
The Netherlands

Bloodstains on dark surfaces are often difficult to detect due to a lack of contrast. By means of infrared light, absorbed by blood and reflected by many fabrics, it is often possible to visualize the blood. Unfortunately, not all dark surfaces reflect infrared light and on these surfaces it is still difficult to detect blood.

In the present study we investigated why on certain surfaces blood is not detected and how we can improve this. We examined 166 different fabrics regarding the visibility of the bloodstain by three different IR cameras: a Nikon camera sensitive to IR light, an IR video camera, and a Short Wave IR video camera. Almost all bloodstains were visible in either of these three cameras or were visible by eye. The fabrics were then examined regarding their reflection spectra. Based on these, different groups could be distinguished with the same reflection properties. Further, the composition of the fabrics was examined (cotton, polyester etc.), the structure (woven/non-woven), and the absorption of a blood drop by the fabric. All these properties combined allow us to classify the fabrics into different groups, enabling a prediction about the fabrics on which a bloodstain will be visible. Thus, when the investigator does not see any blood on a surface with an IR camera, the distinction may be made whether this is due to a possible lack of blood or due to the fabric.

Expert Testimony on BPA

Dario Bosco
Criminal Lawyer
Italy

What’s the present and future of Bloodstain pattern analysis in Court? Is it an important field of forensic science or is it only a trend in Forensic Science field? After the trilogy “Daubert-Joiner-Kumho” and after the last version of the Federal Rules of Evidence (F.R.E.), the opinion of American Courts concerning the admissibility of scientific evidence has changed, and the questions above can have, now, new answers. The change is closely tied to the updated gatekeeping role of the Courts about if and when “new science”, like BPA, can be admitted in Court like scientific evidence. At same time, also in Italy, many things are changing about scientific evidence, and, in last time, the Daubert standards are the new trend also in this Country.

In this work we present a complete review about the most important Court opinions in U.S.A, and Italy about reliability and admissibility of BPA like scientific evidence, and we suggest how and when an expert witness in this field can be admitted in Court.

Certification of BPA Analyst

Jeff Gurvis
Chairman of the IAI - Vice Chair of NIST OSAC
USA

Bloodstain Pattern Analyst Certification: Update from the IAI, The International Association for Identification (IAI) has had a bloodstain pattern certification program for over 17 years. The IABPA has long researched creating a certification program of its own. Over the past year or so, the IAI and IABPA have decided to collaborate on the IAI Bloodstain Pattern Analyst Certification. This discussion will cover the current state of the program, including requirements for application, certification testing, and recertification.
BPA Subcommittee of the Organization of Scientific Area Committees (OSAC)

Jeff Gurvis

Chairman of the IAI - Vice Chair of NIST OSAC
USA

The transition from SWGSTAIN In January of 2015, the US National Institute of Standards and Technology (NIST) hosted the first meetings of the Organization of Scientific Area Committees (OSAC) which was created to essentially bring all the SWGs under one roof in hopes of improving standardization and best practices. One of the subcommittees was formed for Bloodstain Pattern Analysis. This discussion will go over the members, affiliates, and mission of the Subcommittee as well as the current and future documents that will be produced.

Can We put the “I” in BIAS? Assessing the Association Between Analyst Characteristics and Performance on a Bloodstain Classification Task

Niki Osborne

Psychology Department
University of Otago
New Zealand

Contextual information can influence decisions about forensic evidence. Here, we explore the association between the effects of context and analyst characteristics on accuracy and bias on a bloodstain pattern classification task. Thirty-nine bloodstain pattern analysts each completed measures of their need for closure, compliance, and decision-making style, as well as reporting their level of training and experience. For the classification task, analysts first examined a bloodstain pattern without any additional contextual information and allocated votes to listed pattern types according to favoured and less favoured classifications. Next, if they believed it would assist with their classification, analysts could request contextual information and update their vote allocation. We calculated a bias score based on any vote reallocations as a function of the contextual information. Almost all items of contextual information influenced decision-making, with medical findings leading to the greatest number of vote reallocations. While bias scores were positively associated to the largest degree with an intuitive decision-making style, overall, our findings suggest that bias is a general tendency and not a function of cognitive factors, decision-making style, or lack of training and experience. Accuracy was positively associated with advanced training and a rational decision-making style. Error was positively associated with basic training, fewer years’ experience, and a spontaneous decision-making style. The implications of our findings will be discussed.

Transfer of Blood from One Textile to Another Through Direct Contact, and the Resulting Bloodstains

Stephen Michielsen

North Carolina State University
Raleigh, North Carolina
USA

Blood from a bloodied textile, such as a shirt or dress, may transfer to another textile if the two textiles come into contact with each other. A person with the transfer stain may state that their clothing was stained as they were attempting to render assistance to the victim upon coming onto the scene. In studies where a drop of synthetic blood was placed onto a stack of two textiles, it was found that the larger stain occurred in the fabric with the highest wicking rate, regardless of which textile the drop was applied to. It was also found that, when the blood had wicked into the yarns within the fabric, it may be difficult to transfer the stain to another textile. The time allowed for transfer could be as short as two minutes, thus potentially placing the person at the scene.
Synthetic Blood Substitutes

Andrew Vreugdenhil

Trent University
Canada

This talk focuses on looking at BPA through the eyes of a materials scientist. Blood has many material properties that can be reproduced by stable artificial fluids. This plays an important role in synthetic blood substitute (SBS) design and fabrication. The listeners will be taken through a descriptive discussion on identifying key design features of an ideal SBS, including everything from longevity to matching key chemical and physical behaviours of blood. Our research group uses silicon colloid chemistry to develop potential SBS candidates. These candidate materials are aqueous, room temperature, non-toxic and stable colloidal solutions. They can be made to incorporate chemical functionality for emulating the behaviour of blood to simulate forensic imaging and biological analysis. There are many ways to assess the performance of these SBSs in comparison to blood, in this talk, we focus on demonstrating SBS performance during impact simulation using high-speed video analysis.

Forensic Validation of Alternative Formulation of Luminol

Gianmario Martra

University of Turin
Italy

As a consequence of a serendipitous observation occurred when some of us were acting as scientific consultants in a court case, a study of the effect on the Luminol test of the dosage of inorganic nanoparticles (NP), both oxidic and saline in nature, on surfaces supposed to retain latent blood stains was undertaken. Almost independently on the nature of NP, a significant increase and duration of the Luminol chemiluminescence was obtained. In particular, the light emission lasted even for minutes instead of seconds, the typical duration obtained with the best commercial product, Bluestar® Forensic, overcoming the main drawback of the Luminol test. On one hand, FT-IR investigations indicated that the observed behavior is not a consequence of some interaction of the catalytic sites (Fe3+ ions in heme groups in hematin) with the surface of the nanoparticles. On the other hand, the analysis of the kinetic of the chemiluminescent decay revealed that it stems from a decrease of the mass transfer rate of Luminol molecules in the liquid phase sprayed on inspected surfaces towards the catalytic sites, because of the presence of a percolation layer formed by pre-dosed NP. The absence of any interference of NP in recovering DNA from the so revealed blood stains and the significant decrease in the occurrence of false positives allowed for a successful patenting of a new kit and method for the exploitation of the Luminol chemiluminescence on crime scenes.

Research Studies on DNA and Presumptive Test Interaction.

Alessio Ferrara

Carabinieri RIS Parma
Italy

Our aim is to evaluate a new possible approach to the analysis of crime scenes with a lot of blood traces. Combur Test® is one of the most used presumptive test for the first screening of blood sample in crime scene based on the 3,3’,5,5’-tetramethylbenzidine reaction. For this reason we evaluated the inhibition in the extraction of DNA due to 3,3’,5,5’-tetramethylbenzidine. We used our validated internal method that is an automated process based on Qiagen magnetic bead chemistry. Five different dilutions of blood from 1:5 to 1:80 were spotted on denim and then processed. All the bloodstains spotted were firstly swabbed with Copan® swabs and then with Combur Test® strip for a comparison. We obtained a high ratio of full profile from the DNA extracted from both sampling methods. We also observed an increased level of stochastic events in blood traces with high dilutions. Analysis of crime scenes could be difficult in testing and collecting bloodstain when we have to face very small traces particularly when we have to manage a crime scene reconstruction using bloodstain pattern analysis. In this case results that could be useful to collect and analyze the Combur Test® strip instead to collect the entire evidence.
Fifty Shades of Red: Bloodstain Age Estimation Using Hyperspectral Imaging

**Gerda Edelman**

NFI
The Netherlands

The red appearance of blood is due to the absorption properties of oxygenated hemoglobin. After blood leaves the body circulation, its color changes from bright red to dark brown. When measured quantitatively using hyperspectral imaging, this color change can be used to estimate the age of blood stains. By analysing the reflectance spectra of blood stains, we are able to determine the concentration change of oxyhemoglobin, methemoglobin and hemichrome - all reaction products of hemoglobin. The relative amount of these hemoglobin derivatives can in turn be used to calculate the age blood, without destroying or even touching the stain. We evaluated this method in the laboratory and studied the influence of environmental circumstances, human variability and colored substrates on the results. Recently, a new custom-made hyperspectral camera was developed to perform measurements at the crime scene. This camera will be demonstrated in a workshop. The theoretical background will be explained in this talk.

A New Innovative Tool for Bloodstain and Spatter Search and Analysis

**Norbert Jaufmann**

Attestor Forensics
Germany

Some of the established chemicals for detection and visualisation of blood emit rather weak chemo-luminescence or fluorescence. In order to see or analyse the blood stains or blood spatter, the crime scene has to be almost fully darkened. Sometimes this is difficult, sometimes impossible. In cooperation with the Institute of Legal Medicine at Ludwig-Maximilian-University Munich, Germany, Attestor Forensics designed SCENEview BV800, a novel approach to enhance the visibility of fine blood stains or spray, using a high grade residual light amplifier. Trimmed exactly to the wavelength of the application, the light emission can be enhanced up to a factor of x70,000. With SCENEview BV800 the luminescence can be seen long time before the human eye would be able to detect anything, resulting in the capability to work in not entirely darkened crime scenes and reducing the amount of chemical used substantially.

HemoVision: An Automated and Virtual Approach to BPA Pattern Analysis

**Philip Joris**

University Hospitals KUL
UZ Leuven Belgium

Traditional Bloodstain Pattern Analysis, referred to as stringing, starts by estimating individual impact angles through ellipse fitting, after which a piece of string is used to visualise the stain’s flight path. An estimated area of origin can then be obtained by analysing the convergence of these strings. This approach has been successfully used, but is clearly a tedious and time-consuming process requiring skill and expertise. Software packages such as HemoSpat® and BackTrack® use digital images and intuitive software in order to facilitate this process. Several advantages are apparent, though substantial user input is still required. We have therefore proposed and developed a new approach, using computer vision techniques to remove most manual work. Fiducial markers are placed in and around a spatter pattern, after which the pattern is photographed. Close-up images provide sufficient resolution for accurate stain analysis, which is achieved by using an Active Bloodstain Shape Model. The placed markers are then used to automatically reconstruct a single coordinate frame from all images. In this reconstructed coordinate frame, flight path analysis can be performed using traditional (manual) methods, or existing software. By using the proposed marker-based system, most of the manual work is removed from the process of BPA. We believe that, due to its fast and objective nature, the proposed pipeline may be a valuable update to automated Bloodstain Pattern Analysis.
Advances in Computer Software: Documenting and Analyzing Spatter Stain Groups with HemoSpat®

Gordon L.M. Lefebvre

VP IABPA - Region IV
Canada

Violent bloodletting crimes often result in the presence of impact bloodstain patterns on walls and other surfaces found within the crime scene. These patterns may be fully developed and clearly identifiable, other times they may be subtle and not easily detected. The collection of sufficient spatter stains can be critical to an accurate analysis. The bloodstain pattern analyst is faced with many challenges relating to the documentation of spatter stains within the crime scene. Subsequent analysis of the spatter stains provide significant information regarding the location of the blood source at the time blows were struck. Advances in digital imaging and bloodstain computer analysis software have provided powerful tools in area of origin determinations. These advances can assist in more complete analysis as well as reduce time extended in the scene determining which stains to document and collect. These advances can also provide methods which could be used by trained forensic personnel to effectively document and collect spatter stains for subsequent off-scene analysis by a bloodstain pattern analyst who is unavailable for scene attendance.


Theresa Stotesbury

Trent University
Canada

We have all come to know and love the impact pattern at one point or another in our BPA careers. Our research looks at the basic dynamics of the impact mechanism before the blood creates the static patterns that are routinely processed at crime scenes. We use high-speed videos of an impact to investigate the influence of impact velocity, fluid depth and free-space on the characteristics of the mechanism itself. Our work primarily focuses on the changes in crown growth for both blood and water time. This presentation will cover our observed qualitative and quantitative comparisons in crown shape and size under a range of impact conditions. We demonstrate that the point of maximum crown size is where most of the droplets form. This is different from what is traditionally defined as the point of origin. Our findings from this study provide an experimental explanation for the often-reported underestimates in CPx and overestimates in CPz in area of origin estimation studies.

Implementing Probabilistic Approaches and Bloodstain Pattern Simulation with AnTraGoS and BPS

Francesco Camana

Italian State Police
Italy

A general overview of the importance of the statistical and probabilistic approaches in BPA is presented. In particular we show examples of application of the probabilistic method for the calculation of the area of convergence of projected blood drops, realized with AnTraGoS, the BPA software of Italian National Police.

Moreover we describe a possible procedure to estimate the height of origin of projections, based on a combined analysis of the single drop trajectories. We finally present the usefulness of Bloodstain Pattern Simulation (BPS) as a tool for reproducing the statistical characters of the blood patterns and for validating the results of the determination of the area of origin.
Calculating the Coordinates of the Area of Convergence by Using High School Mathematics

**Ludo Verbeek**

Dutch National Police
The Netherlands

In 2011 an impact pattern was found on uneven and sloping walls on a homicide scene. Unfortunately the current methods are not suitable on uneven and sloping walls. The last few years I have developed a model, which allows for the calculation of the coordinates of the area of convergence, which could potentially solve this gap. In this new model the area of convergence is calculated by using the distance between multiple bloodstains and the angles between the lines through the long axis of the bloodstains. By combining the coordinates with the angle of impact of the bloodstain, investigators are now able to calculate the coordinates of the area of origin. If you measure the angle between the line through the long axis of the bloodstain and the plum line, it is possible to calculate the coordinates of the selected bloodstains. The calculated coordinates can be used to calculate the coordinates of the intersection of lines through the long axis of the bloodstain.

Impact Velocity of Blood Droplets for Crime Scene Reconstruction

**Nick Laan**

University of Amsterdam
The Netherlands

Within Bloodstain Pattern Analysis, forensic experts commonly use the stringing method, based on a straight line approximation of the blood droplet trajectories to determine where the source of a bloodstain pattern was. However, by ignoring gravity, errors as large as 45 cm may arise when inferring the 3D-location of the wound. Accordingly, it is impossible to discern, e.g., between a standing or sitting position of the victim. To reconstruct the trajectories correctly, the impact velocity of the droplets needs to be determined. We show how this can be done directly from the shape and volume of dried bloodstains. By using advanced fluid dynamics based on a balance of inertial, viscous and capillary forces, we are able to determine the impact velocity of the bloodstains. In this way, we are able to determine the curved trajectory by taking gravity into account. With a proof-of-principle experiment we show that our method reduces the uncertainty in the reconstructed height of the origin of the bloodstains significantly, making it possible to determine the position of, e.g., a victim much more accurately.


**Vincenzo Scavongelli**

HBDD Italy

The research project Human Blood Detection Dog was born in 2007 by Micheli Giacomo and Scavongelli Vincenzo in order to support the activities of forensic investigation in the search for traces of human blood latent, and not, and human remains, through the use of specifically trained canine units. The ultimate purpose is to implement the existing protocols of intervention experimenting new methods and strategies through interdisciplinary and multinational yearly simulation and through targeted scientific studies, thus promoting coordination and synergy of partnership between the various scientific fields, canine trainings and technology involved. Specifically, two studies were performed: the scientific validation of two of the four canine subjects employed and the comparison of detection capability of the same, including the two non-validated, with the presumptive tests used in forensic analysis of blood traces. In order to be able to assess in an objectively reliable performance, the animal subjects used were considered as detection tools, performing the tests in at least two different dates, in outdoor or indoor location and in sterile conditions or reproduction of actual scenarios of intervention depending on the operating context. In consequence of the results obtained it can be said that the combined use of specifically trained canine units and forensic presumptive tests significantly increase the probability of detection of traces of human blood; in the first place for the complementarity of signaling / positive results issued by the two groups of tools, for the discrete reliability found in both of them and then to the high learning ability of animal subjects and of the easy and rapid use of forensic presumptive tests.
Drone Activities on the Crime Scenes

Tullio Iari
Fabbrica Italiana Droni
Italy

Often when working on a crime scene, even taking all the necessary precautions, you are likely to pollute or not to find everything you look for. Our intervention wants to exert the potential use of new robotic technologies in the search for traces of blood in open areas and confined spaces, preserving the scene and allowing a more accurate collection of data.
The ANZFSS 23rd ANZFSS International Symposium on the Forensic Sciences

Together InForming Justice

Tena koutou, tena koutou, tena koutou katoa
Greetings and hello to you all

The 2016 ANZFSS 23rd International Symposium on the Forensic Sciences will be held in Auckland, New Zealand, 18th to 23rd September. This Symposium will bring together practitioners, experts and students from all forensic science disciplines, law enforcement and the judiciary to explore key aspects of the theme, Together InForming Justice. Bloodstain Pattern Analysis will again feature and as the IABPA Vice President for Region 6, I invite you to attend. It will be another great Symposium, and planning is well underway. In addition to being a world leader in many areas of forensic science and forensic science research, NZ is a top international tourist destination, famous for its natural beauty, indigenous Maori people and diverse Polynesian culture. Most recently, home to Lord of the Rings and the Hobbit, NZ is a tourist destination in itself. Take the opportunity to explore, be entranced and fall in love with this beautiful country.

“"The Maori warrior is challenging you
On behalf of his people, our people
To come to his country, our country
To take up the challenge
To accept our hospitality
And to be welcomed
On behalf of ANZFSS
The President has accepted the challenge
Officially bringing the Symposium to Aotearoa”

Go to the website www.anzfss2016.org to register your interest!
Recent BPA Related Articles in the Scientific Literature


In Memoriam
Anita Y. Wonder

Anita Y. Wonder passed away on May 30th, 2015, in Roseville, California after a long illness. She was the director of the Wonder Institute and became a member of the IABPA in 1983. She was the first editor of the IABPA News during 1984-1985. Anita was the author of three excellent textbooks in bloodstain pattern analysis. Bloodstain Dynamics published by Academic Press in 2001 followed by Bloodstain Pattern Evidence – Objective Approaches and Case Applications published by Elsevier in 2007 and Bloodstain Patterns: Identification, Interpretation and Application published by Elsevier in 2015.

Anita was hearing disabled but she taught BPA courses, consulted on numerous cases including O.J. Simpson, the U-Haul murder, and the Alexander Lindsay Hearing held in Australia. She testified in court in many jurisdictions. Anita was always very intense and energetic when discussing bloodstain theory and pattern identification. She focused on the scientific basis for the discipline including the non-Newtonian property of blood and its effect on stain formation.

Anita was one of many individuals who through their efforts and dedication contributed to the advancement of the discipline of bloodstain pattern analysis and is well appreciated.
Organizational Notices
Moving Soon?

All changes of mailing address need to be supplied to our Secretary Norman Reeves and webmaster Joe Slemko. E-mail your new address to Secretary Norman Reeves at: norman@bloody1.com and to webmaster Joe Slemko at jslemko@alberta.com.com.

Membership Applications / Request for Promotion

Applications for membership as well as for promotion are available on the IABPA website:
IABPA Website: http://www.iabpa.org

The fees for application of membership and yearly dues are $40.00 US each. If you have not received a dues invoice for 2015 please contact Norman Reeves at norman@bloody1.com. Also, apparently, non US credit cards are charging a fee above and beyond the $ 40.00 membership/application fee. Your credit card is charged only $40.00 US by the IABPA. Any additional fees are imposed by the credit card companies.

IABPA now accepts the following credit cards:

Discover    MasterCard
American Express    Visa

Training Opportunities

July 13-17, 2015
Bloodstain Pattern Analysis
Middle Tennessee University
Murfreesboro, Tennessee

Instructor: T. Paulette Sutton
Contact: Mitzi Dunkley
E-mail: fire@mtsu.edu
Tel: 615-494-7713

September 14-18, 2015
Advanced Bloodstain Pattern Analysis Course
(German)
Blutspureninstitut
Obergasse 20
61250 Usingen
Germany

Instructor: Dr. Silke Brodbeck, MD
Tel: +49-170-84 84248
Fax: +49-6081-14879
September 21-25, 2015

**Basic Bloodstain Pattern Analysis Course**
Loci Forensics B.V.
Haversstraat 44
2153 GB Nieuw-Vennep
The Netherlands

Instructors: Martin Eversdijk and Rene Gelderman
Fax: +31(0)20-8907749
E-mail: Info@lociforensics.nl

October 19-23, 2015

**Advanced Pattern Analysis Course**
(English)
Blutspureninstitut
Obergasse 20
61250 Usingen
Germany

Instructor: Dr. Silke Brodbeck, MD
Tel: +49-170-84 84248
Fax: +49-6081-14879

November 9-13, 2015

**Advanced Bloodstain Pattern Analysis Course**
Loci Forensics B.V.
Haversstraat 44
2153 GB Nieuw-Vennep
The Netherlands

Instructors: Martin Eversdijk and Rene Gelderman
Fax: +31(0)20-8907749
E-mail: Info@lociforensics.nl

December 7-11, 2015

**Basic Bloodstain Pattern Analysis Course**
(German)
Blutspureninstitut
Obergasse 20
61250 Usingen
Germany

Instructor: Dr. Silke Brodbeck, MD
Tel: +49-170-84 84248
Fax: +49-6081-14879
December 7-11, 2015

Visualization of Latent Bloodstain Course
Loci Forensics B.V.
Haversstraat 44
2153 GB Nieuw-Vennep
The Netherlands

Instructors: Martin Eversdijk and Rene Gelderman
Fax: +31(0)20-8907749
E-mail: Info@lociforensics.nl

December 7-11, 2015

Bloodstain Pattern Analysis Workshop
Miami-Dade Public Safety Training Institute
Doral, Florida

Instructor: Toby Wolson, M.S., F-ABC
Miami-Dade Police Department
Crime Laboratory Bureau
Forensic Biology Section
9105 N.W. 25th Street
Doral, Florida
33172-1500
Voice: 305-471-3014
Fax: 305-471-3478
E-mail: twolson@mdpd.com

Articles and training announcements for the September 2015 issue of the Journal of Bloodstain Pattern Analysis must be received before September 1st, 2015
Editor’s Corner

The first issue of the Journal in 2015 is published in June since there was insufficient material and lack of case studies or research articles for the March issue. I need input from the membership in order to provide a quality quarterly publication.

This issue contains abstracts from the presentations from the Australian and New Zealand Forensic Science Society’s 22nd International Symposium on the Forensic Sciences held in 2014 that were provided to be by Ted Silenieks, Vice-President of Region VI. I have also included the abstracts of presentations from the recent Fifth European International Association of Bloodstain Pattern Analysts held in Rome Italy. The abstracts from both of these conferences contain a wealth of research projects and case studies and the presenters are encouraged to submit their articles for peer review and publication in our Journal.

I was able to attend the Fifth IABPA International Conference in Rome last month and was very impressed with the efforts of the Conference Coordinator, Dr. Andrea Berti and his staff at the Carabinieri Scientific Headquarters venue in Rome. There were 176 attendees that represented 27 countries worldwide. The Carabinieri personnel were wonderful hosts and the conference was a great success.

It was sad to learn of the passing of Anita Y. Wonder on May 30th, 2015. I had the opportunity to meet her on several occasions over the years and was impressed with her knowledge of the scientific principles and theory of bloodstain pattern analysis. Her textbooks speak for themselves.

Stuart H. James
Editor
jamesforen@aol.com
Publication Committee
Associate Editors

Barton P. Epstein
Paul E. Kish
Daniel Mabel
Jeremy Morris
Jon J. Nordby
Joe Slemko
Celestina Rossi
Jeffrey Scozzafava
T. Paulette Sutton

Past Editors of the IABPA News/Journal of Bloodstain Pattern Analysis

Anita Y. Wonder 1984-1985
Norman Reeves 1984-1989
David Rimer 1990-1996
Toby L. Wolson 1997-2000
Paul E. Kish 2001-2003
Stuart H. James 2004-present

Past Presidents of the IABPA

V. Thomas Bevel 1983-1984
Charles Edel 1985-1987
Warren R. Darby 1988
Rod D. Englert 1989-1990
Edward Podworny 1991-1992
Tom J. Griffin 1993-1994
Toby L. Wolson, M.S. 1995-1996
Daniel V. Christman 1997-1998
Phyllis T. Rollan 1999-2000
Daniel Rahn 2001-2002
Bill Basso 2002-2006
LeeAnn Singley 2007-2008
Iris Dalley 2009-2010
Todd A. Thorne 2011-2012