

**THE USE OF BLOOD PATTERN ANALYSIS TO RECONSTRUCT A
CRIME SCENE**

by

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submitted in accordance with the requirements for

the degree of

MAGISTER TECHNOLOGIAE

in the subject

FORENSIC INVESTIGATION

at the

UNIVERSITY OF SOUTH AFRICA

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FEBRUARY 2016

DECLARATION

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I, Antoinette Bedelia Wiid, declare that this research dissertation is my own unaided work. It is submitted in partial fulfilment of the requirements of the degree of Magister Technologiae in the subject of Forensic Investigation for the School of Criminal Justice, UNISA. It has not been submitted before for any degree or examination at any other institution.

A handwritten signature in black ink, appearing to read 'A. Wiid', enclosed within a faint rectangular border.

Signature

27 January 2016

Mrs AB Wiid

ACKNOWLEDGEMENTS

- Dr NJC Olivier, I want to express my appreciation to you and supervisor Dr JS Horne, for their continuous guidance and patience through my studies.
- Very special thank you go to Ms Y Thiebaut, my editor, for her guidance, advice and patience.
- My thanks go to the UNISA and the South African Police Service's (SAPS) Forensic Science Laboratory (FSL), for allowing me to contribute, through the research study, to my fellow students and investigating officers of the SAPS.
- This dissertation is dedicated to my parents, Mr John Thiebaut and Annette Thiebaut, who has been my inspiration and driving force throughout my studies since 2002. I could not have completed this dissertation if it were not for my parents, who encouraged me to continue and to complete this dissertation under very difficult circumstances. Furthermore, my dearest husband Jan Wiid and children, Damian and Amy-Lee, for your understanding of me always busy with the studies after hours. Without my family's support, I would not have finished at all. All these years of non-stop studying, without you I would not have achieved my dream.
- Dad, John Thiebaut, you have always said, knowledge is power, and through hard work, you can achieve your dreams. Your continuous encouragement in very low times and high times, always giving advice at the right time, helped me immensely, and teaching me to trust in God, in all you do and want to achieve.
- All the participants in this research study, your knowledge and expertise in the field of this research paper was of great assistance, your input has helped me achieve the outcome of this dissertation.

ABSTRACT

The success or failure of any criminal investigation often depends on the recognition of physical evidence left at a crime scene and the proper analysis of that evidence. Crime scenes that involve bloodshed often contain a wealth of information in the form of blood patterns, the location, and its cause. Any criminal investigation has specific tasks, from the time when the crime is reported to the reconstruction of crime scenes. A lot of work needs to be done. Once the investigation starts at the crime scene, BPA needs to be done at the crime scene and the investigating officer must identify this evidential tool. The investigating officer should not necessarily have specialised training in blood pattern analysis, but rather know when to use these experts at their bloody crime scenes. With the interviews and docket analysis done, the researcher found that this was a problem as the investigating officers, either had no knowledge on the subject of BPA or very little knowledge on this research.

The purpose of this study was to determine the use of BPA to CSR, and for the investigating officer to realise that it is not just a bloody crime scene, but also contains a wealth of evidence. The researcher had two research questions. Once the investigating officer follows the objectives of criminal investigation, they should be able to have a strong case against the perpetrators. How could BPA be used in the reconstructing of a crime scene? The researcher wanted to bring it to the investigating officers' attention that it is not just a bloody crime scene, but rather that it contains a wealth of evidence, which can give them a perspective of the movement of both the victim and perpetrator during the commencement of the crime. Regardless of the lack of knowledge of BPA, it is proposed that investigating officers are to be informed, either through station lectures or by yearly refresher workshops and courses of the evidential tool of BPA. When the bloody crime scene is reconstructed with the use of BPA, an insight of what transpired at the crime scene will help them to finalise their cases.

For recommendations, it is proposed that investigating officers are to be trained in more in depth courses in criminal investigation as well as crime scene reconstruction and evidence collection using FSL.

CERTIFICATE BY EDITOR

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Dear Antoinette Wiid,

This letter is to record that I, Yvonne Thiebaut, completed a copy edit of your Master's Dissertation titled, 'The use of Blood Pattern Analysis to reconstruct a crime scene'.

This edit included the following:

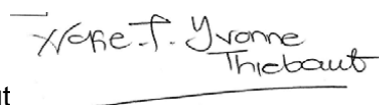
- Spelling
- Tenses
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- Punctuation
- Pronoun matches
- Word usage
- Sentence structure
- Table numbers and layout
- Content (limited)

This edit also included the layout/formatting of this dissertation, as well as a reference check in as far possible.

The edit excluded the following:

- Correctness or truth of information (unless obvious)
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- Correctness/spelling of unfamiliar names and proper nouns (unless obvious)
- Correctness of specific formulae or symbols or illustrations

Yvonne Thiebaut


Yvonne Thiebaut

LIST OF ACRONYMS AND DESCRIPTION

BPA: Blood Pattern Analysis

CAS: Crime Administration System

CSA: Crime Scene Analysis

CSI: Crime Scene Investigator

CSM: Crime Scene Management

CSR: Crime Scene Reconstruction

DNA: Deoxyribonucleic acid

DVD: Digital Versatile Disk

FS: Forensic Science

FSL: Forensic Science Laboratory

IO: Investigating officer

LCRC: Local Criminal Record Centre

NI: National Instruction

ROC: Resolving of Crime Learning Programme

SAPS: South African Police Service

UNISA: University of South Africa

US: United States

VIC: Victim Identification Centre

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CHAPTER ONE

GENERAL ORIENTATION

1.1 INTRODUCTION

Denscombe (2002:3) states there is “no such thing as perfect research”, and “you cannot please all the people all the time” when it comes to doing social research. However, an awareness of the ground rules can help the project researcher to do a competent job that can be defended and justified to those who judge the quality of the final product.

The success or failure of any criminal investigation often depends on the recognition of physical evidence left at a crime scene and the proper analysis of that evidence. Crime scenes that involve bloodshed often contain a wealth of information in the form of blood patterns, the location, and its cause. Therefore, forensic analysts are needed to analyse the crime scene. Not every detective at station-level understands the importance or value of Blood Pattern Analysis, and there are only a few of these BPA throughout South Africa. Captain Marius Joubert from the Western Cape confirmed the above (Interview: 24 June 2013). From the interviews conducted, the researcher also realised that the investigating officers confuse BPA with Deoxyribonucleic Acid (DNA) testing. This Chapter will provide the reader with in depth knowledge on Criminal Investigation.

1.2 PROBLEM STATEMENT

Welman, Kruger and Mitchell (2005:14) refers to a research problem as some difficulty that the researcher experiences in the context of either a theoretical or practical situation and to which he or she wants to obtain a solution. Mouton (2006:48) mentions that the problem statement should be a clear and unambiguous statement of the object of study and the research objectives. The problem statement is sometimes formulated as specific research questions or research hypotheses.

With the use of replication by other researchers, we understand why Blood Pattern Analysis (BPA) should be used to reconstruct every violent crime scene where blood was shed. The investigating officers at station-level investigating these cases do not understand the value, nor do they see the importance, of BPA to reconstruct a crime scene. The docket analysis done by the researcher for the period 1 January 2011 to 31 December 2011 revealed that a

BPA expert was never called to one of the murder scenes to do an analysis of the blood patterns. This was found whilst the researcher perused the diaries of the said dockets. Nowhere in the docket was BPA even considered. The Investigating Officers only used the photographer for their murder cases. It was also stated during the interviews of the participants that they have never used these services available to them. The only time that they have heard of this was with the evidence provided by Colonel Ian van der Nest in the Oscar Pretorius case, televised on National Television. The literature states that an abundance of evidence can arise from doing BPA at crime scenes. "The actual events during the commencement of the crime can be reconstructed by using Blood Pattern Analysis (BPA) as a method of crime scene reconstruction" (Ross Gardner, statement to researcher: 2013-06-24).

The reconstruction with the use of Blood Pattern Analysis is done at the crime scene, involving a series of actions and techniques by the BPA analyst. These will include the differentiation between the various types of blood patterns, and then stringing to verify the point of origin. This will show whether the person was standing, lying, fighting, and others. All this is used as a whole to understand the sequence of events at the crime scene. Once this is done at the crime scene, crime scene reconstruction takes place in court, due to the detectives at station-level not understanding the evidential value of Blood Pattern Analysis (BPA), they do not use the experts available to them.

1.3 AIM

According to Mouton (1996:103), the aim of a study is to establish the 'facts', to gather new data and to determine whether there are interesting patterns in the data. Oliver (2004:102) confirms this stating that research aims essentially express what you want to learn from the research you are doing. The Aim of this research is to determine the use of Blood Pattern Analysis in the reconstruction of crime scenes.

1.4 PURPOSE OF THE RESEARCH

De Vos, Strydom, Fouche and Delport (2011:102) stated that the primary purpose of writing a research proposal is to obtain the permission and necessary funds to conduct the study. Denscombe (2010:10-12) further mentions that within the spectrum of the social sciences, with the array of disciplines and styles of research, there are differing notions about what social research should be trying to do. Denscombe (2012) further stated that often a distinction is

made between criticising or evaluating something, exploratory research, developing good practice, and empowerment.

1.4.1 Criticising or evaluating something

For investigating officers to be able to give evidence in court, they must ensure a thorough investigation, including the instruction of Local Criminal Record Centre (LCRC) to ensure the attendance of a BPA expert and other experts to the scene (Safety and Security Sector Education and Training Authority, 2009:340).

1.4.2 Exploratory research

The purpose here is to collect facts and describe events, for example, how things are, rather than how they will be, or how they should be, or even why they are as they are (Denscombe, 2002:27). The researcher used various literatures available, nationally and internationally, to collect data on BPA, and showed how BPA can be used to reconstruct a crime scene.

1.4.3 Developing good practice

The main driving force behind a piece of research is sometimes the desire to solve a practical problem or to improve procedures (Denscombe, 2010:11, 12). The researcher is concerned about crime scenes not being reconstructed using BPA and consequently the valuable evidence being destroyed or not analysed. The action of events at the crime scene is not noted as evidence and this could lead to the accused being acquitted due to lack evidence.

1.4.4 Empowerment

Most social research treats the people or things that are investigated as the objects of research. Research is conducted on them and about them. An alternative, and controversial, approach is to conduct research for them, casting aside the stance neutrally and openly conducting research with the aim of helping those who are collaborating with the research (Denscombe, 2010:11, 12).

The aim of this research is to empower investigating officers to be able to reconstruct crime scenes by using BPA. The researcher gained more knowledge and information on this topic by doing an in-depth research. This was achieved by research study on literature and interviews with participants of this research. After completion of this research, the participants will receive a station lecture on BPA and its value at bloody crime scenes, at no cost to the SAPS or members, ensuring that all participants will benefit from this research paper.

1.5 RESEARCH QUESTIONS

According to Denscombe (2002:39), the research question should draw upon a review of the existing literature. The exact questions to be investigated will relate to what is already known about the topic, and address one or more of the issues arising from reviewing existing research results. Mouton (2006:53) emphasises that a research problem implicitly or explicitly embodies a research question, such as: What are the causes of crime? Which factors in society are conducive to criminal behaviour? Creswell, Ebersöhn, Eloff, Ferreira, Ivankova, Jansen, Nieuwenhuis, Pietersen, Plano Clark and van der Westhuizen (2007:3, 4) further state that the research question specifies what intrigues the researcher and focuses on what the researcher will study. Creswell et al. (2007:4) further state that a good research question directs the researcher to appropriate literary resources.

The research questions to be researched are:

- What are the objectives of criminal investigation?
- How could blood pattern analysis be used in the reconstruction of a crime scene?

1.6 KEY THEORETICAL CONCEPTS

Denscombe (2010:34) emphasises clearly, that the researcher needs to have certain key words in mind that captures the essence of the topic he or she wishes to investigate.

1.6.1 Blood patterns

Blood patterns found at a crime scene are used to reconstruct the actions that caused the blood to spill and spread. When a droplet of blood hits a surface, the shape of the mark it leaves when it lands reveals the direction in which the drop was traveling and the amount of force that was projected (http://library.thinkquest.org/04oct/00206/text_tte_bloodstain_analysis.htm).

1.6.2 Blood pattern analyst

The blood pattern analyst is the person who evaluates the collapsing mechanisms of blood masses in known situations with respect to the patterns produced, comparing the results against unknown stains found in bloodletting scenes (Journal of Forensic Science, 2013).

1.6.3 Blood Pattern Analysis (BPA)

BPA is the analysis and interpretation of the dispersion, shape characteristics, volume, pattern, number, and relationship of bloodstains at a crime scene to reconstruct a process of events (Houck & Siegel, 2006:252). Furthermore, according to Ross Gardner (statement to researcher: 2013-06-24), BPA is an in-depth evaluation of blood patterns found at a given scene. To reach a conclusion, the analyst considers a number of factors related to each pattern, including but not limited to, size, shape, number, dispersion, volume, and location.

1.6.4 Forensic scientist

This person has gained specialised training and education in chemistry and biology as applied to the recognition, identification, collection, and preservation of physical evidence (Dutelle, 2012:93).

1.6.5 Crime scene

“The scene of the crime is the centre of the forensic world, where everything starts, and is the foundation upon which all subsequent analysis is based” (Houck & Siegel, 2006:28).

1.6.6 Crime Scene Reconstruction (CSR)

By definition, CSR (also known as crime scene analysis) employs the scientific method to evaluate the physical evidence at a scene in an effort to gain explicit knowledge of the series of actions that compromise a given event (Journal of Forensic Science, 2013).

1.6.7 Criminal investigation

According to Orthman and Hess (2013:8), “a criminal investigation is the process of discovering, collecting, preparing, identifying, and presenting evidence to determine what happened and who is responsible”.

1.6.8 Expert

Experts are allowed to offer their opinions about evidence or situations that fall within their area of expertise (Houck & Siegel, 2011:604).

1.7 RESEARCH DESIGN AND APPROACH

According to Mouton (1996:175), a research design is a clarification of the manner in which the researcher plans to examine the formulated research problem. Denscombe (2010:100) confirms this, stating that a research design explains how the key components of the research project link together, explaining the logic of the research process as it moves from the one phase to the next, and showing how the data collection and analysis are consistent in terms of their general philosophy.

The researcher used an empirical design to answer research questions, because it requires fieldwork and one-on-one sessions, where the researcher focused on the personal and real life experiences of the participants (Mouton, 2001:149). According to Leedy and Ormrod (2010:94), qualitative research involves observing amounts, or qualities, that cannot easily be reduced to numerical values. A qualitative research typically aims to examine the many nuances and complexities of a particular phenomenon, most likely in qualitative research studies of complex human situations or creations (for example, peoples' in-depth perspectives about a particular issue).

Qualitative research starts with general research questions rather than a specific hypothesis, and collects an amount of verbal data and sometimes non-verbal data from a small number of people. Welman et al. (2005:188) further confirms that qualitative field studies can be used successfully in the description of groups, small communities, and organisations. The researcher used qualitative research with an empirical design, as the researcher does not have much knowledge of BPA, and is currently not working as a forensic analyst in this field of study.

1.8 TARGET POPULATION

De Vos et al. (2011:222) state that a population is a term that sets boundaries on the study unit, referring to individuals in the universe who possess specific characteristics. De Vos et al. (2011:222) further state that a population is the totality of persons, events, organisation units, case records, or other sampling units with which the research problem is concerned.

It was impossible to involve all investigating officers investigating serious crime scenes, in South Africa, in this study. The ideal population was too large and too widely spread throughout South Africa. The researcher lives in Northern KZN. Therefore, financially and logistically the researcher focused on investigating officers and members from FSL in the

Eshowe Cluster area to establish whether they do understand the value of BPA and its use to reconstruct a crime a scene.

The researcher perused murder dockets (from 1 January 2011 to 31 December 2011) of crime scenes where blood was shed, and BPA has not been used at these crime scenes. The researcher's target population was not scientifically selected. Therefore, the target population is not representative of the population. The study population is based in the Eshowe SAPS Cluster Geographical area.

Welman et al. (2005:126) mentioned that the target population is the population to which the researcher ideally would like to generalise his or her results. The experimentally accessible population is the population that corresponds to the sampling frame from which a random sample is actually drawn.

1.9 SAMPLING

According to De Vos et al. (2011:224), the major reason for sampling is feasibility. A complete coverage of the total population is seldom possible, and not all the members of a population of interest can possibly be reached. Even though it will be theoretically possible to identify, contact, and study the entire relevant population, time and cost considerations usually makes this a prohibitive undertaking. Therefore, the use of samples might result in more accurate information than would have been obtained if one had studied the entire population, because sample, time, money, and effort can be concentrated to produce better quality research, better instruments, more in-depth information, and better trained interviewers or observers.

The researcher used probability sampling, which is a scientific method to draw the samples. According to Leedy and Ormrod (2010:205), the researcher can specify in advance that each segment of the population were represented in the sample. These distinguishing characteristics set it apart from non-probability sampling. From here, simple random sampling was used to draw sample "A" for this research, who would participate on completing interview schedule: Investigating officers Sample "A". Simple random sampling is the least sophisticated of all sampling designs, whereby every member of the population has an equal chance of being selected. It is easy if all of its members are known (Leedy & Ormrod, 2010:207, 208).

The researcher determined the problem in the Eshowe area, which falls under the Eshowe SAPS Cluster Commander who manages six SAPS stations, namely Eshowe, Gingindlovu, Melmoth, Nkandla, Ekhombe, and Mbongolwane. The stations were broken down in the

following workforce concerning investigating officers: Eshowe - 29, Gingindlovu - eight, Mbongolwane - six, Melmoth - 12, Nkandla - 15, and Ekhombe - five, totalling of 75 investigating officers for the Eshowe SAPS Cluster. This will be known as Sample "A" from here on.

Each station had half of the workforce selected by using simple random sampling. The names of each station's investigating officers were taken from their nominal role, written down on pieces of paper, and placed inside a hat. The Detective Branch Commanders drew the names one-by-one to get to the total, giving each investigating officer an equal opportunity to be part of this research paper. For each station, the following 50% were drawn:

- Mbongolwane station has six investigating officers and three were drawn.
- Ekhombe station has five investigating officers and three were drawn.
- Eshowe has 29 investigating officers and 15 were drawn.
- Gingindlovu has eight investigating officers and four were drawn.
- Melmoth has 12 investigating officers and six were drawn.
- Lastly, Nkandla has nine investigating officers and five were drawn.

Even though 36 investigating officers would have been interviewed, only 31 investigating officers, Sample A, were interviewed, as the other five investigating officers from Eshowe refused. Participants were not forced to participate in the interviews, as participation has to be voluntary (Leedy & Ormrod, 2005:101). Participants were informed of the nature of the research, their choice of taking part, and their choice of withdrawing from the research at any time.

Sample "B" was selected, as the investigating officers namely Sample "A", cannot apply BPA or answer specific questions on BPA. The researcher chose one of the LCRC Task Team members, who has only done BPA level 1 and needs a peer, to complete the interview schedule, one FSL BPA expert, and one international BPA expert. They were selected using purposive sampling. Purposive sampling is also called judgemental sampling. This type of sampling is based entirely on the judgement of the researcher, in that a sample is composed of elements that contain the most characteristics, representative or typical attributes of the population that serve the purpose of the study best (De Vos et al., 2011:232).

1.10 DATA COLLECTION

Mouton (2006:104) states that it is imperative that the researcher's document data-collection process is as accurate and in as much detail as possible. Data need to be sufficiently precise and detailed in terms of the specific purpose of the research.

The researcher applied the triangulation principle during the data collection as suggested by Leedy and Ormrod (2010:99), stating that this approach is especially good to use with qualitative research, as the researcher might engage in informal observations in the field, conduct in-depth interviews, and then look for common themes that appear in the data gleaned from both these methods. Leedy and Ormrod (2010:99, 146) further mentions that triangulation refers to multiple sources of data that are collected, with the hope that they will all converge to support a particular hypothesis or theory. Furthermore, De Vos et al. (2011:442) states that triangulation involves the concurrent, but separate, collection and analysis of quantitative and qualitative data in order to compare and contrast the different findings to see the extent to which they do or do not agree with each other.

For the purpose of this research, the researcher decided that docket analysis, literature, and interviews would be the most suitable technique. Through triangulation, the researcher wants to determine the well-validated conclusions that BPA can be used to reconstruct a crime scene. There is a lot of literature on BPA and on crime scene reconstruction. By bringing the two together, the detectives would understand that BPA is important in any crime where blood was shed.

1.10.1 Literature

According to Wellman et al. (2005:39), university libraries usually have staff to assist researchers in conducting computer search for references on relevant research based on a list of key words. Determining whether such literature or publication with the same title was available, the researcher conducted a search of the UNISA Library Catalogue and several sites with information on publications and journal articles hosted on the Internet.

The researcher used the literature available to assist in completing the research paper. Hofstee (2006:90) emphasises, a literature review should be exhaustive in its coverage of the main aspects of the study. It is obviously impossible to do a review that includes every single article or contribution ever written on a particular topic. The mere speed at which scientific publications are generated would make such a goal unattainable anyway. A good review is fair in its treatment of authors.

The researcher has read various literatures on the topic of BPA, none of which has the same topic as this research paper. The researcher has found no literature from South Africa on this topic. Even though there are many books written on various subjects and topics, some of these books only contain small chapters or inserts regarding BPA. The books used in this research were documented in the reference list, giving credit to those authors. The aims and research questions were used as a standard to collect evidence from the literature; each source was treated the same way and this ensured that the literature is valid and reliable. The researcher understands that various literatures on BPA are available, but the researcher wanted to incorporate BPA with crime scene reconstruction. By doing this, the researcher can empower the investigating officers to understand the importance of BPA as evidence.

When using the internet, documents accessed were printed, and these copies will be kept on file for reference purposes. The Forensic Unit of the SAPS has some literature on this subject from authors already accessed by the researcher, but no official training in BPA is presented to the members of the SAPS. When training is supplied, they are trained by people with knowledge, such as Mr Ross Gardner from America. This will be handled as privileged information, but copies will be kept on file for reference purposes. The researcher also has contact with Mr Gardner and all information received from Mr Gardner is treated so that all credit is given to him in the list of references, as well as a letter of consent given by Mr Gardner, this includes the illustrations of the various blood pattern spatters. Furthermore, the researcher did only make copies of the said pages according to the research paper and will be kept on file for reference purposes.

1.10.2 Interviews

Leedy and Ormrod (2010:188) state that with semi-structured interviews, the researcher may follow the standard questions with one or more individual tailored questions to get clarification or to probe a person's reasoning. The interview also tends to set a more informal and friendly atmosphere. The interview schedule was drawn up to interview the six stations' investigating officers' units (Eshowe, Gingindlovu, Mbongolwane, Ekhombe, Nkandla, and Melmoth SAPS investigating officers). As mentioned by Leedy and Ormrod (2010:207, 208), the questions were generated from both the aims and research questions. The researcher did all the interviews for the investigating officers personally. Open-ended questions were asked, giving the participants leeway in their responses to the questions asked. The interviews were recorded on a Dictaphone, enabling the researcher to go back and listen to the interview in

case a point was overlooked, and for confirmation of what was stated during the interview. Permission was obtained from the interviewee before the Dictaphone was used.

A second interview schedule was drafted with different questions for the three members from FSL and the international BPA expert selected. Because the members from FSL and the international BPA expert are not based in KZN, their interviews were emailed for them to complete, and emailed back to the researcher. Furthermore, Leedy and Ormrod (2010:149,151, 153) give guidelines to conducting interviews in a qualitative study as follow:

- *Identify some questions in advance*

The researcher used the research questions as a guide to compile the interview schedules for the participants, ensuring that participants only answered the questions pertaining to the research questions and that the interviewee does not stray from the questions asked when the interview was conducted. The researcher based the questions on the research questions only namely, 'What are the objectives of investigation?', and 'What is the importance of Blood Pattern Analysis in the reconstruction of crime scenes?'

- *Consider how participants' cultural backgrounds might influence their responses*

Participants' cultural backgrounds can influence their interview responses in ways not necessarily anticipated. Culture might affect how participants interpret and respond to questions. The researcher kept this in mind during the interview sessions and showed respect throughout.

- *Make sure your interviewees are representative of the group*

The researcher scientifically selected the members of the first sample from the six stations by using simple random sampling, giving the members from each station an equal opportunity to be selected and representing the population. The second sample was selected by purposive sampling from FSL, LCRC task team, and one international BPA expert.

- *Find a suitable location*

The researcher had an office available at the SAPS station at Eshowe and the investigating officers from Eshowe was interviewed at Eshowe SAPS. The members of the investigating officers' group from the other stations were interviewed at their respective stations in the Detective Branch Commanders office for privacy and non-interruption during their interviews. Members from Sample 'B' could not be interviewed in person, as they reside outside KwaZulu-

Natal, and logistically and financially, it was not viable to organise interviews with them. The interview schedule was emailed to them for completion.

- *Get written permission*

The researcher obtained written permission from the National Office of the SAPS (see Annexure “C”). This permission was emailed to the participating stations where the researcher did interviews with participating members. Furthermore, the members had the opportunity to give permission to use their information for the purpose of this research paper. The researcher filed these documents for future reference. Written consent was obtained from every interviewee to ensure that validity and reliability are obtained and no discrimination and forced participation was used.

- *Establish and maintain a rapport*

The researcher focused on being courteous and respectful at all times, showing genuine interest in what the participants had to say.

- *Focus on the actual rather than on the abstract or hypothetical*

You are more likely to get revealing information if you ask what a person *does*, or *what happens in a specific situation*.

- *Do not put words in peoples' mouth*

Let people choose their own way of expressing their thoughts.

- *Record responses verbatim*

The researcher used hand written notes and Dictaphone recordings, which was then stored on computer. Some of the investigating officers opted not being recorded on a Dictaphone and their answers were captured on their interview schedules respectively. They then, out of their own free will, signed the interview schedules to prove validity. This, in turn, was burnt onto a Digital Versatile Disk (DVD) for safekeeping.

- *Keep your reaction to yourself*

The researcher did not inform the interviewees at any time during the interview that they are wrong, or agreed on the information given to the researcher during the interviews.

- *Remember that you are not necessarily getting the facts*

As confident and convincing as some participants may be, their responses should always be treated as perceptions rather than facts. The answers given were checked against relevant literature and data to ensure that the answers given, answered the research aim and research questions of the research paper.

According to Leedy and Ormrod (2010:110,111), a researcher may sometimes need to do a brief exploratory investigation, or pilot study to try out particular procedures, measurement instruments, or methods of analysis. As confirmed by Welman et al. (2005:148), a brief pilot study is an excellent way to determine the feasibility of an interview schedule, whether the questions are understandable. This pilot study was done with five members not forming part of the research paper's Sample Groups. This ensured testing and adapting shortfalls on the interview schedules and assisted the researcher in ensuring that the aim and research questions was answered for this research paper.

1.10.3 Case docket analysis

Creswell et al. (2007:3, 75) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used. The authors further more state that the characteristics of case studies is that they strive towards a comprehensive (holistic) understanding of how the participants relate and interact with each other in a specific situation and how they create meaning of a phenomenon under study. This is confirmed by Hofstee (2006:123), who says that the case study method is useful when detailed knowledge is required of any particular case (the researcher focusing on murder) for whatever reason.

The researcher searched and perused the SAPS SAP6 documents on violent crimes where firearms, traditional weapons, knives, pangas, among others were used to commit murder. The quantity of cases that were filed and finalised were searched for the period 1 January 2011 to 31 December 2011. The researcher has given a breakdown of the docket analysis per station to show how many dockets were analysed and why some of the dockets were discarded. The case dockets' numbers registered on the Crime Administration System (CAS) was taken from the SAP6. In total, the researcher had perused 80 of the 134 case dockets: Eshowe 42, Gingindlovu 19, Mbongolwane five, Ekhombe 16, Nkandla 13, and Melmoth 39 case dockets, as given by the SAP6 per station. The following dockets were not perused due

to the following reasons: 43 dockets were at court and not available for the researcher, and six case dockets were discarded as the victims were strangled, burnt, or had drowned. The researcher used the following questions to answer during the docket analysis:

- Was blood shed during this crime?
- What were the injuries of the victim?
- Was BPA considered at the crime scene?
- Was BPA done at the crime scene?
- What did the BPA analyst's report state?
- Was BPA a known factor in the conviction of the accused?

1.11 DATA ANALYSIS

According to Hofstee (2006:117), once data is obtained, it has to be analysed in order to turn it into evidence. Statistical analysis techniques or some form of textual analysis, or a combination of the two, needs to take place. The readers must understand how the researcher will arrive at his or her conclusion. Leedy (1997:101) puts it, that primary data is the closest to the truth, "Knowledge places information within a broader set of ideas and theories that allow researchers to make sense of the facts".

Data collected for this research, whether it was interviews, literature, or docket analyses, was analysed to ensure that the research aim and questions were answered. The researcher used qualitative research with an empirical design for the purpose of this research paper. The researcher used Microsoft Excel to assist in the data analysis done in this research paper, first entering them into a spreadsheet and converting it to numbers to obtain figures. Those items used as words were kept as is, as given by the participants of this research paper. The researcher organised the data into folders on the computer by either scanning documents or entering it manually into the computer, where it has reference. The data was firstly sorted in accordance to the research questions, and then cascaded further down into sub-headings for the research paper. De Vos et al. (2011:408) further states that this step in data analysis is away from the site, also referred to as the intensive data analysis phase. At an early stage in the analysis process, researchers organise their data into folders, index cards, or computer files (De Vos et al., 2011:408).

The data collected by the researcher was analysed by breaking it up into manageable identified trends and patterns to compare it with national and international literature on blood

pattern analysis. These themes were placed into the different folders and sub-folders for the various chapters of this research paper and then placed into a computer database to ensure that the data is organised and correct. Any original documents received and completed were kept on file for future comparisons.

1.11.1 Historical information of participants

In total, 31 of the 36 investigating officers were interviewed. From the interview answers, their historical background is as follows: Thirty participants stated 'yes' and one participant (the branch commander) 'no' when asked if they are investigating officers. Seven participants have been investigating officers for 'less than one year', 19 stated '10 years or less', three for 'more than 10 years', and two for 'more than 20 years'. Twenty-seven participants were currently investigating violent crimes where blood were shed, and one participant indicated 'no', as they have just started working at the branch. On the question 'For how many years have you been investigating crimes where blood was shed', 22 indicated '10 years or less', 5 'not at all', and four indicated 'more than 10 years'. Seven participants underwent no basic detective training, while 24 indicated that they have. Lastly, 10 participants received specific training to investigate violent crimes where blood was shed, seven received no training, and 14 participants stated that they had training but not in this specific topic. As seen above, the researcher used a variety of participants, from those with more than 20 years of experience to those participants with less than one year.

The BPA experts consisted of an international BPA expert, one local LCRC member, and a FSL expert. Their historical information reads as follow: All three participants indicated they are BPA experts. Two have been BPA experts for 5 – 10+ years and the FSL expert for 5 – 10 years. The local FSL expert indicated that he is currently analysing all violent crimes where blood were shed, the FSL expert indicated 'no', and the international expert indicated, "*No, as a consultant I am called in at agencies' requests*". When respondents were asked 'For how many years are you now analysing violent crimes where blood was shed?' the international expert answered '33+ years', the FSL expert answered '21+ years', and the LCRC member answered '6 years'. All three experts answered 'yes' to the question: 'Did you receive specific training in (a) The reconstruction of violent crime scenes where blood was shed, (b) Crime scene management, and (c) BPA.'

1.12 VALIDITY

Validity concerns the accuracy of the questions asked, the data collected, and the explanations offered. Generally, it relates to the data and analysis used (Denscombe, 2002:100). Welman et al. (2005:142) further mentions that validity is the extent to which the research findings accurately represent what is really happening in the situation. In each of the following instances, the researcher ensured that the data collected was valid because it was based on the research questions and adhered to the measures described hereunder:

- The literature reviewed
- The case analysis
- The interviews

The researcher used the triangulation method to collect data. Leedy and Ormrod (2010:99) confirms this, stating that this approach is especially good to use with qualitative research as the researcher might engage in informal observations in the field, conduct in-depth interviews, and then look for common themes that appear in the data gleaned from both these methods. De Vos et al. (2011:442,443) added that it generally involves the concurrent, but separate, collection and analysis of quantitative and qualitative data in order to compare and contrast the different findings to see the extent to which they do or do not agree with each other. This will enable the researcher to produce more complete and well-validated conclusions. Leedy and Ormrod (2010:99) further states that triangulation refers to multiple sources of data that are collected with the hope that they will all converge to support a particular hypothesis or theory.

The literature was used to show that the investigating officers do not understand the importance of using these experts to do blood pattern analysis to reconstruct crime scenes. The questions asked during the interviews with the investigating officers and experts, as with the task team, were valid as the research questions and aim were answered. No other information except those regarding the research aim and research questions was used. Following below are several additional strategies the researcher employed to ensure validity, as given by Leedy and Ormrod (2010:100):

- Extensive time in the field: The researcher may spend several months studying a particular phenomenon, forming tentative hypotheses, and continually looking for evidence that either supports or disconfirms those hypotheses. The researcher had perused dockets and had interviews with the investigating officers selected to analyse

whether the investigating officers or experts had visited murder crime scenes. This also showed whether blood pattern analysis was used to reconstruct crime scenes.

- Negative case analysis: The researcher actively looks for cases that contradict existing hypotheses, and then continually revises his or her explanation or theory until all cases have been accounted for. Eighty dockets were perused for the year 2011 for all six stations within the Eshowe Cluster. If the dockets perused did not have any blood shed at the crime scene, for example, cases such as poisoning, strangulation, and others, those case dockets were discarded and the researcher gave reasoning why it was discarded.
- Thick description: The situation is described in sufficiently rich, 'thick' detail so that readers can draw their own conclusions from the data presented. With the data collected being 'thick detail', the researcher did not exclude any data that may assist the community, SAPS, and other training institutions in future with regards to the research aim and research questions.
- Feedback from others: The researcher sought the opinion of colleagues in the field to determine whether they agree or disagree that the researcher has made appropriate interpretations and has drawn valid conclusions from the data. The researcher used investigating officers who did not participate in this research study to check and approve of the data collected and the docket analysis done for this research paper. Participants were also asked to read their answers to ensure that this is what was stated by them. The research paper will be made available to the SAPS after completion and approval by UNISA. The researcher received good feedback from the interviewees after the interviews and many questions were posed to the researcher regarding BPA and obtaining more information about the subject of BPA.
- Participant validation: The researcher takes his or her conclusions back to the participants in the study and ask quite simply, "Do you agree with my conclusions?" Do they make sense based on your own experiences? The researcher ensured that the information received from the respondents in the pilot study were collected and analysed, answering the research questions and aim. The information was then presented to the participants of the pilot study and they agreed on the information received back from the researcher, in so doing, assisting the researcher to adapt questions on the interview schedules if need be.

The analysis of the data collected assisted the researcher only to use the data relevant to the research aim and research questions. By using data relevant and only answering the research aim and research questions, ensured the validity of data collected.

1.13 METHODS TO ENSURE RELIABILITY

Creswell et al. (2007:3 and 147) says that reliability has to do with the consistency or repeatability of a measure or an instrument (interview schedule). High reliability is obtained when the measure or instrument will give the same results if the research is repeated on the same sample. The random sampling used by the researcher ensured that all those selected had an equal chance to be part of the research paper. The purposive sampling was done specifically to ensure that specific areas of the research paper were answered. The interview schedule was set up specifically to answer the research aim and research questions, and as a result, gaining reliable data for the purpose of this research paper.

All the participants had similar answers to the questions posed to them. The researcher is certain that if posed again, even for a sample group outside the population area the researcher used, the answers will most certainly be the similar. The investigating officers at station-level who attend to these bloody crime scenes do not see the importance of blood pattern analysis during their investigative duties to reconstruct crime scenes. After completion of the interviews, the researcher handed the interview, answering schedule back to the participants, and they could confirm that it stated what they answered, as well as listening to the recording on Dictaphone, for those participants who agreed being recorded.

1.14 ETHICAL CONSIDERATIONS

The researcher has studied Policies and procedures for post-graduate studies (Policies and procedures for post-graduate studies. 2014, UNISA. From www.unisa.ac.za accessed 2014-04-15). Denscombe (2010:76, 77, 78) gives the following guidelines for good practice for ethical considerations:

- Adopt an appropriate code of practice for the research ethics
- Ensure that approval from the relevant ethics committee is obtained
- Appropriate reference to the contributions
- Protection from harm
- Informed consent, as well as written consent

The researcher did not deviate from the policies and procedures of UNISA, as well as the ethics regulations of the SAPS. The researcher abided with their rules and regulations regarding this research paper. This research was approved before the Ethics Clearance Committee of UNISA and permission was obtained from the SAPS to conduct this research. The participants were informed of what the study entailed, and were not forced to partake in this research. When a participant refused participation, another participant was used according to the chosen population. An informed consent form was handed to each participant, which included all information as stated by Leedy and Ormrod (2010:102). The venues of the interviews were safe and secure for all participants. The participants were not exposed to any physical or psychological harm. The researcher acknowledged all sources, whether it is literature or a participant's answer to the interview schedule (Mouton, 2001:241). Where no permission was granted for the use of a persons' identity, a code was given to the participant, to protect the participant's identity.

1.15 CHAPTER LAYOUT

Chapter Two - Objectives of criminal investigation - This Chapter covered areas such as crime scene, how to find and define a crime scene. It also covered the various aspects of a crime scene.

Chapter Three - The importance of BPA in the reconstruction of crime scenes - This chapter covered all relevant topics regarding BPA, as well as how it can be used to reconstruct a crime scene.

Chapter Four - Findings and Recommendations – This chapter summarises the research with concluding findings and statements, and suggests workable recommendations to SAPS.

CHAPTER TWO

CRIMINAL INVESTIGATION

2.1 INTRODUCTION

Once a crime has been committed and reported, criminal investigation forms an integral part of the successful prosecution of the offender, to ensure the safety and security of all inhabitants of South Africa. As defined by Orthmann and Hess (2013:8), “a criminal investigation is the process of discovering, collecting, preparing, identifying, and presenting evidence to determine what happened and who is responsible”. As no two crimes are the same, even if they were committed by the same person, each criminal investigation is unique to each case. This chapter will deal with criminal investigation and the meaning thereof.

2.2 CRIMINAL INVESTIGATION

According to Becker (2009:19), criminal investigation started at the end of the 13th century. In 1829, the metropolitan police started in London, established by the King who had a justice of peace and parish constables. This system served in England and the United States (US). Even though it was inefficient, it did maintain a modicum of order in the class-based agrarian societies of this era, where conflict resolution was more often the result of a tradition of defence, than that of law enforcement. The villagers policed their own morals and values in those times. In 1829, the creation of the metropolitan police department altered the London system of law enforcement. They served as a role model for the British municipalities, as well as the emerging American cities (Becker, 2009:19, 20).

According to Marais (1992:1), from the time the crime was committed until the perpetrator’s guilt either is proven or disproven in court, crime investigation is a process of identifying people and physical objects. Furthermore, the investigation involves documenting and photographing the undisturbed scene, collecting relevant physical evidence, attempting to determine the time of death, which must be done in a timely fashion at the scene, and amongst other things, ascertain the pre-mortem location of the body and whether any post-mortem movement of the body occurred. The investigating officer (I/O) (as referred to in the National Instruction (N/I) Policy Documents on crime scene Management (CSM), Policy 2/2005, 1/2015, and the Resolving of Crime (ROC): 495 programme for Investigating officers) will also focus their investigation on the identification of the victim, which could sometimes have complications

because of the decomposition of the body. Decomposition will necessitate more sophisticated technology such as DNA, fingerprinting, dental examination, and facial reconstruction for the identification of the victim (Saferstein, 2013:122, 123). Gilbert (2010:37, 38) further states, criminal investigation is a logical, objective, legal inquiry involving a possible criminal activity. The results of this inquiry, if successful, will answer the following questions:

- Did a criminal violation, as described by a code or statute, occur?
- Where and at what time and date, did the crime occur?
- Who were the individuals involved in the planning, execution, and aftereffects of the violation?
- Was a witness to the criminal activity present?
- Is there evidence of the criminal activity?
- In what manner, or by what method, was the crime perpetrated?
- Is there an indication of guilt or innocence to aid judicial officials in determining a just solution to the case?

To the question posed to Sample "A", "What is criminal investigation?" the following answers were given by the participants:

- Five participants answered that it is when you investigate an incident and prove before court that a crime was committed.
- One participant answered it is the where you investigate all criminal cases in the community to maintain peace.
- Three participants said it is where you collect clues and exhibits for successful prosecution.
- Eight participants said it is when you investigate crime.
- One participant answered that it is the detection of the crime committed.
- Five participants answered that it is the systematic search for the truth and leads, in order to bring the suspects to book and to have a conviction in a court of law.
- Two said it involves the study of facts to identify suspects to prove them guilty.
- Two stated that it is to make the unknown known.
- One stated, to do a follow up after receiving the docket and gather evidence for court proceedings.
- One said it is where the crime has been committed and reported, and need to be interrogated and investigated.

- Two participants answered that they are unsure of what to answer, as they do not know the true meaning and did not have any formal investigating officer training.

To the question posed to Sample “B”, “What is criminal investigation?” the following answers were given by the participants:

- One stated that criminal investigation leads the court to make a decision whether the culprit is guilty of the crime or not.
- One said it is to use all relevant and available information of a case to solve the case. The question, “What has occurred”, can only be determined after a careful and intelligent examination of the scene and all evidence gathered during the investigation.
- One stated that a criminal investigation seeks to identify factually, what occurred in a given incident, if actual crimes were committed, and to identify all parties associated (victims, witnesses, subjects).

Two participants of Sample “B” gave a very good answer to what a criminal investigation is and are close to the statement of Marais (1992:1) that from the time the crime was committed until the perpetrator’s guilt either is proven or disproven in court, crime investigation is a process of identifying people and physical objects.

The participants of Sample “A” in this research study have given a wide array of answers to what criminal investigation is. All the answers given by these participants are close to the true definition of criminal investigation, but all participants confuse this definition with the objectives of criminal investigation; their answers are only pieces of what the criminal investigation entails. From the literature, as stated by Marais (1992), Becker (2009), Gilbert (2010), and Saferstein (2013), criminal investigation encompasses the whole process, from reporting of the crime, investigating the crime scene and suspects, through to the suspect being in court, and convincing the court of the guilt of the perpetrator. The participants’ experience working as investigating officers, vary from less than one year to over 20 years. Their training as investigating officers varies from the very old syllabus to the new ROC for investigating officers’.

Criminal investigation has grown to a highly respected profession as seen in its development from the beginning of investigations in the early 13th century up to today. According to Becker (2009:19, 20), from the early 13th century, it has grown from a person only being a peace officer to a person practicing a profession, where knowledge of the law and communities’ norms and values are taken into account. The victims are not only the murdered but also the

families and friends left behind; they want the truth to be heard and the perpetrator removed from the society. As mentioned by Osterburg and Ward (2010:5), the investigation of crime encompasses “the collection of information and evidence for identifying, apprehending, and convicting suspected offenders”.

2.3 OBJECTIVES OF CRIMINAL INVESTIGATION

Stelfox (2009:2) states that the objective of criminal investigation has changed since the 1300s. Originally, its sole objective then was to bring offenders to justice and the investigative practice was shaped solely by the need to identify suspects and gather evidence to support prosecutions. Furthermore, Stelfox added, in the 1300s all criminals were charged against the moral values and norms (allowable behaviour as decided by the society) of the society in which they found themselves then. Stelfox (2009:2) further mentions, nowadays victim care, community reassurance, intelligence gathering, disruption of criminal networks, and managing a wide range of crime risks are also seen as fundamental objectives of the process of criminal investigation. Du Preez, Prinsloo, Botha, Moar, Schwär, Smith, Stokol, Naudé, Putter, Van Schalkwyk, Fourie, Wright and Van der Westhuizen (1996:4) state that the objectives of criminal investigation are the identification of crime, gathering of evidence, individualisation of the crime, arrest of the suspect, recovery of stolen property, and the involvement of the prosecution process. Furthermore, Palmiotto (2013:4) emphasised that the primary objective of criminal investigation is to gather facts about a criminal situation. This objective is accomplished by collecting all the accurate information pertaining to a specific act or crime.

Becker and Dutelle (2013:17, 18) state that it is true is that a person cannot enter a crime scene without leaving something or taking something (perhaps only microscopic). Even though Du Preez et al. (1996:4) and Stelfox (2009:2) agreed on the aspects discussed in the previous paragraphs, Stelfox (2009:2) was the only author who touched on victim care, intelligence, or community reassurance, which is very applicable nowadays. Today we do not only bring the perpetrator to book, but looking after the victims and communities is a priority in South Africa. Stelfox (2009:2) also mentioned that ensuring the victims of crimes are looked after as well, is part of being an investigating officer. Palmiotto (2013:4) mentioned that the objective of criminal investigations is to gather facts and that this has to be accurate, but he does not mention victim care.

When the question, “Name the objectives of criminal investigation”, was posed to participants of both Sample “A” and Sample “B”, they had various answers to this question. This is a breakdown of the answers given by the participants in Sample “A”:

- Six stated that they do not know at all.
- Six said to bring the perpetrator before a court of law and stand for their trial.
- Three stated to maintain peace and order in public.
- Seven said the type of instrument that was used, the time, how many people involved and witnesses to the murder, gathering evidence, tracing suspects, seeing cases through to court.
- One said to fight crime.
- One said to reduce crime.
- One stated to reveal the truth and convict the suspect.
- Two said informers, how the crime took place, where it took place.
- Two said to find evidence.
- One mention the Criminal Procedure Act (Act 51 of 1977) whereby an IO finds him- or herself, as if he/she is in a trial or accused of the crime.
- One said to deal with crime, to solve the crime.

With Sample “B”, the participants stated:

- One stated it is to identify objectively what occurred, and in what order, the collection of all associated evidence and in a form that is valuable, to apprehend suspects.
- One stated, to provide the criminal justice system with a valuable tool by which justice can be served.
- One answered, to lead the court in making a decision to see whether it is a possible suicide or not.

Similar to the literature discussed above, it seems that most of the participants mentioned some but not all the points to the objectives of criminal investigation. The next logical exploration to follow is to discuss the concept of forensic science.

2.4 FORENSIC SCIENCE

Houck and Siegel (2010:4) state that forensic science describes the science associating people, places, and things involved in criminal activities; these scientific disciplines assist in investigating and adjudicating criminal and civil cases. Ogle (2012:352) mentions that forensic science owes its origins, first, to the individuals who developed the principles, and techniques needed to identify or compare physical evidence and, second, to those who recognised the need to merge these principles into a coherent discipline that could be practically applied by the criminal justice system. Forensic science is the umbrella term encompassing a myriad of professions in the forensic science field, whether it is biology, anthropology, entomology, and others. using their skills to help law enforcement officials conduct their investigations (Saferstein, 2011:4), further added that forensic science applies the knowledge and technology of science to the definition and enforcement of such laws. It matters directly because crime scene investigators are expected to understand, often quite advanced, technology in the performance of their tasks investigating things at the scene, and they must apply the scientific method in developing a reliable story from them (Tilstone, Hastrup & Hald, 2013:3).

The researcher understands that investigating officers could use these resources available to them to secure a proper conviction in court. With this mentioned, the forensic science world is huge, with many different professions in this area. The most used by the SAPS is for DNA testing, where these biologists use their profession to find matches on rape cases, murder cases, or even to link a suspect to a specific crime scene, as well as matching fingerprints lifted from crime scenes to the SAPS database.

As emphasised by Saferstein (2011:4), forensic science is the umbrella term encompassing a myriad of professions in the forensic science field, whether it is biology, anthropology, entomology, and others. With interviewing Sample "A", the question was put to them "What is your understanding of forensic science?"

- Seven said they deal with blood DNA analysis.
- Seven said it is where biological substances are forwarded for analysis and comparison (ballistics).
- Five said that they are experts doing analysis regarding bloodstains and fluid stuff, DNA.
- Two said it is people who are trained.

- One said it is to assist in obtaining expert evidence at crime scenes and to assist in court cases with the use of DNA.
- Two said it is the investigation where forensic investigation is required.
- One said, where people, or the silent witnesses', evidence confirms the real person who committed the crime.
- Six did not know or answer the question posed to them.

Sample "B" had the following answers to the same questions:

- One said it is a field of people who are trained experts in their field of forensic science.
- Two stated it is many different fields, where these people are trained in specific fields.

The participants of Sample "A" had various answers to the question posed, even though they mostly focused on DNA, fingerprint experts, and ballistic analysis. Orthmann and Hess (2013:8) state clearly that forensic science covers a wide array of disciplines, including pathology, entomology, odontology, anthropology, photography, serology, toxicology and on and on. Comparing the participants' answers and literature by Orthmann and Hess (2013:8) participants do not use any of the other services available to them from the Forensic Science Laboratories or specialised units, except for LCRC, the photographer, fingerprint expert, the biology unit, as well as ballistic unit. As discovered during the docket analysis done by the researcher, the investigating officers use ballistics, LCRC, and the biology unit for DNA analysis, no other specialised units were mentioned in the investigation diaries of the docket analysis.

Sample "B" answered the question "What is your understanding of forensic science" as it being a specific field, specialising in specific things, such as ballistics, biology, etc. but as stated by Stelfox (2009) these are people trained as experts in that specific field. To the same question, Sample "A" stated the use of LCRC, ballistics, and DNA testing, but not any of the other forensic units available to their disposal. During the case docket analysis done by the researcher, the non-use of all additional forensic science units available to them was confirmed. The investigation diary revealed which experts attended to the crime scene, and to where the exhibits were sent.

2.5 THE ROLE OF THE FSL IN CRIMINAL INVESTIGATION

According to Jackson and Jackson (2008:1, 2, 3) forensic science plays a pivotal role in most criminal prosecutions, especially those of a more serious nature. This was evident with the

Oscar Pistorius case of February 2013. Oscar Pistorius shot and killed his girlfriend Reeva Steenkamp. The ballistics expert (Major Chris Mangena), a BPA expert (Colonel Ian van der Nest), and various other experts from the FSL were present in court and testified (S v Pistorius (CC113/2013) [2014] ZAGPPHC 793, 12 September 2014). Colonel Van der Nest testified on his interpretation of the blood patterns found at the crime scene.

Colonel Van der Nest's evidence tied up with ballistics findings from Major Mangena. Like Mangena, van der Nest said Steenkamp's arm was raised when she was shot. Colonel Van der Nest said he believed many of the blood spatters on the scene could have been caused by arterial spurts from two of Steenkamp's wounds – one to the head and the other to her right arm. A photograph of the toilet showed large blood smears on the toilet seat and a great deal in the toilet. Colonel Van der Nest also showed a close-up photograph of a long blonde hair with tissue attached. He believed she sustained the head wound close to the toilet. One source of heavy blood flow was over the toilet seat into the bowl and another onto the floor next to the toilet. The one onto the seat he believed to have been blood flowing through Steenkamp's long hair into the toilet from her head wound and the other blood source being from her arm wound. Colonel Van der Nest said he had inspected the whole toilet area and had found no evidence of blood staining or arterial spurts any higher up than toilet level. He found no foot prints or marks from a bloody sole onto a clean floor. Colonel Van der Nest said he found no evidence that any bleeding had been the result of a blunt force trauma. He further stated the wound to the arm and the damage seen on Steenkamp's black vest were evident that she had been raising her arm in a defensive position when she was shot close to her elbow through her arm. A defect in the elastic band of Steenkamp's shorts and her hip wound showed that her clothes were in "a normal wearing position" when she was shot. Colonel Van der Nest said he believed Steenkamp had been lifted into an upright position, dragged a little and then picked up and carried down the stairs and placed in the position in which she was found. The field of forensic science is very wide, and therefore, the researcher cannot list and discuss each discipline under the forensic science laboratory.

The involvement of forensic science in the investigation and resolution of criminal offences starts at the crime scene, from the collection of the evidence, the analysis of the evidence, to the writing of findings in the form of a report for court (Jackson & Jackson, 2008:1, 2, 3). In some instances, the forensic scientist has to appear in court as an expert witness (Jackson & Jackson, 2008:1, 2, 3). This is reiterated by Orthmann and Hess (2013:8) that forensic science covers a wide array of disciplines, including pathology, entomology, odontology, anthropology,

serology, toxicology, etc., which can be utilised and accessed by the investigating officers, assisting them with the evidence that they have retrieved, or that the analyst retrieved for analysis.

These experts in their own field of specialisation can determine various items for the investigation officer, such as linking a suspect's fingerprints to a crime scene, linking the firearm to the victim using ballistics, verifying the story of the suspect with BPA analysis, etc. Orthmann and Hess (2013) state the forensic scientist performs the following steps at crime scenes:

- Recognise physical evidence;
- Document the crime scene and the evidence;
- Collect, preserve, inventory, package, and transport physical evidence;
- Analyse the physical evidence;
- Interpret the results of the analysis;
- Report the results of the analysis; and
- Present expert testimony.

With interviewing of Sample "A", the question "What is the role of the forensic science laboratory in criminal investigation?" was posed to the participants and their responses were documented as follow:

- 26 participants said it is to investigate crime, for example, DNA is a medical science but is applied to investigate crime. It links physical evidence found on the scene to an individual or source. It helps in the area of DNA.
- One stated it assists in fingerprints.
- One said to assist in evidence at court.
- Three did not answer the question posed to them.

Orthmann and Hess (2013:8) assert that forensic science covers a wide array of disciplines, including pathology, entomology, odontology, anthropology, serology, toxicology, among others. The investigating officers should not only use a handful of these experts but should utilise all the possible experts to their disposal. With interviewing Sample "A", the researcher realised that the investigating officers confuse the two terms, BPA and DNA.

When asked the question whether they had any successes in court with the use of BPA, most of the participants answered yes, only to find out that they refer to DNA, such as when rape

cases were brought before court. The concept of forensic science is not understood clearly by the investigating officers. Even though they understand DNA analysis they do not understand BPA, as they have never used it at a crime scene, as found in their answers to the above question, or have documented it in the docket analysis, as the researcher found while perusing the case dockets. The scope of forensic science entails a wide array of disciplines, as mentioned by Orthmann and Hess (2013) above, and investigating officers should use all the experts from the forensic science to assist them in their daily investigation of cases.

The term 'forensic' refers to the scientific study of objects involved in a crime. Therefore, a forensic expert is someone who relies on the methods, techniques, and knowledge of particular science to determine the evidential value of specific objects or phenomena involved in a crime (Technicon South Africa, OVM241ZE, 2002:55). The first major book describing the application of scientific disciplines to criminal investigation was written in 1893 by Hans Gross, a public prosecutor and later judge from Graz, Austria. This book was translated to English in 1906 under the title *Criminal Investigation* and it remains highly respected today as seminal work in the field (Swanson, Chamelin & Territo, 2003:12).

Scientific fields such as chemistry, biology, and microscopy have a long history of separate development. Hans Gross published the textbook in 1893, detailing the application of information derived from these separate fields to criminal investigation. It was not until 1910 when Edmond Locard established the first crime laboratory in Lyon, France, that these specialities were brought together for the sole purpose of improving criminal investigation (Becker & Dutelle, 2013:01). Becker and Dutelle (2013:11, 12) mention that in modern, well equipped forensic laboratories, experts from the fields of serology and immunology, ballistics, document analysis, fingerprinting, polygraphing, analytical chemistry, and geology work together to solve crimes and provide scientifically validated evidence.

The investigating officers are taught in the ROC, that the LCRC must first be contacted, only then, on the motivation of the LCRC member, may the FSL Biology unit be called out to do reconstruction on blood spatter in murder cases (Safety and Security Sector Education and Training Authority, 2009:340).

2.6 CRIME SCENE

The crime scene is the starting point of an investigation. This is where direct or indirect proof of the commissioning of a crime exists and where evidence can be found to solve the crime

(Safety and Security Sector Education and Training Authority, 2009:343). According to Gilbert (2010:80), a crime scene is the location at which a suspected criminal's offence has occurred. Dutelle (2011:13) states that the working definition of a crime scene (both the primary and secondary), is anywhere evidence may be located that will help explain the events and furthermore, states a single crime scene may have various locations. Palmiotto (2013:97) mentions that the crime scene is proof that a crime has been committed and is the initial point where criminal investigation starts and contains evidence that would connect the suspect with the crime scene.

Participants in Sample "A" were asked the following question, "Define a crime scene". Their responses are as follow:

- 16 participants stated it is the place where the incident occurred.
- Two answered, where evidence is being collected.
- One answered it is a place where a wrongdoing occurred or place where criminal activities took place.
- Seven answered it is the place where an unlawful act occurred.
- One stated it is the place where an unlawful act took place.
- One stated it is where a crime has been committed and need to be cordoned off so that evidence at the scene cannot be interrupted.
- One answered it is the place where the incident took place, and it must be protected for evidence and can lead to the suspected person.
- Two participants did not answer the question at all.

With Sample "B", the participants answered as follow:

- One stated: Someone must be deceased before FSL will go and attend the crime scene. Blood must be present at the crime scene for a BPA expert to attend.
- One answered: The physical location associated with an alleged criminal incident.
- One answered: A crime scene is any scene that may provide potential evidence to a Crime Scene Investigator or the investigation. This may include but is not limited to, the victim's body, vehicles, buildings, fields, any objects that form part of the incident, which may assist with the investigation. The bloodstain pattern, analysis environment, the crime scene is any place, object, clothing, victims, or suspects contaminated with blood. It tells you blood shedding or transfer occurred during the incident.

2.6.1 Classification of crime scenes

James and Nordby (2009:167) state due to the diversity of possible crime scenes there are many ways to define or classify crime scenes. Crime scenes can be classified according to the location of the original criminal activity. This classification of the crime scene labels the site of the original or first criminal activity as the primary crime scene and any subsequent crime scenes as secondary.

Palmiotto (2013:164) gives a very good explanation of what a primary crime scene is; the location where the body of a deceased is found, or the point of entry, or even where the suspect lives is called a primary crime scene. This refers to the place where the actual offense took place, whereas a *secondary crime* scene is the place in some way, shape, or form that is related to the offense but is not the place where the offense occurred (Ezine articles. Castillo, F. 2008).

Becker and Dutelle (2013:28) mentioned that the crime scene includes all areas through which the participants moved while entering to commit the crime, while committing the crime, and while exiting the crime scene. Becker and Dutelle (2013:28) further states that generally, the crime scene is a single, well defined area, but it may encompass several non-contiguous areas because most human activity takes place in sheltered areas. The investigating officers should by using criminal investigation, ensure that there is no secondary crime scene, unless the suspect has moved a body from one place to the next. This information is vital for the investigation officer (Becker & Dutelle, 2013:28).

The literature by Du Preez et al. (1996:19) describe that the attendance at crime scenes can assist the investigator greatly, the investigator can ensure that the evidence available is identified, collected from the crime scene, and all possible experts can attend to the crime scene, revealing the truth at the end. The indoor crime scene is for the most part protected from the elements and easily preserved for a longer period of time (James, Kish & Sutton, 2005:274). Whereas the outdoor crime scene, yields difficulty, as Fisher and Fisher (2012:397) state that outdoor crime scenes should be attended to as soon as possible. The weather could change evidence or destroy possible evidence, especially blood patterns, for example, on grass, as grass could discolour blood patterns rapidly, or may even be more difficult to detect, and small rain showers could wash away the blood patterns.

2.6.2 Crime scene investigation

According to the White paper on the Police and White paper on Safety and Security www.gov.za/sites/www.gov.za/files/38526_gen178.pdf (2015), on Crime scene management and Gilbert (2004:91), a crime scene means the place, including the surrounding area, where an alleged offence was committed, or where items with potential evidential value may be collected. The crime scene is where the initial reconstruction is done on the Blood Patterns Analysis, enabling the BPA experts to derive their opinion on what transpired at the crime scene. The documentation, reports, and photographs taken during this analysis will be used in court.

Du Preez et al. (1996:19) states that the collection of evidence starts at the crime scene, as this is the location of observable and concealed information and furthermore, the location where the circumstances of the events are revealed and the associative relationship between the perpetrator, his weapons and/or instruments, and his actions amidst the unlawful situation is determined.

2.7 LOCARD PRINCIPLE

Dr Edmond Locard (13 December 1877 – 4 May 1966) was a pioneer in forensic science and his contributions to the field have proved invaluable. Locard was one of the founders of the International Academy of Criminalistics and he has published over 40 books and articles in French, English, German, and Spanish (Wilding, 2012). Locard proved that any action of an individual, and obviously the violent action constituting a crime, could not occur without leaving a trace (Wilding, 2012).

According to Locard's exchange principle, when two objects are exposed to each other, a cross-transfer of materials occurs. This he started using in 1910, when Mr Locard asked the Lyons Police department to give him two rooms and two police officers to start a police laboratory (Saferstein, 2011:11).

Lyman (2013:39) states that when the Locard principle is applied to crime scenes where the perpetrator of the crime is exposed to the scene, the perpetrator will bring something into the scene and leave with something from the scene. Every contact leaves a trace. Fisher and Fisher (2012:32) reiterate that every contact leaves a trace. Jackson and Jackson (2011:15) also mention that the perpetrator of a crime will not only take traces of the crime scene away, but will also leave traces behind at the crime scene.

Safety and Security Sector Education and Training Authority (2009:340) states that there is a reciprocal transfer of traces whenever two objects or persons come into contact with each other, that they are always there, and it is the duty of the investigating officer to discover them by means of the aids and techniques at the investigating officer's disposal. With interviewing Sample "A", the question was posed "What is your understanding of the Locard Principle?"

- One stated it is a way of searching.
- Two stated that they do not understand it.
- 15 answered they do not know.
- One answered, bloodstain transferred from a person to scene of crime.
- One stated it is another way of investigating a crime.
- One answered it is principle of work. Whatever you leave behind and pick up, and link to a person for identification.
- One answered it is leaving fingerprints behind.
- Six participants answered it is when two objects come into contact, traces are left.
- One stated that the participant is not familiar with the term.
- One answered it is whereby the court could be allowed for a while to visit the crime scene for clarity.
- One participant answered lastly, that they deal with the criminals.

The most prevalent use of the Locard principle is fingerprints. It is used daily when fingerprints are lifted from crime scenes, and fingerprints taken from suspects to have it matched to crime scenes. The researcher understands that with BPA, the Locard principle plays a vital role in a bloody crime scene. When the suspect enters and exits the crime scene, some trace of the suspect and victim will transfer from one to the other, especially if there was a physical altercation between the victim and suspect. According to the Locard's exchange principle, when two objects are exposed to each other, a cross-transfer of materials occurs. The Locard principle plays a vital role in the use of BPA to reconstruct the crime scene. Locard's Principle that the perpetrator will take away traces of the victim and the scene, the victim will retain traces of the perpetrator and may leave traces of himself on the perpetrator, and the perpetrator will leave behind traces of himself at the scene many times is borne out in the evaluation and retrieval of bloodstain pattern evidence (Geberth, 2006).

2.8 NATIONAL INSTRUCTION (NI) POLICY DOCUMENT ON CSM

NI Policy document on how to get BPA experts to attend to the crime scenes, the use of these experts is of necessity and this includes the use of blood pattern analysts at bloody crime scenes. The SAPS Forensic Services (FS) has the following role at crime scenes.

1. FSL must attend to crime scenes when it is necessary to render a specialised service on the scene such as:
 - (a) Fire origin-and-cause investigations, fire debris analysis and detection of commonly-used ignitable liquids in exhibited material;
 - (b) Representative sampling for chemical analysis;
 - (c) Scene where firearms were used and require shot range or distance determination; and
 - (d) Coordinating clandestine drug scenes.
2. The FSL must be available to provide assistance, 24 hours, including telephonic advice.
3. If telephonic guidance can be provided to the Investigating officer or Crime Scene examiners, it may not be required for the FSL to attend to the scene.
4. However, if it is clear that specific and scientific services are required, the scene will be attended by the forensic expert from the FSL.

When the question was posed to the participants of Sample "A", "What does the NI Policy document 2/2005 state regarding calling out an expert to your crime scenes?" The following was stated:

- 18 participants stated that they hand the crime scene over to LCRC, identifying key points, explaining what they need them to do for the investigation.
- Five said that there is no NI Policy document on calling out an expert to a crime scene, except for LCRC.
- Five said, no one gives instructions, we ask at the crime scene, whether touched, and then we call out the experts.
- One said to investigate the crime scene.
- Two participants did not answer.

With Sample "B", they stated as follows:

- One said, FSL, Biology Unit, Western Cape crime scene policy, the policy, and

procedure only covers the attendance and not the 'how' section. There is a provincial policy/procedure for the experts' own use in the Western Cape – Victim Identification Centre (VIC), which the expert compiled in June 2013, to perform BPA functions according to the policy and procedure. Unfortunately, the expert could not share this document with the researcher, as it is not a National Order and the researchers' research area falls under KZN.

- One could not answer, as he is an international expert from the US. However, as stated by Colonel I van der Nest, there is no NI policy document as to how and when to call out BPA experts at all.
- One stated that there is no NI policy document on calling out a BPA expert to a crime scene in the SAPS.

No further instructions or guidelines regarding these experts' use are available to the detectives for the call-out of a BPA expert to the crime scene. As discussed with Colonel van der Nest on 19 March 2015, as well as on 22 December 2015, there is currently no National Instruction, Policy document, or Standing Order in the SAPS regarding the use of a BPA analyst to reconstruct the crime scene with the use of BPA. The policy document states a forensic expert will be attending the crime scene if called out by the investigating officer and CSM.

2.10 SUMMARY

As discussed in this chapter, criminal investigation dates back to the 13th century, and the criminal investigator plays an important role in fighting crime (Becker, 2009:19). Criminal investigators are the ones who must search for the truth, evidence, and exhibits, finding the perpetrator and convince the court to ensure that the culprit is convicted. Investigating officers have multiple sources to assist them during their investigations (Orthmann & Hess, 2013). The use of scientific methods and collecting evidence ensures that their cases are rock-solid and that they have a much better conviction rate. The removal of criminals from society depends on the criminal investigator, who must use all possible avenues of collecting evidence and ensure that the chain of custody is clearly marked and added to the case docket going to court. BPA plays an important role, as this forms a triangular model linking the victim, scene, and evidence (object, item, other) that was used to commit the crime. All three items, the victim, crime scene, and evidence are needed, as it establishes an interrelationship between the scene, victim, and object (Orthmann & Hess, 2013).

CHAPTER THREE

BLOOD PATTERN ANALYSIS AND CRIME SCENE RECONSTRUCTION

3.1 INTRODUCTION

BPA is a specialised field where trained and experience experts can assist the investigating officer at a crime scene. CSR, using bloodstain pattern interpretations, is a useful technique but only for those who are properly trained. All too often investigators overstate their conclusions based on a limited understanding of BPA and crime scene reconstruction (Fisher & Fisher, 2012:198). BPA is the science of examining and interpreting blood present at a bloodshed event in order to determine what events occurred, in what order, and who possibly left the stains (Dutelle, 2011:237). As with any area of forensic science, this discipline seeks to define the facts surrounding the incident in question (Dutelle, 2011:237).

3.2 RECONSTRUCTION OF CRIME SCENES

Nordby (2013:xxix - xxxii) states, "reconstruction as a scientific crime scene or event analysis and reconstruction logically links a detailed series of events of scientific explanations in order to provide an understanding of the sequence of events leaving some given set of data that may become physical evidence". Each explanation is developed, linked, and evaluated by applying a relevant scientific method to this available data. Crime scene reconstruction must be based upon scientific methods (Ogle, 2012:5). Clearly, the reconstruction of a crime scene is one of the major purposes for the collection of physical evidence (Ogle, 2012:5). The reconstruction of a crime scene may involve the reconstruction of a single event, such as determining a muzzle-to-target distance in a shooting or a sequence of events, such as the interpretation of bloodstain patterns at a crime scene (Ogle, 2012:5). Saferstein (2013:122) mentions that a critical phase of the investigation will be the preliminary reconstruction of events that preceded the onset of the incident. Reconstruction of the scene is accomplished by carefully noting where evidence is located in relationship to its known former position (Gilbert, 2010:81).

According to Saferstein (2011:377), crime scene reconstruction is the method used to support a likely sequence of events at a crime scene by observing and evaluating physical evidence and statements made by individuals involved with the incident. The physical evidence left at crime scenes plays a crucial role in reconstructing events that took place surrounding the

crime. The collection and documentation of physical evidence is the foundation of a reconstruction (Saferstein, 2011:377). The reconstruction of the crime scene supports the likely sequence of events involved with the incident (Saferstein, 2011:376). Furthermore, Saferstein (2011:378) states that crime scene reconstruction relies on the combined efforts of medical examiners, criminalists, and law enforcement personnel to recover physical evidence and sort out the events surrounding the occurrence of a crime. Sample "A" gave the following answers to the question, "What is your understanding of the reconstruction of crime scenes?"

- Six participants answered: When you go back to the crime scene and rebuild the crime scene. If the crime scene was destroyed by wind/rain, we have to put it back to the way it was, not physically but in writing.
- Six stated after crime is committed, like to take crime scene photographs, what was placed where, positions; we have to reconstruct it to the way it happened.
- Three said where they came back and they are not satisfied to find another clue for the investigation.
- Three said it is when first responder, cordon the scene, so there is no person to tamper with the scene.
- Two stated: It is where the first member attended then we reconstruct, to be meaningful to court.
- Three said: It is where the incident has already taken place but the scene was not attended by the experts so the scene needs to be reconstructed to get the leads to the evidence that can lead to the arrest.
- Three said clearly that they do not know.
- Two said to attend where crime was committed and correct some loopholes.
- Three did not answer the question at all.

Whereas Sample "B" had the following answers to the same question posed to them:

- One answered, when you take a holistic approach with all information, test the hypothesis to get a meaningful answer, and to prove the hypothesis. We use a scientific method to test it.
- One said in my field, crime scene reconstruction is to analyse and evaluate all evidence relating to the crime. To determine the events and sequence in which it happened. Given the data available, provide the most plausible conclusion based on evidence and the scientific method.
- One stated: CSR is a forensic discipline that seeks to identify as many objective

statements as possible regarding what happened and in what order it happened during a given phenomenon - some incident believed to be criminal in nature. This is accomplished by examining the physical scene, the evidence, and artefacts associated to the scene, and defining specific actions that took place, placing order to these events where possible and seeking to resolve contradicting hypotheses that may occur.

Sample "A" and Sample "B" had various answers to the question. Sample "B" had a more in-depth answer to the question posed to them. Sample "A" had a very vague answer to the question, as they are not the experts in reconstruction of crime scenes. Saferstein (2013:151) mentions that investigators should approach each case free of previous theories or expectations. Accordingly, crime scene reconstruction-personnel should use the processes of deductive reasoning, inductive reasoning, and falsifiability to create a logical reconstruction of crime scene events (Saferstein, 2013:151).

3.3 THE PURPOSE FOR CSR

To reconstruct the crime scene using BPA, a combination of geometry, physiology, physics, and logic, BPA requires extensive training coupled with a solid scientific education to be properly applied (Houck & Siegel, 2010:244). Jackson and Jackson (2011:6) state, the partial or complete reconstruction of a crime may be very important in corroborating or refuting an account of events given, for example, by an individual suspected of involvement, or an eyewitness. According to Fisher, Tilstone and Woytowicz (2009:308), in the cases of violent crimes, expert interpretation of bloodstain patterns left at the scene may provide vital information about what actually happened. Furthermore, the authors state that the analysis of blood spatter can help identify the location of both the victim and perpetrator. It can also reveal information whether the crime scene is staged or not (Fisher, Tilstone & Woytowicz, 2009:308).

Crimes involving violent contact between individuals and objects are frequently accompanied by bleeding, resulting in bloodstain patterns. Experts in BPA see bloodstains as a valuable object that can provide valuable insights into the events that occurred during the commission of a violent crime (Saferstein, 2011:378, 379). BPA interpretation can reveal the following (Saferstein, 2011:378, 379):

- the direction from where the blood originated from;
- the angle at which a blood droplet struck the surface;

- the location or position of a victim at the time a bloody wound was inflicted;
- the movement of a bleeding individual at the crime scene;
- the minimum number of blows that struck the bleeding victim; and
- the approximate location of individual delivering blows that produced a bloodstain pattern.

Furthermore, the investigator must not overlook the fact that the location, distribution, and appearance of bloodstains and spatters may be useful for interpreting and reconstructing the events that accompanied the bleeding (Saferstein, 2011:379). This type of evidence is known as associative evidence and link a suspect with the crime (Lyman, 2013:39). Sample "A" answered the following to the question "What is the purpose for reconstructing crime scenes?"

- Seven said to prove that how the facts is on how the crime occurred.
- Two stated to get more information from the crime scene.
- Six stated ...left something, not sure, to get all clues.
- Three said: Give an outline of the crime to court of law of how the crime scene looks like.
- Three said: Make sure no one enters.
- Three participants did not answer.
- One said to prevent contamination of the crime scene.
- One said: When they reconstruct a crime scene, they disturb evidence.
- Two stated it is where the incident has already taken place but the scene was not attended by the experts so the scene needs to be reconstructed to get the leads to the evidence that can lead to the arrest.
- Two said to show clearly what was not clear with the first visit, or add more to what was not included in the first visit.
- One said to preserve evidence.

Sample "B" answered the following to the same question posed to them:

- One said: The following information may be obtained from BPA and with the purpose to assist with the reconstruction of the crime scene:
 - The impact and directional angle of a droplet that was moving through the air and striking a target surface;
 - Area of convergence or origin for a group of related stains;
 - By establishing the number of cast-off patterns, the minimum amount of blows

- delivered onto a target may be calculated;
- The nature of the force that created the stains;
- The nature of the object that created the stains;
- Relative position of victims and suspects or objects at distinct moments in the crime;
- Possible sequence of a series of events;
- The movement and direction in which victims and suspects were moving at the crime scene, if they were running or walking;
- To refute or verify statements produced by victims, eyewitnesses, or suspects;
- To study flow patterns to determine if bodies was moved or crime scene that might have been staged;
- By studying the void patterns on a crime scene, the expert may determine if an object was moved or if objects was removed from the crime scene;
- The type of weapon used may also be determined;
- By studying blood clotting, serum separation and drying times of blood on a crime scene, time laps may be determined between events; and
- The position (standing, kneeling, lying down) of the victim or suspect may be determined by studying the bloodstains on a crime scene.
- One stated that blood patterns tell us what bloodletting actions are occurring and where those events took place, which is an integral part of CSA.
- One said: If we look at the Oscar Pistorius case, certain aspects of the suspect's version in court was wrong, as Mr Pistorius stated that the magazine rack was not in that position, but the blood patterns showed a void against the wall and on the floor around the feet of the magazine rack. The BPA also showed that he did carry her down the stairs, with her bloody hair touching part of the banister on the way down to the foyer.

As seen above, participants of Sample "B" has the same description on what BPA can be used for and how it is used. All the authors have the same main principle that BPA can show the events that took place during the commission of the bloodletting, and the possible actions of both the victim and the suspect(s). With the docket analysis done for this research paper, not one of the bloody crime scenes was attended by a BPA expert for the purpose of reconstruction. Sample "B" concurred what was stated in the literature - it could eventually contradict the suspect's version of what had transpired at the crime scene.

3.4 BLOOD PATTERN ANALYSIS

Before discussing blood pattern analysis, it is firstly important to understand the terminology, thus giving us a clear understanding of the term BPA. Like any forensic science or discipline, blood pattern analysis seeks to define the facts surrounding some incident that is in question (Bevel & Gardner, 2002:2). The examination of the physical nature of bloodstains provides information specific to the events that occurred during the incident. The information we are likely to discover through the examination of bloodstains includes:

- the direction a given droplet was travelling at the time of impact;
- the angle of impact;
- the probable distance from the target from which the droplet originated;
- the nature of the force involved in the bloodshed and the direction from which that force was applied;
- the nature of any object used in applying the force;
- the approximate number of blows struck during an incident;
- the relative position in the scene of the suspect, victim, or other related objects during the incident;
- the sequencing of multiple events associated with an incident; and lastly,
- in some instances, which hand delivered the blows from the beating (Bevel & Gardner, 2002:2).

Consider a drop of blood forming on a person's fingertips. According to James, Kish and Sutton (2005:59), blood will continue to accumulate on the most dependent portion of the fingertips until a drop is able to break free and fall. When a drop is forming in a dependent location, gravity is exerting a downward force on the drop. Simultaneously, the cohesion forces of the surface tension of the blood are trying to reduce the amount of exposed surface area and are exerting an upward force in opposition to gravity. When the drop finally breaks free, it is very slightly elongated. As it continues to fall, the effects of air resistance will cause the sphere of blood to flatten slightly (James, Kish & Sutton, 2005:61).

BPA is one of the most explicit methods of forensic science that exemplifies its reconstructive nature in the analysis and interpretation of bloodstain patterns. BPA includes the analysis and interpretation of the dispersion, shape characteristics, volume pattern, number, and relationship of bloodstains at a crime scene to reconstruct a process of events (Houck & Siegel, 2010:244).

Dutelle (2011:239) mentioned that the ability to interpret a bloodshed event should be viewed as a forensic tool, assisting the crime scene investigator to understand what took place and what could not have taken place during a bloodshed event. There are three (3) basic classifications of bloodstains; *passive*, *spatter*, and *altered stains* (Dutelle, 2011:239). Bloodstain patterns often tell a story of what took place at a crime scene; it is up to the investigator to read the story and interpret it. BPA requires much experience and training to make interpretations about the bloodstain pattern correctly (Fisher & Fisher, 2012:196, 197).

Passive bloodstains consist of clots, drips, flows, and blood pools. They are not related to a specific action within the context of the scene regarding bloodshed violence. They are the aftermath associated with the violence, as the resulting bloodshed begins to move and cure due to environmental and gravitational forces. *Spatter bloodstains* occur when a bloodshed event occurs at a crime scene; typically, it will result in a spatter pattern. There is no “L” in the word. These stains are defined as a random distribution of bloodstains that vary in size, and might be produced by a variety of mechanisms. This pattern is created when sufficient force is available to overcome the surface tension of the blood (Dutelle, 2011:246).

Sample “B” answered as follow with the question “Give your understanding of blood pattern analysis”:

- One stated that the best explanation for the function is that the result of bloodstain pattern analysis is to define the events/actions that occurred during the incident, “bloodstain patterns define the nature of the actions that created it”.
- One said: Identify the pattern types based on established criteria (taxon). Seek to isolate a source event (crime scene mechanism) for the pattern. Determine any spatial information to isolate where and in what direction the event occurred in the scene. Through subsequent DNA attempts, isolate a human source for the pattern. Consider any associated issues (physically altered bloodstains concerns, sequential order, among others). All of this leads to identifying specific bloodletting actions that occurred, the general area in which they occurred, and as best as possible isolating who was involved. Bloodstain patterns effectively tell you what was happening (what kinds of bloodletting activities), where they occurred, and in some instances the order in which they occurred.

The experts use scientific ways (for example physics, mathematics, biochemistry) and are able to form an opinion on the blood patterns found at the crime scene. When looking at the

participants of Sample “B”, each has their own view and understanding of what BPA is, for example it all leads to showing the events of the incident that led to the bloodletting.

3.5 BLOOD PATTERNS

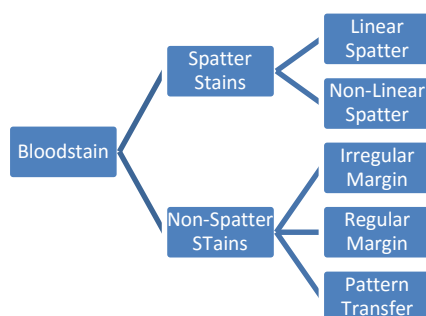
According to James, Kish and Sutton (2005:67), the classification of bloodstain patterns is an understanding of how the bloodstain pattern, analysis terminology has been created, and is evolving. The terminology is necessary to convey research as well as scene observations in a clear and concise manner. The terminology of this discipline is continually being refined in an effort to create a clear and concise language in which scientists can convey information. The various terminologies such as spatter stains, voids, and impact spatter, etc. as discussed below, will assist in understand the various terminology used in BPA. When examining bloodstain patterns analysis terminology, two trends stand out regarding how terms were and are derived (James, Kish & Sutton, 2005:67):

- From the physical appearance of the stain pattern
- From the mechanism in which the pattern was created

The terminology used in BPA is very specific, as set out below in the various blood patterns and stains (received from Mr Ross Garner 2014-08-22, and given permission to be used by the researcher, as per attached Annexure “G”).

Altered bloodstains are patterns whose appearance indicates the blood and pattern had undergone a physical and/or physiologic alteration (James, Kish & Sutton, 2005:68, 69). Bevel and Gardner broke down Bloodstains; see the attached image on Figure 3.1 and 3.2 on page 46 (reproduced with permission of Ross Gardner, 2015 as per attached Annexure “G”) as follows for easy mapping:

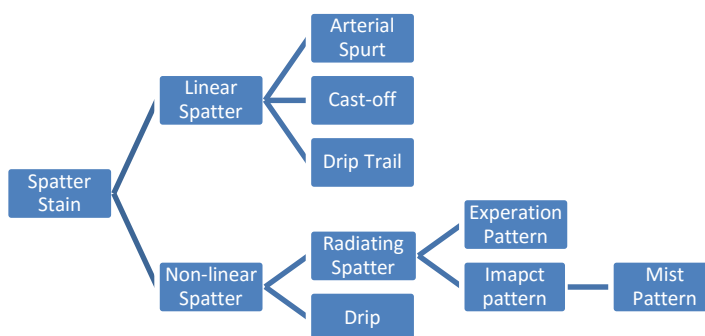
Figure 3.1: Breakdown of bloodstains



(Source: Reproduced with permission of Ross Gardner, 2015 as per attached Annexure “G”)

Bevel and Gardner break these spatter stains further down into classifications and help to understand where the stain fits:

Figure 3.2: Further breakdown of bloodstains



(Source: Reproduced with permission of Ross Gardner, 2015 as per attached Annexure “G”)

3.5.1 Linear spatter stains

According to Bevel and Gardner (2008:43), linear stains are a series of related spatter stains, dispersed over a surface in a linear orientation and have an interrelationship in the shape and impact angles. Linear spatter stains are divided into the following: arterial spurts, cast off, and drip trails, as discussed below with illustrations of the various types of linear spatter stains.

●Arterial spurts

Arterial spurts are a result of a projection mechanism resulting from arterial pressure that propels blood upward, forward, or downward from a damaged artery, often in a spray type

manner. Distinctive physical characteristics, such as the presence of a bright red colour of oxygenated arterial blood, may also be present. These stains may be as small as 1 mm to 1 cm in diameter. The stains may exhibit elongated spines and satellite spatters around the central area of the stain (James, Kish & Sutton, 2005:149). This occurs when a victim suffers from an injury to a main artery or the heart. The pressure of the continuing pumping of blood causes blood to spurt out of the injured area. These spurts occur as the heart pumps blood through the body. Some radial spikes, satellite spatter, or flow patterns may be evident because of the large volume of blood being expelled with each spurt. The line-up of the stains shows the movement of the victim. Any vertical arcs or waves in the line show the fluctuations of the blood pressure (Saferstein, 2011:390). See the attached image on Figure 6 as per attached Annexure "A".

●Cast-off

Cast-off bloodstain patterns occur when blood is projected or thrown onto a surface from a bloody source or object in motion, such as a hand or beating instrument, owing to a whip-like action, and the generation of centrifugal force overcomes the adhesive force that adhere blood to the object. The size of the cast-off stains is usually between 4 mm to 8 mm, although they may be larger or smaller depending on the type and size of the bloody object, amount of available blood, and the forcefulness and length of the arc of the swing.

As the object comes into the bloody area, as the swing is upwards or sideways, the line it creates is in a semi-arc or straight line, but the direction towards left or right or vice versa. The drops will also be smaller with the downward action, as most of the blood has left the object with the upward movement. In some instances, there is also some obvious impact spatter. These cast-off drops will also adhere to anything in its flight path, which can be objects, walls, and ceilings (Saferstein, 2011:388).

Cast-off spatter is created when a blood-covered object flings blood in an arc onto a nearby surface. This pattern commonly occurs when a person pulls a bloody fist or weapon back between blows to a victim. The width of the cast-off spatter created by a bloody object may help suggest the kind of object used in the crime. The sizes of the droplets are directly related to the size of the point from which they were propelled. Drops propelled from a smaller object will produce a smaller spatter with a more linear line; where as a blunter object will create a larger and wider pattern. The cast-off pattern can also indicate whether the blows were from right to left or left to right. The pattern will point in the direction of the backwards thrusts, which is in the opposite direction of the actual blow. This would show which hand was used in the

commission of the crime. It can furthermore show the minimum amount of blows to the victim (Saferstein, 2011:388).

In the forensic circumstance, blood leaves a blood-covered object when the centripetal force acting on it overcomes the adhesive forces holding the blood onto the object, whether blood cast from the object occurs while the bloody object is swung or if it comes to an abrupt halt (cessation cast-off) (Shaler, 2012:392). Dutelle, (2011:250) also mentions that cast-off patterns are those created when blood is released or thrown from a blood-bearing object in motion. They can be the result of two basic actions: (1) arc cast-off patterns created when the blood is released from an object through the influence of centrifugal acceleration, and (2) the instances of cessation, or stop-action, when the blood is thrown from the object when the object's motion is abruptly stopped. Furthermore, arc cast-off are generally distributed in a linear configuration, the directionality of the cast-off can also be determined. Cessation, in general, does not show a linear arrangement but rather have the pattern of impact spatter. The cessation stains must not be used in the reconstruction of the incident. Cast-off patterns can also determine the amount of blows to the received by a given blood source (Dutelle, 2011:250). See the attached image on Figure 7, 8 and 9 as per attached Annexure "A".

●Drip trails and drip

A drip trail is created by blood either dripping from a person or bloodied object. A drip trail is a deposit of a series of drips in a linear orientation. Blood accumulates on the object and small drops are formed. When the mass reaches around 0.8 ml, gravity overcomes the ability of surface tension to hold the drop to the object and the drop will be put into free flight. When the drops falls to the ground and hits the surface, it produces a relatively large spatter stain (Bevel & Gardner, 2008:25).

Drip trails are a series of drops that are separate from the other patterns, formed by blood dripping off an object or injury. The stains form a kind of a line or path usually made by the suspect after injuring or killing the victim, or they can show movement of the wounded victim. It could lead the investigator to the discarded weapon, or it can also be the blood of the suspect leaving the crime scene, who could be wounded when committing the crime. These drip trails will lead away from the original crime scene where the event took place. If the person was moving slowly, the drops will be more circular in shape, whereas if the shape of the drop has a tail, it will show the direction in which the person was moving (Saferstein, 2011:395, 396). When blood drips from an object in motion, the resulting droplets' shapes can range from nearly circular (falling perpendicular to the surface) to elongated (hitting the surface at an

angle) depending on the speed of travel (Shaler, 2012:384). See the attached image on Figure 10 and 11 as per attached Annexure "A".

3.5.2 Non-linear spatter

According to Bevel and Gardner (2008:49), non-linear spatter is a series of related spatter stains dispersed over surfaces other than in a linear orientation, an evident interrelationship in the shape and impact angles. Below is a discussion on the non-linear spatter stains with illustrations of each. Radiating spatter contains three spatters: expectorate, impact, and mist spatter.

●Expectorate spatter

This spatter occurs when blood is forced from the mouth, nose, or respiratory system under pressure. This is as a result from situations where the mouth, throat, or lungs are injured or when blood is interjected into the air passage and the blood is ejected as a function of breathing. This stain is usually less vivid in colour (from being diluted by saliva), contains vacuoles (where small air bubbles in the stain burst), or contain evidence of mucous strands (Bevel & Gardner, 2008:25).

If the blood that creates such a pattern is under great pressure, it produces a very fine high velocity spatter. Expecterated blood at a very low velocity produces a stain cluster with irregular edges. The presence of air bubbles in the drying drops can differentiate a pattern created by expecterated blood from other types of bloodstains. The presence of expecterated blood gives an important clue as to the injuries suffered and the events that took place at a crime scene (Saferstein, 2011:391). See the attached image on Figure 12 as per attached Annexure "A".

●Impact spatter

James et al. (2005:126 & 129) state that impact spatter results from an object directly striking a source of exposed blood. Size of the stains may vary from 0.01 mm to 4 mm, and in some cases have a larger diameter. Further analysis of the crime scene and victim is needed, as this stain can occur from various violent actions, whether it is beating, stabbing, gunshot, power tools, or explosive events. The case information is the most important in this spatter type, as any of the mentioned events can lead to impact spatter.

If a suspect is found with spatter on their clothing and shoes, thorough investigation must be done. The possible suspect could state that they found the victim, or shook the victim, or

attempted to do cardiopulmonary resuscitation, or that some other activity could cause the spatter on the clothing or shoes. With a gunshot injury, the assailant or victim could have 'back spatter' or 'forward spatter' present. These spatters will have a radiating-out formation on the person. Depending from the direction the impact came, the forward spatter will have a fan like appearance away from the energy source. See the attached image on Figure 13 as per attached Annexure "A".

With back spatter, the spatter is directed back towards the energy source. Many factors may be present when impact spatter is found on the victim or possible suspect. According to James et al. (2005:126 & 129), the following must be taken into consideration:

- Shape of the weapon
- Weight and length of weapon
- Number of impacts
- Amount of force applied
- Direction of force applied
- Location of the wounds
- Movement of the victim and assailant during the attack
- Amount of blood available for the given impact

Back spatter is mostly seen with gunshot wounds at close range to the victim because of the gasses that accompany the projectile that often lacerate the entrance wound due to the expansion beneath the skin. It usually has a mist-like appearance with bigger stains overlapping the mist stains. If the gunshot is into an already open wound, the back spatter may produce an increase in back spatter. With a perforation gunshot, there could be back-and forward spatter present (James, Kish & Sutton, 2005:135), confirmed by Saferstein (2011:383) and Dutelle (2011:252). See the attached image on Figure 14 as per attached Annexure "A".

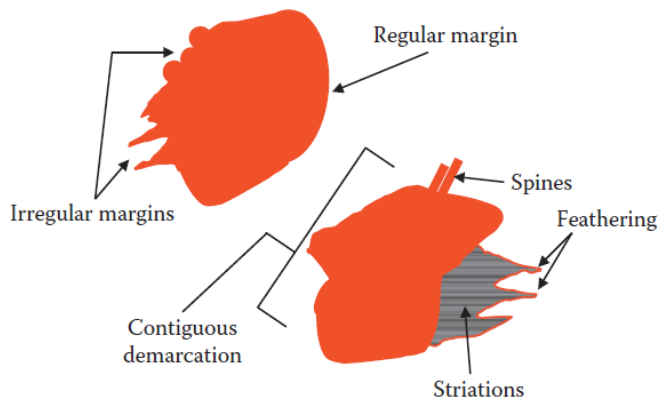
Saferstein (2011:383, 384) further added that with impact spatter we need also to take into consideration the velocity of the spatter. With low-velocity spatter, the patterns consist of large separate or compounded drops with diameters of 3 mm or more. This spatter is normally produced by minimal force; typically, the drops hit the surface at a speed of less than 5 feet per second. Medium-velocity spatter consists of small drops with diameters from 1 mm to 3 mm, and is associated with blunt-force trauma to an individual. These drops will hit the surface at 5 to 25 feet per second. High-velocity spatter is very fine drops with a diameter of less than

1 mm. With high-velocity spatter, the drops travel and hit the surface at a speed of 100 feet per second, associated with gunshot exit wounds and explosions. Due to the drops being so small, these drops may not travel that far, and this may be overlooked by the investigative personnel (Saferstein, 2011:383, 384). See the attached image on Figure 15, 16 and 17 as per attached Annexure “A”.

3.5.3 Non-spatter stains - irregular margin non-spatter

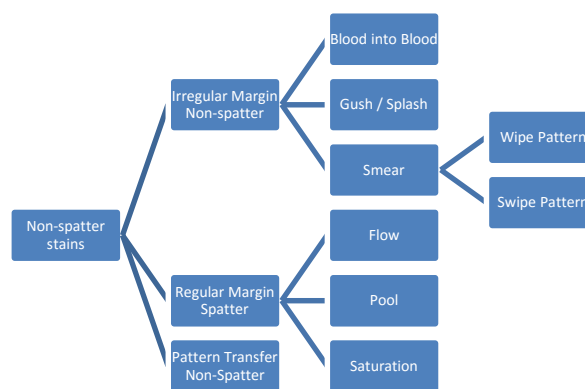
The non-spatter stain is composed of patterns in which the primary stain is not a circular- or elliptical-shaped stain. This does not mean that a non-spatter pattern will not have any circular- or elliptical shaped stains associated with them. The primary stain will not be spatter (Bevel & Gardner, 2009:120). The irregular margin group includes blood into blood, gushes, smears, swipes, and wipes.

Figure 3.3: Non-spatter stains



(Source: Reproduced with permission of Ross Gardner, 2015 as per attached Annexure “G”)

Figure 3.4: Breakdown of non-spatter stains



(Source: Reproduced with permission of Ross Gardner, 2015 as per attached Annexure “G”)

●Blood into blood

This pattern usually occurs when a blood source, typically a bleeding person, remains in one place long enough for dripping to occur. The pattern has two distinct features: random satellite spatter surrounding the pool, and the inverted fan shape evident on adjacent vertical surfaces, if present (Bevel & Gardner, 2002:251). Blood into blood also results in volume accumulation, but one produced through time. The primary stain will be volume accumulation having pool like characteristics but with secondary spatter as satellite spatter surrounding the primary stain (Bevel & Gardner, 2008:132). This is when blood drips into blood. Drip patterns generally display satellite staining that result from the deposition of small droplets that are ejected from the blood pool upon it being struck by a falling droplet (Dutelle, 2011:246). See the attached image on Figure 18 as per attached Annexure "A".

●Gush/spurts

Gushes and spurts are two distinct pattern types. They most often occur because of a breach of an artery. As such, when one refers to a spurt or gush it is invariably described as arterial (Bevel & Gardner, 2008:19). Furthermore, the presence of the distinct bright red colour of oxygenated arterial blood may also be apparent, in many instances, spines, pressure fluctuations, or pulsation features of the patterns. The stains may exhibit elongated spines and satellite spatter around the central area of the stain. The shape of the stain may vary considerable, sizing from 1 mm to 1 cm and more in diameter. If the stain is on a wall, a downward flow pattern may be present as well (James, Kish & Sutton, 2005:151). See the attached image on Figure 19 as per attached Annexure "A".

●Smear

Smears are a broad classification of pattern types produced by contact. Smears include as sub-categories the more defined classifications of wipe and swipe. In most instances, the analyst can distinguish a wipe from a swipe mark, but in some situations where this is not possible to determine, it is classified as a smear (Bevel & Gardner, 2008:33). See the attached image on Figure 20 as per attached Annexure "A".

●Wipe pattern

Any stain or pattern created when an object moves through a pre-existing bloodstain on another surface. This is when the blood was already present and an object moves through the

present blood. An outline is sometimes visible as the blood started drying already (Bevel & Gardner, 2008:35). See the attached image on Figure 21 as per attached Annexure "A".

●**Swipe pattern**

Bevel and Gardner (2008:35) states the swipe-pattern is any stain or pattern created by the transfer of blood from a bloodied object to another by some form of lateral motion, for example, bloodied hair coming into contact with another surface. See the attached image on Figure 22 as per attached Annexure "A".

3.5.4 Non-spatter stains - regular margin spatter

Furthermore, Bevel and Gardner (2009:120) states that the regular margins are groups that include pattern transfers, flows, saturations, and pools. Their margins are not erratic, but smoother in appearance. Below is a discussion on non-spatter stains with regular margins including references to illustrations.

●**Flow**

Flows are made by drops of large amounts of blood flowing by the pull of gravity. Flows may be formed by single drops or large volumes of blood coming from an actively bleeding wound or blood deposited on a surface from an arterial spurt. The flow direction may also show movements of objects or bodies while the flow was still in progress or after the blood has dried (Saferstein, 2011:394). Flow patterns are a change in the shape and direction of a bloodstain because of the influence of gravity or movement of the surface and are generally observed in circumstances where a volume of liquid blood moves freely along a downward path (Dutelle, 2011:247). See the attached image on Figure 23 as per attached Annexure "A".

●**Pool**

A pool of blood occurs when blood collects in a level (not sloped) and undisturbed place. Considering the drying time in the environment where the pooling takes place, the edges of the blood will start forming a phenomenon called skeletonising. This usually occurs within 50 seconds after depositing of drops and longer in large volumes of blood. If the centre of the volume of blood is disturbed by a wipe, the outer ring of the blood drop or volume will be seen, as the outer edge has formed a skeleton (Saferstein, 2011:395). With pooling, this pattern allows crime scene investigators to gauge how much blood was lost by the victim, whether or not there was any movement of the victim from the area where the pooling occurred, and the

period due to clotting and drying of blood within the pool (Saferstein, 2011:395). See the attached image on Figure 24 as per attached Annexure "A".

●**Saturation**

A saturation stain is an accumulation of a volume of blood without specific shape that has absorbed into the surface. When there has been extensive bleeding by a victim, large saturation bloodstains may occur on carpets and bedding, as well as the clothing of the victim, and can obliterate other stains of interest that occurred prior to the saturation (James, Kish & Sutton, 2005:87). See the attached image on Figure 25 as per attached Annexure "A".

●**Pattern transfer**

Saferstein (2011:393) mentions that when an object with blood on it encounters another object or surface, a transfer or contact pattern is created. Examples are fingerprints, handprints, footwear, tool imprints, etc. These objects encountered the blood and transferred to the other object or surface (Locard principle). The size and general shape of a tool can also be seen in a simple transfer. Other transfer patterns, also known as swipe patterns, may be caused by the movement of the bloody object across a surface. Usually the swipe pattern will lighten and feather as the pattern moves away from the initial contact point. This may also show the movement of the victim or suspect through the crime scene after the blood was deposited. The first transfer will be darker in colour and the further the victim or suspect moves away, the lighter the transfer will be (Saferstein, 2011:393). Close examination of transfer bloodstains may yield valuable information about the points of contact made between individuals and objects during the course of the crime. It may further also help to establish the movement of the individuals involved (Jackson & Jackson, 2011:150). See the attached image on Figure 26 and 27 as per attached Annexure "A".

3.5.5 Passive/gravity

Passive bloodstains are patterns whose physical features indicate they were created without any significant outside force other than gravity and friction. Spatter exhibits directionality, vary in size, and are associated with a source of blood being subjected to an external force(s), in addition to gravity and friction (James, Kish & Sutton, 2005:68, 69). See the attached image as per attached Figure 28 of Annexure "A".

3.5.6 Void patterns

A void is created when an object blocks the path of the deposition of blood spatter onto a target surface or object, where the blood is instead deposited on the person or object. The blank space on the target surface may give a clue as to the size and shape of the object or person. Once the object or person is found, the pattern should fit into the void. It can also assist in the position of the body at the time of the incident (Saferstein, 2011:391). See the attached image on Figure 29 as per attached Annexure "A".

3.5.7 Area of convergence

Impact spatter can help investigators with clues to determine the origin of the blood source and the position of the victim at the time of the impact. The area of convergence is the area on a two-dimensional plane from which the drops originated. This can be established by drawing straight lines through the long axis of several individual bloodstains following their tails. The intersection where all the lines cross is the area of convergence (Saferstein, 2013:234). Saferstein (2013:234) further states that an object hitting a source of blood numerous times will never produce exactly the same pattern each time. Therefore, one can determine the number of impacts by drawing the area of convergence for groups of stains from separate impacts. This will show the position of the victim or suspect in space when the stain-producing event took place. The distribution of the drops in an impact pattern gives a general idea of the distance from the blood source to the bloodstained surface (Saferstein, 2011:385).

Multiple points of convergence suggest multiple blows. This is also the mechanism for selecting the proper bloodstains from within a bloodstain impact spatter-pattern to use in determining the 3D area of impact (Shaler, 2012:389). There are various methods to determine the area of origin of the blood spatter patterns, the tangent method, the string method, and currently, the law enforcement agencies are using a computerised system called Hemospat (Shaler, 2012:389). See the attached image on Figure 30 as per attached Annexure "A".

3.5.8 Surface texture

Saferstein (2011:379) stated that surface texture is of paramount importance in the interpretation of bloodstain patterns arising from blood dripping off an object or person. Comparisons between standards and unknowns are valid only when identical surfaces are used. The harder and non-porous surfaces (such as glass and a smooth tile) result in less

spatter. Rough surfaces (such as carpets and wood) usually result in irregular shaped stains with serrated edges, with possible satellite spatter (Saferstein, 2011:379). In general, a hard, smooth, non-porous surface, such as glass, will create little if any spatter, however, in contrast, a rough surface texture such as untreated wood or concrete will create a significant amount of spatter (Dutelle, 2011:255). See the attached image on Figure 31 as per attached Annexure "A".

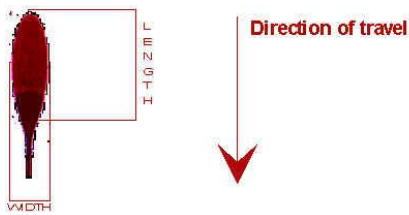
3.5.9 Direction and angle of impact

As a stain becomes more elliptical in shape, its direction of impact becomes more discernible because the pointed end of the bloodstain faces the direction of travel. It is possible to determine the impact angle of the blood on a flat surface by measuring the degree of the circular distortion of the stain. At 90°, the blood drop will be almost perfectly round, but as the angle deviates off 90°, it changes to a more elliptical or elongated shape, the tails will become longer and longer as the angle of impact becomes smaller (Saferstein, 2011:380). When a blood droplet hits a surface, it forms a right-angled triangle, whose angle A can be calculated using trigonometric functions. The systematic procedure for measuring a stain prior to making the calculations, as stated by Shaler (2012:388), is as follows:

- Approximate the outline of a stain as the oval. Do not include the stain's tail in the approximation.
- Measure the length (C) and the width (A) from the stain. Calculate the fraction by dividing the width by the length $\left(\frac{A}{C}\right)$.
- Calculate the impact angle by calculating the arcsine (\sin^{-1}) of the fraction $\left(\frac{A}{C}\right)$. A fraction of 0,5 represents a 30° angle.

Errors can occur with the incorrect measuring of the stain (Shaler, 2012:388).

Figure 3.5: Calculating direction and angle of impact



$$\sin \angle = \frac{\text{width}}{\text{length}}$$

$$\angle = \text{invsin} \left(\frac{\text{width}}{\text{length}} \right)$$

$$\text{e.g. } \angle = \text{invsin} \left(\frac{1,5}{3,0} \right)$$

$$\angle = \text{invsin}(0,5)$$

$$\angle = 30 \text{ degrees}$$

(Source: Shaler, 2012:388)

Therefore, the droplet originated from a source that was approximately 30 degrees out from the plane of the target surface.

3.7 DOCUMENTATION OF THE CRIME SCENE WHEN BLOOD PATTERN ANALYSIS IS USED

Blood spatter patterns of any kind can provide a great deal of information about the events that took place at a crime scene. In general, the photographer must ensure that an overall photograph is taken of the crime scene. From here the photographs taken must be taken of each drop and pattern individually, and as a group per pattern with close-up photographs and medium-ranged photographs with dimensions and rulers. A perimeter ruler should also be clearly visible on the overall photograph of the crime scene. These must be marked clearly. The photographs and sketches can also point out specific stains used in determining the direction of force, angle of impact, and area of origin (Saferstein, 2011:396, 400).

Therefore, all significant details of the crime scene must be recorded and documented, such as blood spatter and blood flow patterns. Blood should be sampled for testing in case the blood was cast off by the perpetrator. In firearm deaths, fired bullets or casings must be found

and their locations documented. In these deaths, before the body is moved or clothing is removed, blood spatter directionality and trace evidence (such as hairs) on the hands must be documented (Saferstein, 2013:123). Saferstein (2013) further reiterates which photographs must be taken before the crime scene is altered at all, unless for life-saving efforts. Photographs will play a very large role when reconstructing the events later. Photographs should be taken with a scale, always first overall, then at medium range, and then close up. The photographer must also be careful not to be caught up in capturing the injuries exclusively. Negative findings can also be significant. This means that photographs must also be taken of areas with no visible injuries on the body of the victim. Photos and sketches should be completed in such a manner as to allow a third party to utilise the documentation to place the bloodstain patterns and articles of evidence back in their original locations. This process is known to be reconstruction (Dutelle, 2011:255).

From the docket analysis and interviewing of participants of Sample "A", Sample "A" only used the photographer to document the crime scene. In the docket analysis, the investigation diary only mentions LCRC. In addition, the participants only stated LCRC. The participants do not mention any other experts in the documentation of the crime scene. The experts of Sample "B" mention that the documenting of the crime scene is of utmost importance, as it is impossible to take the crime scene to court. They use the photographs and sketches in court, so the court can visualise the area that was documented. These photos and sketches are used in court to reconstruct the crime scene for the court. If the documenting is not done properly, the court will not understand what transpired at the crime scene.

Once all obvious evidence is located and documented in this manner, it is collected, with additional close-up photography accomplished (all sides of the item, etc.), and then physical intrusive searches where items are moved and examined in detail occur. Throughout the process when new evidence is discovered (e.g. bullet hole under a chair) the CSI goes back to earlier stages to play catch up on this newly discovered evidence. Once all evidence has been recovered and documented through notes, photos, and sketches, detailed on-scene analysis (large-scale chemical enhancement for fingerprints or bloodstains, in-depth bloodstain pattern analysis or trajectory analysis, removal of bullets from surfaces) are accomplished and documented as well.

3.8 THE USE OF BLOOD PATTERN ANALYSIS IN RECONSTRUCTING A CRIME SCENE

The physical evidence left behind at a crime scene plays a crucial role in the reconstructing of the events that took place surrounding the crime scene. Although evidence alone does not describe everything that happened, it can support or contradict accounts given by witnesses and or suspects (Inman, 2001:61). Bevel and Gardner (2009:99) state that documenting the scene involves the creation of photographs, video recordings, and sketches that show the full and complete context of the scene as found by the investigating officer. Furthermore, the various aspects of documentation have an order and a sequence. In order for crime scene reconstruction with the use of BPA to be done, the bloodstain pattern analyst will determine the age of the bloodstain, clots, and patterns. Such recreation and replication will be necessary in order for associated analytical findings to be admissible in court (Dutelle, 2011:255).

According to Saferstein (2011:375, 376, 377), using the physical evidence available to the investigator's naked eye, he or she can hypothesise about what occurred, where it occurred, and when it occurred. By carefully collecting physical evidence and thoroughly documenting the crime scene, the investigator can start to unravel the sequence of events that took place during the commission of the crime. The investigator will bring in special skilled persons to assist in reconstructing the crime scene, for example the BPA expert, because blood patterns are objective evidence that cannot be altered (Saferstein, 2011:375, 376, 377). Violent crime scenes can carry with it a large amount of blood and disorder. Blood might be found at different locations throughout the scene. This could prove to be important in shaping the events that led to the outcome; it may be possible to determine the initial location of the injury, as well as victim and perpetrator movements throughout the course of events (Saferstein, 2013:123). Sample "A" answered the question "What is the use of blood pattern analysis in the reconstruction of crime scene?" as follows:

- Two said the investigating officer must know the importance.
- One said they collect evidence from the scene of crime that may be left on the scene; the investigating officer is not an expert. Experts reveal more on the scene of crime. It makes your case to be strong; they get more information on the case.
- Two stated to find who the suspect is and link the suspect to the deceased.
- Three said for the purpose of individualisation.
- One stated to make sure to collect every blood pattern at the crime scene.
- One said to prove beyond reasonable doubt in the successful prosecution of the

suspect.

- One said it is very important. You can identify who committed that particular crime with the use of DNA.
- One stated it is important to identify, to see what had happened standing or seated, or if there was a struggle
- One said the crime scene is cleaned when they are there, they can see the blood patterns.
- One said to not tamper with the scene or evidence.
- One stated to confirm a suspect's version. To gain more information on a possible suspect for example, left hand, height, and others.
- One said necessary for someone who is injured to assist by adding blood.
- Four did not know.
- One said to compile a full investigation.
- Seven did not answer at all.
- One stated to determine the position of body, to determine suspects version of events, how the events unfolded during crime.
- One said the position of the offender can be determined, it also reveal if there was a struggle between the victim and offender, and victim position, see if the victim died on the spot or were moved.
- One said it is important; it is used successfully where the offenders are punished.

Sample "B" answered the question posed to them as follows:

- One stated that blood patterns tell us what bloodletting actions are occurring and where those events took place, which is an integral part of CSA.
- One stated that the position (standing, kneeling, and laying down) of the victim or suspect may be determined by studying the bloodstains on a crime scene.
- One stated that depending on the crime scene, a lot of bloodshed, smudges, wipes, swipes, could show the fighting between the victim and the suspect. It will tell the truth of what had transpired at the crime scene.

The participants of Sample "A" had so many answers; some of which are true, but other participants of Sample "A" had some idea, but not all the facts as stated by literature, of what the importance of BPA is in the reconstruction of crime scenes, whereas, the experts had the right answers. If Sample "A" would, use BPA more in their investigation of crimes, a lot more evidence will be available to be used in a court of law for a decent conviction of the suspect

and the removal of such suspect from our society. The reconstruction of a crime scene varies from one expert to the next. The investigating officer must understand that the reconstruction of a crime scene is not only the witness, suspect, or any other expert's version of what has transpired at the crime scene, but a collective force between all participants and persons in attendance at the crime scene. Saferstein (2011) emphasised clearly that blood patterns is objective evidence, and can give the investigator an idea of what had transpired during the incident and bloodletting.

3.9 SUMMARY

With BPA done correctly at all bloody crime scenes, the detective will have good case, and will have a sense of knowing what the movements were of the victim and or perpetrator at the bloody crime scenes. Even though the right surface texture is needed to be able to do blood pattern analysis at a crime scene, the BPA expert does not necessarily need to be on the crime scene immediately whilst the victim is present, but it can be done in cold cases as well. The wealth of information we can receive will only assist the detective in the prosecution of the perpetrator. The detective only needs to ensure that the BPA expert is called out to the scene; they need the BPA to be done. The detective does not necessarily need to be an expert in the field of BPA, but needs to know that blood is not only DNA, but also tell a story of what transpired at the crime scene, as mentioned by Saferstein (2013).

The SAPS currently only has two BPA experts who can testify in a court of law, as with the case of Oscar Pistorius. There are a handful of BPA level 1 police members trained, most of which work for the LCRC as photographers. The only problem is that they need to have a 'peer' to confirm their findings at a crime scene before they can testify in court. As stated by one of the experts from Sample "B", "This analysis provides an objective picture, although incomplete, that can be used to consider the more subjective information that develops during any criminal investigation. It specifically helps in determining if any claims by involved parties (suspects, victims, and witnesses) can be refuted or corroborated, and it provides an objective way to consider all investigative theories developed regarding the case. This includes theories developed by counsel (both prosecution and defence)".

CHAPTER FOUR

FINDINGS AND RECOMMENDATIONS

4.1 INTRODUCTION

The success or failure of any criminal investigation often depends on the recognition of physical evidence left at a crime scene, and the proper analysis of that evidence. Crime scenes that involve bloodshed often contain a wealth of information in the form of blood patterns, the location, and its cause (Saferstein, 2013). Therefore, forensic analysts are needed to analyse the crime scene. Not every detective at station-level understands the value of BPA, and there are only a few of these blood pattern analysts throughout South Africa.

The following research questions were researched:

- What are the objectives of criminal investigation?
- How could Blood Pattern Analysis be used in the reconstruction of a crime scene?

The researcher's intention behind this research paper was to be able to empower the investigators at station-level to understand the importance of BPA. These investigators should not necessarily know what the different types of blood patterns are, but they should be able to identify the important evidential aspect of it at their crime scenes, and also how reconstruction could assist them during the investigation process of the crime scenes. The findings and recommendations of this research paper aims at empowering investigators in their investigation process at crime scenes.

4.2 FINDINGS

Based on the literature used, the interviews of both the participants of Sample "A" and Sample "B", and the docket analysis, the researcher has made the following findings during the tour of this research.

4.2.1 Findings related to research question 1

4.2.1.1 Criminal Investigation

From the literature (Gilbert, 2010:37, 38) it was found that, criminal investigation is a logical, objective, legal inquiry involving a possible criminal activity. It also encompasses the whole

process, from the reporting of the crime, investigating the crime scene and suspects, through to the suspect being in court, and lastly, convincing the court of the guilt of the perpetrator. From the interviews, the data indicates that most of the participants of Sample “A” understood some aspect of this, and Sample “B” mentioned that it is a search for the truth, eventually.

4.2.1.2 Objectives of Criminal Investigation

Literature (Stelfox, 2009:2) stated that during the 1300s, the sole objective during that period was to bring offenders to justice and the investigative practice was shaped solely by the need to identify suspects and gather evidence to support prosecutions. Also taking into account that during the 1300s all criminals were charged against the moral values and norms (allowable behaviour as decided by the society) of the society in which they found themselves during that period.

Today the objectives of criminal investigation are the identification of crime, gathering of evidence, individualisation of the crime, arrest of the suspect, recovery of stolen property, and the involvement of the prosecution process, as stated clearly by Du Preez et al. (1996:4). When the question “Name the objectives of criminal investigation”, was posed to the participants of both Samples “A” and “B”, various answers were given, although some of the participants did not answer at all, as they said they do not know. The main answer to the question “Name the objectives of criminal investigation” was that it is a type of instrument used. The time, how many people involved and witnesses to the murder, gathering evidence, tracing suspects, seeing cases through to court, thus showing that the participants again had some aspect correct as stated by literature. Interestingly, only Stelfox (2009) mentions victim care, which forms a huge part of any investigator’s tour of duty in the SAPS. The SAPS now expects the investigator to ensure that victim care is provided by investigators during their investigation process.

4.2.1.3 Forensic Science

Saferstein (2011:4) emphasised it clearly; forensic science is an umbrella term that encompasses a myriad of professions in the forensic field, whether it is biology, entomology, ballistics, geology, etc. These professions use their skills and knowledge to help law enforcement officials to conduct their investigations. Even though the investigators of Sample “A” mentioned they do use forensic science, which they do, they mostly use it for DNA analysis and ballistics. The investigators do not use the full array of forensic scientist to their fullest within the SAPS.

Sample “B” mentioned during their interviews, forensic science consist of different fields of trained experts in those specific forensic science fields. Saferstein (2011:4) stated further that forensic science applies the knowledge and technology of science to the definition and enforcement of such laws. The forensic scientist can assist any investigator in their daily investigation of criminal cases.

4.2.1.4 The Role of Forensic Science Laboratory in Criminal Investigation

Jackson and Jackson (2008:1, 2) stated that forensic science plays a pivotal role in most criminal prosecutions, especially those of a more serious nature. As seen with the Oscar Pistorius case, the forensic science units, such as ballistics and the biology unit, and blood pattern experts had the opportunity to testify in this case, where their forensic evidence was of utmost importance during the trial. The involvement of forensic science starts at the crime scene, the collection, and analysis of evidence, and the experts writing their reports on their findings during their investigation using forensic science.

Forensic science is a scientific study of an object to determine the evidential value of the object or phenomena involved in a crime. Forensic science can link the suspect to the crime and/or prove the suspect’s version wrong. Orthman and Hess (2013) stipulated the steps that should be followed by the forensic scientist during the investigation of a crime scene, and thereafter. Participants of Sample “A” mainly focussed their answers on DNA, ballistics, and LCRC experts, as these are the three forensic science fields they mostly use.

4.3 Findings related to research question 2

Based on the literature used, the interviews of both the participants of Sample “A” and Sample “B”, and the docket analysis, the researcher has made the following findings during this research for research question 2.

4.3.1 FINDINGS

4.3.1.1 Crime Scene Reconstruction

The researcher found that the reconstruction of crime scenes is a scientific analysis of the crime scene or event and logically links a detailed series of events of scientific explanations in order to provide an understanding of the sequence of events. Reconstruction has a major purpose for the collection of physical evidence (Saferstein, 2011:377). The reconstruction not

only focuses on the incident itself, but also on the events preceding the event leading up to the main event or incident.

The reconstruction of the crime scene will support the likely sequence of events at the crime scene. Furthermore, crime scene reconstruction also relies on combined efforts from medical examiners, criminalists, and investigators to recover the physical evidence and ensuring that the events surrounding the crime are finalised (Saferstein, 2011:378). Even though Sample "A" had various answers relating to crime scene reconstruction, they did not mention all the facts surrounding crime scene reconstruction, whereas Sample "B" had similar answers as stated by literature. Saferstein (2013) puts it clearly, that crime scene personnel should use the processes of deductive reasoning, inductive reasoning, and falsifiability to create a logical reconstruction of crime scene events, and that investigators should approach each case free of previous theories and expectations.

4.3.1.2 The Purpose of Crime Scene Reconstruction

The purpose of reconstructing a crime scene by using blood pattern analysis is very important as it will corroborate or refute an account of events given by the eyewitness or the suspect of the incident that occurred (Jackson & Jackson, 2011:6). Especially in violent crime scenes, the interpretation of bloodstain patterns left at the scene may provide vital information of what actually happened during and after the incident. BPA can reveal information of the location and movements of both the victim and perpetrator, as well as whether the incident was staged or not (Fisher, Tilstone & Woytowicz, 2009:308).

Various answers were given by Sample "A" of which seven participants stated that the purpose of crime reconstruction is to prove the facts on how the crime occurred. The rest of the Sample "A" participants vaguely touched on the purpose of crime scene reconstruction. Sample "B" confirmed exactly what was stated by literature, as dealt with in the previous chapters. Unfortunately, with the docket analysis, the only experts that they did use during the crime scene investigation to do reconstructions, was a member from LCRC to take photographs. In not one of the case dockets analysed did the investigators use proper experts for reconstructing a crime scene.

4.3.1.3 The Use of Blood Pattern Analysis in the Reconstruction of Crime Scenes

The researcher found that physical evidence left behind at a crime scene and taken away by the suspect, plays a crucial role in reconstructing the events that occurred during the incident. Like any forensic science or discipline, BPA seeks to define the facts surrounding some

incident that is in question (Bevel & Gardner, 2002:2). Even though the evidence does not describe exactly what transpired during the event, it can support or contradict accounts given by the suspect or witnesses. With BPA, the BPA analyst will determine the age of the bloodstains, clots, and the various patterns at the crime scene (Dutelle, 2011:255).

Recreation and replication of the blood patterns will be necessary in order for associated analytical findings to be admissible in court. As Saferstein (2011) clearly emphasised, blood patterns are objective evidence that cannot be altered. Violent crime scenes may have large volumes of blood and disorder that might be found in different locations throughout the crime scene. The use of blood pattern analysis in reconstructing the crime scene could prove to be important, as it will give guidelines as to what transpired during the incident, locate the initial location of the injury and the movements of the victim, as well as the perpetrator during the course of the incident.

4.4 RECOMMENDATIONS

4.4.1 The recommendations derived from research question 1

4.4.1.1 Criminal Investigation

Based on the findings for research question 1, the investigating officers, should receive a more in depth course on criminal investigation. This must include regular workshops and lectures. This will enable them to understand what criminal investigation entails. The younger criminal investigators must work alongside more seasoned and more experienced investigators, as it will assist in increasing the level of learning and expertise.

4.4.1.2 Objectives of Criminal Investigation

It is recommended that the investigators be taught the objectives of criminal investigation, as this is their daily core function in the SAPS. Not only ensuring that the suspects are apprehended and taken to appear before a court, but rather to ensure that the objectives of criminal investigation are met, on every case they receive to investigate. The investigators must rather ensure that when the crime office attends to a violent crime scene, they go back to the crime scene and ensure that all the necessary facts, evidence, recovery of stolen property, and victim care is of utmost importance during the investigation process.

Once the objectives of criminal investigation are obtained, the success of the criminal investigation will be met. The researcher recommends that the investigators must receive

specific training for the various crimes, whether it is murder, theft by shoplifting, or white-collar crimes. They must receive specialised training for each specific crime. In addition, the researcher recommends that these investigators must not be moved around within the unit, but rather kept focused on their specialised investigation fields in which they will be trained.

4.4.1.3 Forensic Science

The participants of Sample "A" should receive a more in depth study into the forensic fields, not so much as to become an expert, but rather to know when to call out these experts.

4.4.1.4 The Role of the Forensic Science Laboratory in Criminal Investigation

The investigating officers should have yearly workshops, lectures, and training sessions to keep them up to date with the latest technology and forensic science available to them, for investigating crimes and for the use at crime scenes.

4.4.2 The recommendations derived from research question 2

4.4.2.1 Crime Scene Reconstruction

The researcher recommends, considering the findings, that the investigators must understand that crime scene reconstruction can assist them during the course of the crime scene investigation. The investigators should use all avenues available to them to understand what occurred at the crime scene. This will assist them, as they will know what the possible sequence of events was. The investigating officers should again do shadow-work with more experienced investigators, as well as have regular workshops, lectures, and information sessions on these reconstruction methods available to them.

4.4.2.2 The purpose of Crime Scene Reconstruction

As recommended above, the investigators should focus on specific crimes and receive training on how to investigate these specific crimes. The investigating officers should then be able to understand what the purpose is of crime scene reconstruction. The investigating officers should only focus on those crimes they were trained for, and not receive other case dockets, for different crime-types, to investigate. With this said, the researcher feels that by having the investigating officers trained in the specific field of crime investigation, the court conviction rate should rise significantly on positive criminal judgements. This will also assist the public, by bringing back their faith in our SAPS and the criminal justice system.

4.4.2.3 The Use of Blood Pattern Analysis in the Reconstruction of a Crime Scene

The researcher recommends that more members be trained specifically in BPA. Not only up to Level 1, but to Level 2 as well. These members could be members working for LCRC, but preferably, it would be best if each cluster have designated BPA experts working alongside members from LCRC. This will assist the investigating officers tremendously with their investigation of violent crimes where blood was shed.

Furthermore, the researcher recommends that a specific National Instruction should be added to the Crime Scene Policy, which will entail the full description on how to use, when to use, and for which cases to use BPA experts. The investigators should also be given a more in depth lecture on the use of blood pattern analysis to reconstruct crime scenes. Once the investigators understand what evidential evidence this is, the more they will use these experts. This also includes our Criminal Justice system employees, the prosecutors, as they also do not know how BPA can assist them during a trial of a violent crime that was committed.

4.5 SUMMARY

The research on the use of BPA to reconstruct a crime scene was chosen to determine the valuable information to be obtained by using this as an investigation tool. This tool would assist any investigating officer with a violent bloody crime scene. The SAPS will also benefit with this tool, as this will ensure that the general community in South Africa will regain trust in the SAPS, as well as in the Criminal Justice System of South Africa.

It will help the investigating officer to ensure that all avenues of crime scene reconstruction is used to the fullest and all evidence are collected and presented before a court of law. By having more members trained in this field of BPA and having more members in the clusters designated to do BPA will greatly assist the general LCRC members. Ensuring that crime scene reconstruction with the use of BPA is done at each violent bloody crime scene will benefit the investigating officers in the investigation of these cases.

The investigating officer will understand clearly, what criminal investigation and the objectives of criminal investigation are, as this research has clearly defined each of these aspects. The investigating officers will also understand and use the experts available to them through the forensic science laboratory in their daily investigation of crimes.

Even though lectures, workshops and yearly refresher workshops and courses are recommended, capacitating the detective branches and having the investigators trained in the investigation of specific crimes will benefit the SAPS, even though it might come at some cost to the state. If each SAPS cluster could have designated experts or crime scene investigation-experts in their designated clusters, more crime scenes will be investigated properly and all evidence will be collected, retrieved, and used to reconstruct the crime scenes, thus, ensuring a better conviction rate in the courts of law in South Africa. This will not only benefit the SAPS and Justice, but the general community of South Africa.

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ANNEXURE A

IMAGES OF BLOOD PATTERNS AND STAINS

(All images of Annexure A Reproduced with permission of Ross Gardner, 2015 of Annexure "G")

Figure 6. Arterial spurts



Figure 7. Cast-off patterns

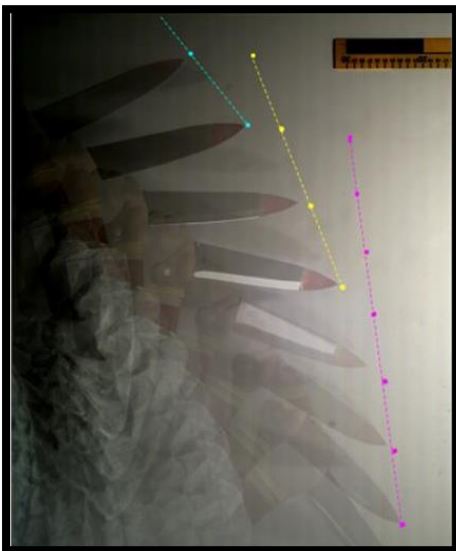


Figure 8. Cast-off patterns

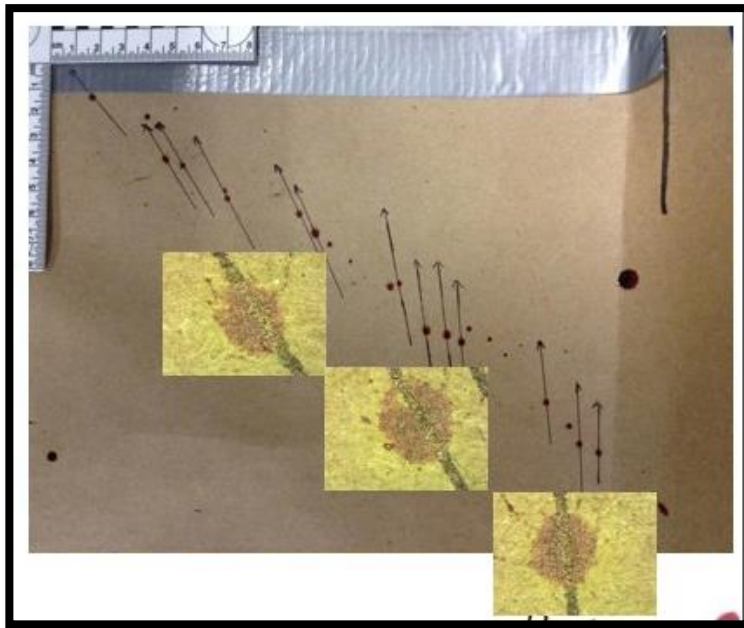


Figure 9. Cast-off patterns

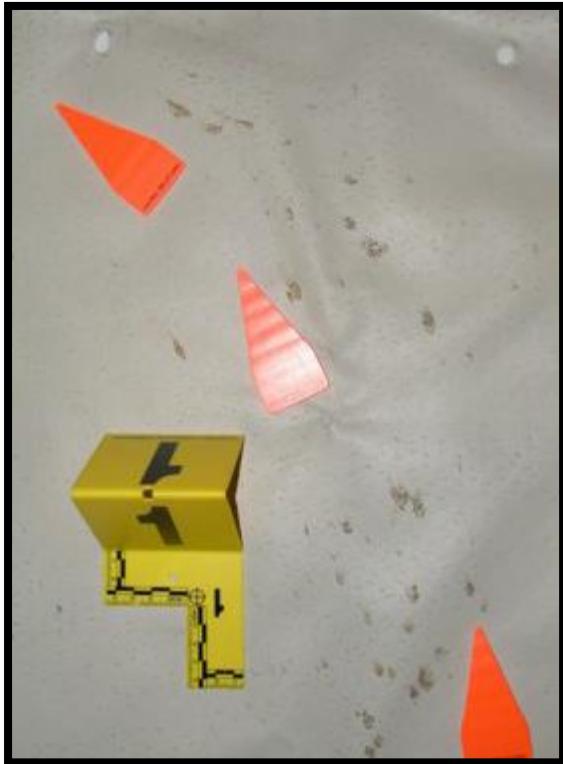


Figure 10. Drip trails



Figure 11. Drip

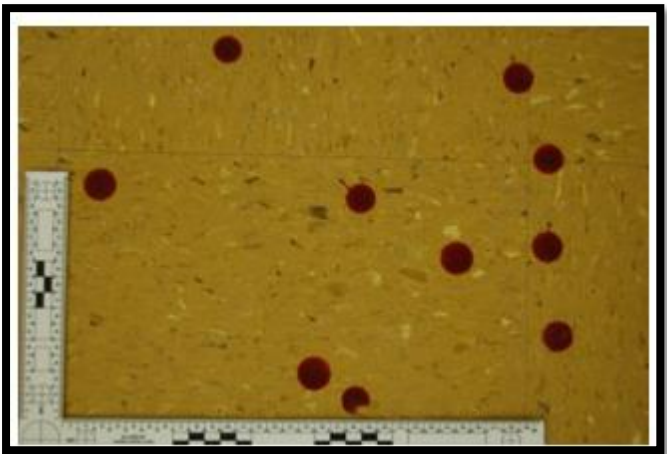


Figure 12. Expectorate spatter

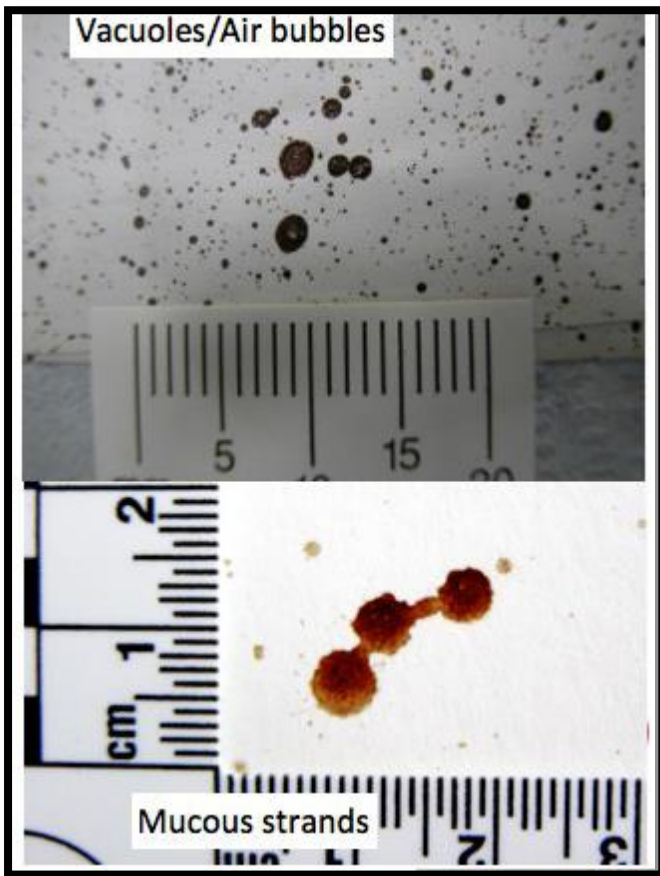


Figure 13. Forward spatter



Figure 14. Back spatter



Figure 15. Low velocity blood spatter, example a nosebleed where the blood is subjected to minimal force



Figure 16. Medium velocity impact spatter

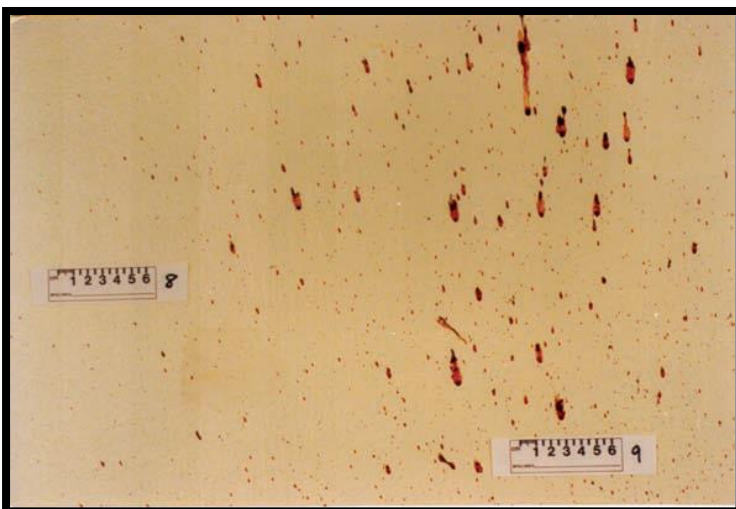


Figure 17. High velocity impact spatter



Figure 18. Blood into blood



Figure 19. Gush (left) and spurt (right)

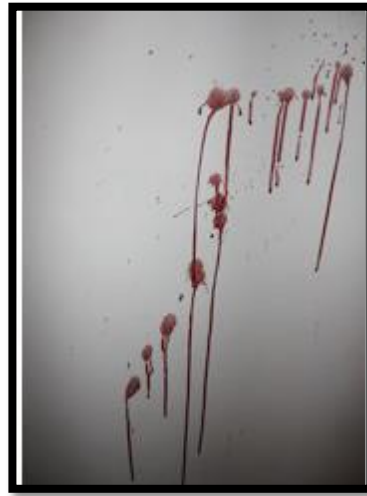
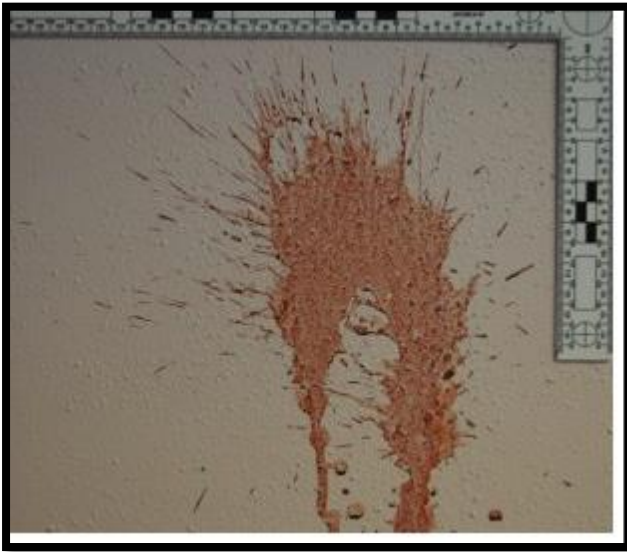


Figure 20. Smear



Figure 21. Wipe-pattern



Figure 22. Swipe-pattern

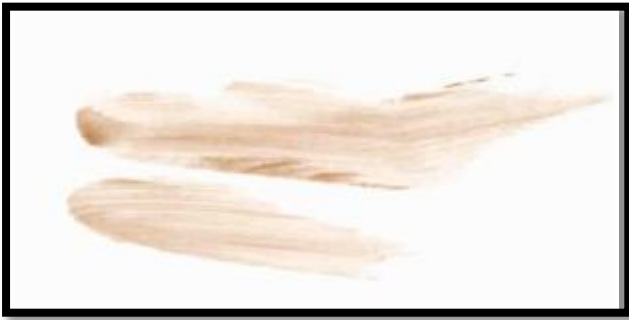


Figure 23. Blood flow



Figure 24. Blood pool



Figure 25. Saturation



Figure 26. Pattern transfer



Figure 27. Pattern transfer



Figure 28. Passive bloodstain



Figure 29. Void patterns

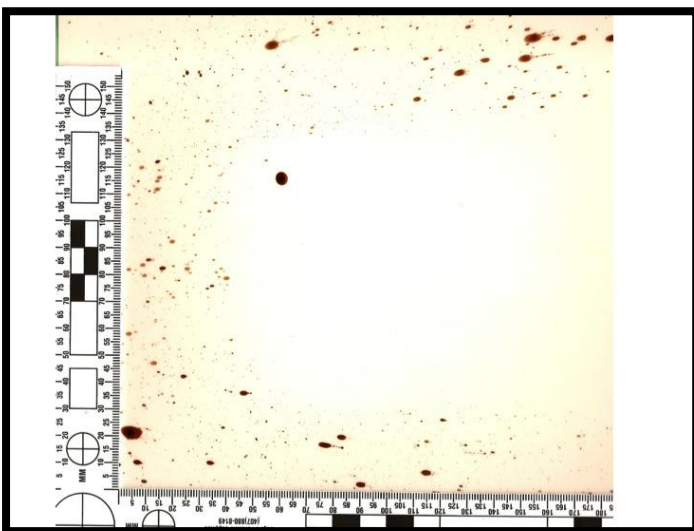


Figure 30. Area of convergence

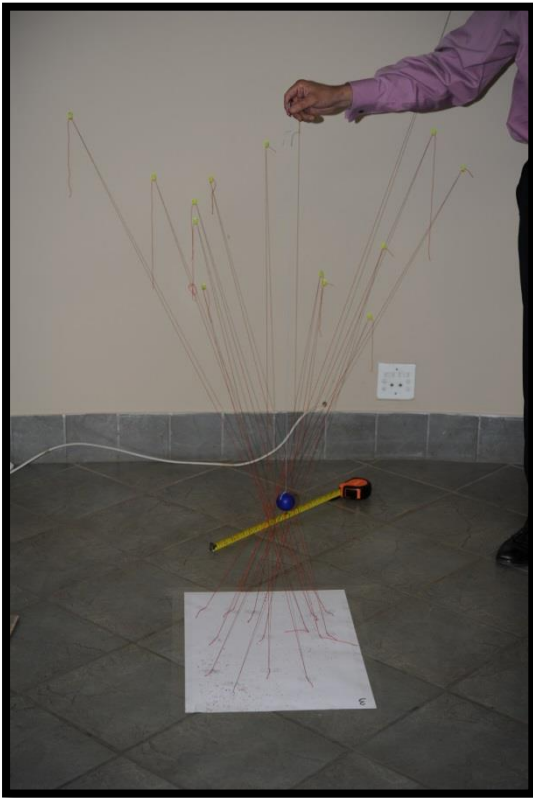
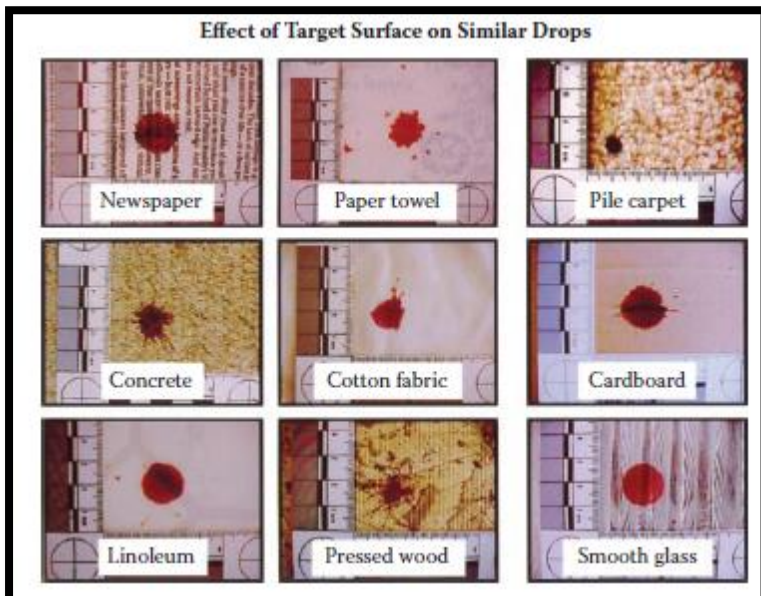


Figure 31. Surface texture



ANNEXURE B

INTERVIEW SCHEDULE: POLICE INVESTIGATORS (SAMPLE "A")

Participant number: _____

TOPIC: The use of Blood Pattern Analysis (BPA) to reconstruct a crime scene

AIM: To determine the importance of BPA in the reconstruction of crime scenes

RESEARCH QUESTIONS:

- What are the objectives of an investigation?
- What is the importance of Blood Pattern Analysis in the Reconstruction of a crime scene?

You are kindly requested to answer the following questions in this interview schedule, for research purposes. The questions, responses, and the results will be revealed.

The researcher is bound by her assurances and guarantees to the ethics code for research of the University of South Africa (UNISA). The researcher will also ensure that no harm will come to the participant, and that the participant will be informed of the date of the interview, and will ensure the participants' privacy. The researcher further aims to establish and maintain a good rapport with the participant, and ensures to acknowledge the contributions of the participants through appropriate referencing. This information will only be used once the participant has given written consent to partake in this research. Furthermore, the participant will receive a copy of the written consent given by the South African Police Service (SAPS) National Office to conduct the research. The information you provide will be used in a research project for a Master of Technology degree registered with the Programme Group: Police Practice at the UNISA. The analysed and processed data will be published in a research report.

Your answers will be noted by the interviewer, on paper and by use of a Dictaphone. Should any question be unclear, please ask the researcher for clarification. Only one answer per question is required. When answering the questions, it is very important to give your own opinion.

Written permission has been obtained in advance from the SAPS for this interview to be conducted.

PARTICIPANT

I hereby give permission to be interviewed and that any information supplied by me can be used in this research:

YES / NO

SIGNATURE OF PARTICIPANT (optional) _____

DATE _____

SECTION A: HISTORICAL INFORMATION

A.1) Are you an investigator?

YES	NO
-----	----

A.2) How long have you been an investigator?

1 – 5 years	5 – 10 years	10+ years
-------------	--------------	-----------

A.3) Are you currently investigating violent crimes where blood was shed?

YES	NO
-----	----

A.4) For how many years have you been investigating violent crimes where blood was shed? _____

A.5) Did you undergo basic detective training?

YES	NO
-----	----

A.6) Did you receive specific training to investigate violent crimes where blood was shed?

YES	NO
-----	----

SECTION B: WHAT ARE THE OBJECTIVES OF AN INVESTIGATION?

- B.1) What is criminal investigation?
- B.2) Name the objectives of criminal investigation?
- B.3) What is your understanding of Forensic Science (FS)?
- B.4) What is the role of the Forensic Science Laboratory (FSL) in criminal investigation?
- B.5) Define a crime scene.
- B.6) What is your understanding of the Locard principle?
- B.7) What does the National Instruction (NI) policy document 2/2005 state regarding calling out an expert to your crime scenes?

SECTION C: WHAT IS THE IMPORTANCE OF BLOOD PATTERN ANALYSIS IN THE RECONSTRUCTION OF A CRIME SCENE?

- C.1) What is your understanding of the crime scene reconstruction?
- C.2) What is the purpose for Crime Scene Reconstruction?
- C.3) What is the use of blood pattern analysis in crime scene reconstruction?

ANNEXURE C

INTERVIEW SCHEDULE: FORENSIC BPA ANALYSTS (SAMPLE "B")

Participant number: _____

TOPIC: The use of Blood Pattern Analysis (BPA) to reconstruct a crime scene

AIM: To determine the importance of BPA in the reconstruction of crime scenes

RESEARCH QUESTIONS:

- What are the objectives of Investigation?
- What is the importance of Blood Pattern Analysis in the Reconstruction of a crime scene?

You are kindly requested to answer the following questions in this interview schedule, for research purposes. The questions, responses, and the results will be revealed.

The researcher is bound by her assurances and guarantees to the ethics code for research of the University of South Africa (UNISA). The researcher will also ensure that no harm will come to the participant, and that the participant will be informed of the date of the interview, and will ensure the participants' privacy. The researcher further aims to establish and maintain a good rapport with the participant, and ensures to acknowledge the contributions of the participants through appropriate referencing. This information will only be used once the participant has given written consent to partake in this research. Furthermore, the participant will receive a copy of the written consent given by the South African Police Service (SAPS) National Office to conduct the research. The information you provide will be used in a research project for a Master of Technology degree registered with the Programme Group: Police Practice at the UNISA. The analysed and processed data will be published in a research report.

Your answers will be noted by the interviewer, on paper and by use of a Dictaphone. Should any question be unclear, please ask the researcher for clarification. Only one answer per question is required. When answering the questions, it is very important to give your own opinion.

Written permission has been obtained in advance from the SAPS for this interview to be conducted.

PARTICIPANT

I hereby give permission to be interviewed and that any information supplied by me can be used in this research:

YES / NO

SIGNATURE OF PARTICIPANT (optional) _____

DATE _____

SECTION A: HISTORICAL INFORMATION

A.1) Are you a blood pattern analyst Expert?

YES	NO
-----	----

A.2) How long have you been a blood pattern analyst expert?

1 – 5 years	5 – 10 years	10+ years
-------------	--------------	-----------

A.3) Do you currently analyse all violent crimes where blood was shed?

YES	NO
-----	----

A.4) For how many years are you now analysing violent crimes where blood was shed?

A.5) Did you receive specific training in:

The reconstruction of violent crimes scenes where blood was shed?

YES	NO
-----	----

Crime scene management?

YES	NO
-----	----

Blood pattern analysis?

YES	NO
-----	----

SECTION B: WHAT ARE THE OBJECTIVES OF AN INVESTIGATION?

- B.1) What is criminal investigation?
- B.2) Name the objectives of criminal investigation?
- B.3) What is your understanding of Forensic Science (FS)?
- B.4) Define a crime scene.
- B.5) What does the National Instruction (NI) policy document 2/2005 state regarding calling out an expert to your crime scenes?

SECTION C: THE IMPORTANCE OF BPA IN THE CSR

- C.1) What is your understanding of the Crime scene reconstruction?
- C.2) What is the purpose for Crime scene reconstruction?
- C.3) Give your understanding of Blood Pattern Analysis.
- C.4) What is the use of Blood pattern analysis in Crime scene reconstruction?

ANNEXURE D



COLLEGE OF LAW RESEARCH ETHICS SUB-COMMITTEE

28 March 2014

Dear Ms A B Wiid

REQUEST FOR ETHICAL CLEARANCE: THE USE OF BLOOD PATTERN ANALYSIS TO RECONSTRUCT A CRIME SCENE

The application for ethical clearance for the above research project has been approved.

The ethical clearance is granted for the duration of this project. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated to the College of Law Ethical Review Committee. An amended application could be requested if applicable.

It is your responsibility to ensure that the research project adheres to the values and principles expressed in the UNISA Research Ethics Policy, which can be found at the following website:
http://www.unisa.ac.za/cmsys/staff/contents/departments/res_policies/docs/Policy_Research%20Ethics_rev%20app%20Council_22.06.2012.pdf

Yours faithfully

A handwritten signature in black ink, appearing to read "M Schoeman", with a long, sweeping flourish extending to the right.

Prof Marelize Schoeman
Chairperson
Ethics Review Committee
College of Law

A handwritten signature in black ink, appearing to read "S Songca", with a stylized, looped flourish.

Prof S Songca
Executive Dean
College of Law



University of South Africa
Pretter Street, Muckleneuk Ridge, City of Tshwane
PO Box 392, Unisa, 0003, South Africa
www.unisa.ac.za/law

ANNEXURE E

G.P.-S. 002-0222

SAP 21

SUID-AFRIKAANSE POLISIEDIENS



SOUTH AFRICAN POLICE SERVICE

Privaatsak/Private Bag X94

Reference Nr Verwysing	3/34/2
Navrae Enquiries	Col J Schnetler W/O MB Chokoe
Telefoon Telephone	012-393 3177/3228
Faksnommer Fax number	012-393 3178

**STRATEGIC MANAGEMENT COMPONENT
HEAD OFFICE
PRETORIA**

The Divisional Commissioner
FORENSIC SERVICES

(Attention: Col Van Onselen)

RE: RESEARCH REQUEST: THE USE OF BLOOD PATTERN ANALYSIS TO RECONSTRUCT A CRIME SCENE: M-TECH FORENSIC INVESTIGATION, UNISA: RESEARCHER: AB WIID

1. The research request of AB Wiid, pertaining to the above mentioned topic, refers.
2. The aim of the study is to determine the importance of Blood Pattern Analysis in the reconstruction of a crime scene.
3. The researcher will use semi-structured interviews with open-ended questions and docket analysis as a means of data collection. The target population is 39 Detectives from Eshowe SAPS Cluster within Kwazulu Natal Province.
4. The proposal was perused according to National Instruction 1 of 2006 by this office, it is recommended that permission be granted for the research subject to the final approval and further arrangements by the office of the Divisional Commissioner: Forensic Services, and that an undertaking be obtained from the researcher prior to the commencement of the research that –
 - 4.1 the research will be at his/her exclusive cost;
 - 4.2 he/she will conduct the research without any disruption of the duties of members of the Service and where it is necessary for the research goals, research procedure or research instruments to disrupt the duties of a member, prior arrangements must be made in good time with the commander of such member;
 - 4.3 the researcher should bear in mind that participation in the interviews must be on a voluntary basis;
 - 4.4 the information will at all times be treated as strictly confidential;
 - 4.5 if information pertains to the investigation of crime or a criminal case, the researcher must acknowledge that he/she, by publication thereof, may also be guilty of defeating or obstructing the course of justice or contempt of court;

RE: RESEARCH REQUEST: THE USE OF BLOOD PATTERN ANALYSIS TO RECONSTRUCT A CRIME SCENE: M-TECH FORENSIC INVESTIGATION, UNISA: RESEARCHER: AB WIID

- 4.6 the final draft document will be tested with the Divisional Commissioner: Forensic Service to confirm whether the research ethics have been adhered to, prior to the publication of the dissertation, and
- 4.7 he/she will donate an annotated copy of the research work to the Service.

With kind regards,


MAJOR GENERAL
HEAD: STRATEGIC MANAGEMENT
M MENZIWA

Date: 2014. 02. 11

ANNEXURE F

South African Police Service



South African Police Service

Private Bag X322 Fax No:

012 421-0401

My reference: 3/1/5

THE DIVISIONAL COMMISSIONER

FORENSIC SERVICES

Enquiries: Colonel FJ Van Onselen

PRETORIA

Tel: (012) 421-0440

0001

The Head

STRATEGIC MANAGEMENT COMPONENT

(Attention: Col Schnetler)

REQUEST FOR RESEARCH: THE USE OF BLOOD PATTERN ANALYSIS TO RECONSTRUCT A CRIME SCENE: M-TECH FORENSIC INVESTIGATION, UNISA

1. Your letter with reference 3/34/2 dated 2014/02/11 bears reference.
2. Permission is herewith granted to the request for research by Sgt Wiid.
3. Sergeant Wiid is to comply strictly with the condition and requirements as set out in the letter from the Strategic Management Component with reference 3/34/2 dated 2014/02/11.
4. A copy of the outcomes of the research must be forwarded to the Divisional Commissioner: Forensic Services for consumption.

Kind Regards



**LIEUTENANT GENERAL
DIVISIONAL COMMISSIONER: FORENSIC SERVICES
JK PHAHLANE**

DATE: 2014 -03- 07

ANNEXURE G

Tom Bevel, President

Ross M. Gardner, Vice President

Partners: *Iris Dalley*

Tom "Grif" Griffin Craig Gravel Jonathyn Priest

Associates: *Kim Duddy Ken Martin David Dustin*



To: Antoinette Wild 26 November 2015

RE: BGA Image Use – Dissertation

Bevel, Gardner and Associates gives Ms. Antoinette Wild authorization to utilize various BGA images for the express purpose as demonstrative images for her dissertation.

Ross M. Gardner