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## Deborah Beaufort-Moore, *Crime Scene Management and Evidence Recovery*, Oxford University Press 2015, 2nd ed.

### Summary

The author emphasizes the importance of actions taken by police officers, who usually are the first to arrive at the crime scene, for a full explanation of the event. It is essential to provide them with basic knowledge of the types of forensic evidence, methods of its collection and securing. The results of operational activities of the police and other investigation services acting under Law Enforcement Agency (LEA) depend on the work of those police officers.

There are numerous manuals describing the work of crime scene investigators (CSIs) and tests used in different branches of forensics. The author highlights the necessity to improve the qualifications and knowledge of the police officers who are the first to arrive at the crime scene, with the task of collecting and securing all significant evidence at the site.

The author's considerations are presented in 15 Chapters entitled:

1. Roles and responsibilities at the crime scene, in particular a complex one
2. Securing the crime scene and managing procedures conducted
3. Crime scene and securing the evidence – including digital photography
4. Handling physical evidence
5. Physical evidence obtained from persons (e.g. retrieved from clothing, residues of explosives, etc.)
6. Fingerprints
7. DNA – sources, database
8. Analysis of blood stains
9. Homicide investigation
10. Evidence related to firearms, including ballistic evidence
11. Traces of footwear, tires and tools
12. Evidence of glass shards, chips of paint and particles of soil
13. Hairs and fibers
14. Drugs and drug abuse
15. Document analysis

Re 1: In the section on the responsibility of crime scene investigators, particular attention is given to cases of serious or complex crimes. In the cases of

murder, homicide or infanticide, the responsibility for the investigation in the UK in both strategic and financial terms is in the hands of the senior investigating officer (SIO). Examination of the crime scene in order to secure the evidence is conducted by the appropriate unit (group) of a CSI department that can be assisted by specialists. The responsibilities of CSI include:

- photographic and videographic registration of the crime scene and the victim
- localization and securing of the potential physical evidence
- localization and securing of fingerprints and handprints
- packaging and storage of this evidence to prevent its contamination
- recording the perpetrator's modus operandi
- preparation of opinion and its presentation in the court.

Special attention is given to the role of coroner, concerning both the determination of the cause of death of the victim and other circumstances, such as suspected poisoning, previous surgical interventions (during the 3 months before death), suspicion of an occupational disease, etc.

The author also focuses on the obligation of the police to ensure the health and safety of all persons at the crime scene, who come in contact with the secured material. The crime scene may pose a threat due to the contact with biological fluids and chemicals (e.g. hepatitis B virus or *Clostridium tetani*). A damaging effect on the health of police officers and other staff present at crime scenes involving murder and violence can also be exerted by stress symptoms causing posttraumatic stress disorder (PTSD).

Re 2: In this section, it is stressed that the crime scene is not limited strictly to the site of the event, but may include other aspects, such as witnesses contacting the perpetrator or the victim, vehicles used, rooms in which weapons are stored etc. The investigation may allow identification of the perpetrators by determining their relationship with those sites.

All actions at the crime scene should be documented and undertaken with care to avoid damage or contamination of the physical evidence, especially of microtraces. The author indicates the necessity to determine as soon as possible the path of entrance to the crime scene to avoid destruction of traces and introduction of new ones; the author illustrates her recommendations with sketches. The procedures at the crime scene are discussed in detail, and cordoning off the crime scene along with constant control over the site until the traces and physical evidence have been collected are listed as one of the first actions to be taken.

Re 3: One of the most important aspects of crime scene investigation is its detailed documentation using photography. However, in order to determine the distance between the different objects in the photography, it is necessary to draw a diagram indicating the positions and distances between important objects, helpful with the subsequent preparation of a protocol. The author thoroughly discusses the use of digital photography in the documentation of the crime scene.

In her view, the photographic documentation of the crime scene should be performed by properly trained professionals, as they frequently operate in difficult conditions, particularly in terms of lighting.

Re 4: The author makes valuable remarks about the procedures conducted by the first police officers at the crime scene and physical evidence found there. In her opinion, traces and evidence should be left in their original position (in situ), so that the investigation team can secure them for subsequent analysis. Of course, in circumstances that pose risk of potential evidence destruction or damage, the evidence must be collected and secured immediately. The key principles of handling physical evidence are: (i) continuation, involving prevention of degradation, damage or loss from the stage of securing crime scene investigation through the presentation of evidence in court, and (ii) integration, i.e. demonstration that the evidence has not been altered or contaminated accidentally or intentionally in the investigation process until the presentation in court. This procedure, i.e. the packaging and storage of evidence, has to ensure that the quality of evidence is not impaired by negligence or someone's intervention. Therefore, the proper evidence storage conditions need to be observed, especially before its forensic analysis. The author illustrates her remarks with practical examples and also refers them to digital evidence. Much attention and detail is given to the particular competence required for the preservation

of the original data on a computer or other storage devices.

The author stresses the great importance of labeling for continuation and maintaining the integrity of physical evidence, in particular with the unique identification number and initials of the person handling the evidence. All physical evidence has to be protected as part of the standard procedure, whether it originates from a minor or major crime.

Re 5: Collection and securing physical evidence from persons.

This type of evidence is collected mainly from clothing of suspects, victims and witnesses who may have had contact with victims or perpetrators. The types of evidence transferred onto other persons mainly include glass shards, fibers, chips of paint and particles of soil, as well as bodily fluids such as blood and semen. Location of the characterized traces and evidence can effectively indicate the involvement of a person in the event.

The author mentions circumstances often overlooked in securing of traces, e.g., taking footwear impressions when no other traces, such as bodily fluids, have been collected, yet. Moreover, the author lists several rules regarding the methods of collecting and securing traces, indicating that these actions should be preceded by the localization of traces and physical evidence using photography or sketches.

It is important to distinguish liquid traces derived from persons that may be of intimate or non-intimate nature, whereby the former require to be collected by medical personnel (blood, semen, body tissues, pubic hairs); it is also noted that dental patterns are considered as intimate traces and should be retrieved by a dentist.

As regards traces from firearms and explosives, their handling should be conducted by both specialists in this field and CSI team members. These traces should be obtained as soon as possible after detaining the suspect, prior to his/her fingerprinting.

At the end of the Chapter, the author describes securing objects using smartwater, i.e. a commercially available solution leaving a specific trace, which is a novel method used in crime scene investigation. For example, in cases of intrusion, a person in the immediate vicinity of the dispersion source of this preparation may be affected, which can be detected in the ultraviolet light on the skin and clothing. The suspect's clothing should be packaged in a brown paper bag and sent for laboratory analysis. The use of smartwater is known in the UK and the USA as part of a strategy of securing valuable objects and preventing car theft. Smartwater, as a theft countermeasure, contributes to the reduction of this type of crime.

Re 6: The author also presents an overview of the different aspects of preserving fingerprints, namely:

- a. Evolution of the techniques of fingerprint detection and protection

- b. The role of fingerprinting experts
- c. Creation of national fingerprint databases

However, the author emphasizes the fact that destruction of fingerprints by burning or acid treatment is often ineffective, as the specific characteristics of papillary ridges can be reproduced in their locations. The perpetrators can be identified by both fingerprints and handprints.

Generally, there are 3 categories of fingerprints identified at the crime scene:

- hidden or invisible to the naked eye. Special chemical and light amplification techniques can be used if dactyloscopic powders are ineffective;
- visible fingerprints occurring on surfaces covered with paint, blood, cosmetics etc.
- impressed (three-dimensional) fingerprints, i.e. formed by the impression on a soft material such as kit, wax, chocolate etc.

The least destructive method of detecting fingerprints is their visual search under intense light. Forming casts constitutes a new method of collecting fingerprints from difficult surfaces, such as those damaged by fire.

Porous surfaces, such as banknote paper, envelopes or unpainted wood, allow detection of fingerprints (after unsuccessful earlier attempts) using:

- a. DFO (diazfluoren-9-one) or ninhydrin
- b. Physical detection that can be used after DFO and ninhydrin treatment
- c. On nonporous surfaces (glass, plastic), the author recommends spraying with superglue (cyanoacrylate) or soot, or vacuum metallization. The latter method is very expensive and used only in the most difficult cases (not routinely).

Among the reasons for taking fingerprints, the author lists:

- identification of individuals and elimination of persons who were at the crime scene.

Re 7: Chapter 7 is devoted to DNA (DeoxyriboNucleic Acid) and discusses the following issues:

- sources of DNA (blood, semen, saliva, sweat, urine, hairs, mucus).

The author explains DNA profiles and mentions the creation of a DNA database in England and Wales as early as in 1995;

- methods of obtaining the source material for DNA identification and its storage in order to conduct comparative studies with profiles found at other crime scenes. It is also mentioned that the decreasing sample size that can be used for the determination of DNA profiles in the collected material increases the risk of contamination and cross-contamination.

As in other Chapters, at the end of this Chapter the author referenced a few publications that may expand the knowledge on this important subject.

Re 8: In this Chapter, focused on the analysis of blood stains, the author notes right at the beginning

that such analysis can be conducted only by persons with appropriate qualifications and experience. This type of analysis is important, as the shape, dimensions and distribution of blood stains at the crime scene may provide the investigators with information confirming or contradicting the testimony, and allow interpretation and determination of the sequence of events. The direction of blood splashes is also useful in determining the position of the victim and the perpetrator during the event. Due to blood viscosity, the extended part of the stain indicates the direction of its movement. Blood dries quickly in the air, forming a shell along the external edge of the stain, and often an outer ring remains after wiping the spots, which allows the professionals to draw appropriate conclusions.

The author discusses the three categories of blood stains, i.e. passive, elongated and transferred. If stains of the former type arise as a result of gravity, those of the latter type are the result of an external or internal force. A drop of blood falling at an angle other than 90° assumes an elongated shape. In turn, blood stain patterns caused by hitting a victim for the second time form a typical line of splashes. Transferred blood stains are formed when a surface covered with blood stains comes into contact with another surface, e.g., blood from the sole of a shoe leaves stains on the floor.

It is important to determine the location of blood stains, especially when attempts to wipe them off have been made at the crime scene. This is achieved by the use of high-intensity light and observing objects under fluorescent light. However, these tests do not allow distinguishing between human and animal blood. Therefore, the investigation needs to be conducted by experts. If determining the presence of blood stains with the naked eye is impossible, chemical reagents are used, among which the most common are luminal and "Blue Star" that react with hemoglobin (generating chemiluminescence).

The author thoroughly discusses these procedures, used both indoors and outdoors, as well as techniques of revealing fingerprints and footwear impressions in blood stains.

Blood stain analysis is a non-destructive technique, therefore it should be used before any other analysis.

Re 9: In this Chapter, the author presents the essential knowledge about the forensic aspects of investigation in cases in which the cause of death of a person is investigated. This may include suicides, victims of road accidents, murders or death from drug overdose. In cases of suspected deaths, the investigators need to determine whether death was the result of a crime or another cause. Police officers who are the first to arrive at the crime scene initially have to conduct visual inspection of the site according to a prepared list, taking into account multiple circumstances depending on the location of the site indoors or outdoors. If the identity of the victim is unknown, a detailed description



of the person must be created, including the person's clothes and distinguishing marks, such as tattoos, scars etc. Fingerprints and tissue samples for DNA analysis have to be taken, along with the description of the dental status etc.

If a significant amount of time passed between death and the discovery of the corpse, the author recommends creating a description of the corpse status and determination of rigor mortis, depending on the circumstances.

The Chapter also includes a detailed description of the causes of death such as strangulation, hanging, choking, drowning, etc. It is, of course, emphasized that the first actions of the police at the site of the event should be focused on saving the victim's life, and subsequently on the site investigation. All procedures should be described, and the protocols should be submitted to the appropriate investigation team.

Re 10: The Chapter discusses issues associated with firearms and their use. Much attention is given to the description of weapon and ammunition types, and ballistic analyses. Firearms and ammunition may contain forensic evidence (characteristics) which allows establishing whether a bullet found at the crime scene was fired from a specific firearm.

By specifying the principles of securing weapons, bullets and shells from the crime scene, the author emphasizes the need for proper packaging of such evidence before submitting it to the laboratory. Investigators securing such materials should operate wearing latex gloves to prevent damage to trace evidence. After a shot is fired, the primer and unburned particles of gunpowder leave the barrel and form a cloud known as the gunshot residues that deposit on the shooter's arms, clothing, hair and face. The components of this cloud can provide evidence on the relationship between the crime scene, the person and the firearm itself. Therefore, it is so important to collect those particles from the suspected perpetrator since, as has been shown in studies, they may be removed or become undetectable within 48 hours.

The author also mentions the consequences of ricochet and the possibilities of accidental shot. Such cases require a careful examination of the mechanism of the firearm by an expert.

Re 11: In this Chapter, the author discusses traces and impressions of footwear, tires and objects at the crime scene, whose analysis may lead to the identification of the perpetrator. Comparison of the evidence with the suspect's footwear, tires of the car used or objects in question allows associating the suspect with the crime scene. These traces may be either impressed or two-dimensional and found in such media as dust or blood. Analysts of footwear impressions may classify the patterns of soles of shoes collected at the crime scene and found with the suspect, and submit them to the National Footwear Database together with a description of individual

characteristics. The author comprehensively presents the methods and techniques of securing footwear impressions at the crime scene, and mentions that photocopying the footwear patterns found with the suspect is inappropriate for comparative purposes due to the possible alteration in quality. Electronic scanning and submission to SICAR (a database) is recommended, which facilitates the identification procedure using traces from the crime scene.

In comparative analyses of tire impressions from the crime scene and those secured with the suspect driving in a similar terrain type, the characteristics of wear and damage in particular are taken into account.

In turn, in comparative analyses of the marks of cutting tools, attention is given to both their production flaws and signs of wear and damage. Footwear and tire impressions, as well as tool marks can provide evidence of contact of a person with the crime scene through the transfer of materials, such as bodily fluids, paint, glass or soil, which may be found on those marks.

Chapter 12 contains a separate discussion about such crime scene evidence as glass, paint and soil. This type of transferred material normally found in minimum quantities can easily be lost. Therefore, particular care should be taken not to destroy the material during investigation activities. For example, securing the clothing of the victim and the perpetrator cannot be conducted by the same person, and the suspect and the victim should not be transported in the same vehicle. The Chapter also presents the assessment of the value of that material as evidence.

Re 13: This Chapter refers to hairs and fibers. Hairs may be lost naturally or may be pulled out in the course of the fight between the perpetrator and the victim. The most common hairs found at crime scenes are head and pubic hairs, and they may be an important source of evidence. Hairs pulled out with roots may contain material for the analysis of DNA of a person. Hair length and color may also indicate the race of the person. Experts can easily distinguish between human and animal hairs based on their physical characteristics. Analysis of hairs also allows determining whether the person has taken drugs regularly. Fibers, in turn, may constitute evidence of intensive contact between people, e.g., violence.

Both hairs and fibers allow associating people with the crime scene. They are not always noticeable to the naked eye and are lost with time. The author discusses the three phases of hair growth and concludes that hairs most often found at crime scenes are in the first ("anagen") and third ("telogen") phase. The physical and chemical analyses of hairs described in this section give researchers the most information. It should be remembered that hairs differ not only between different persons, but also within the body of the same person. Hairs sampled from a person and from the crime scene for comparative analyses

should originate from the same body part. The author describes these issues in detail with regard to both hairs and fibers.

Re 14: Drugs tested for in the described analyses are divided by the author according to the degree of their detrimental effect to the health into 3 categories:

- A – includes the most harmful drugs: cocaine, crack, heroin, ecstasy, methamphetamine (crystalline), LSD and IV amphetamine
- B – includes amphetamine powder, barbiturates, cannabis, codeine and ketamine
- C – includes the least harmful drugs, such as anabolic steroids, mild-type amphetamine, khat, and cannabis leaves and resin.

The author extensively discusses cannabis as the most widely used drug, grown both industrially and for individual purposes, as well as other drugs, such as hallucinogenic LSD.

Dangers associated with illegal laboratories producing drugs are indicated, including protected bomb traps and corrosive liquids in the doors and windows, which complicates entry.

The author warns against the risk of fire, explosion and use of mobile phones or radio in the vicinity of such laboratories. Touching and opening bottles or other containers in the laboratory is also strictly prohibited. Admission into an illegal laboratory can only be granted to persons with proper training and equipment. The author also describes the analysis of drugs, including their traces. Such analysis should allow identification of the substance, determination of sample purity and association of the sample with samples from other locations of this type.

Re 15: The last, fifteenth Chapter is devoted to the investigation of documents, including the analysis of handwriting, falsified and copied handwriting, as well as securing documents at the crime scene. The author gave particular attention to signatures falsified by rapid

or slow reproduction and to handwriting impressions. The use of the ESDA technique allows reading this kind of writing, however, the analyzed material should be placed on a brown porous plate. Moreover, printed or photocopied documents allow establishing their machine of origin. Documents made on computer printers can also be tested to check whether they originate from a specific printer, as long as they reflect the wear or damage of the internal mechanisms of the printer.

In addition, the analysis of inks may allow detection of various amendments (inserts) made to counterfeit documents.

At the end of each Chapter, the author recommends and cites additional literature to expand the knowledge of police officers who are the first to arrive at the crime scene, as well as teams conducting detailed crime scene investigation.

Independently, broad literature on this topic is listed at the end of the publication.

There is also an alphabetic index of the terminology used throughout the publication.

To conclude, the author covers an extensive amount of knowledge in every Chapter, including multiple aspects of the commented issues and even the essential precautions to save the lives of police officers who are the first to arrive at the crime scene. Many of the author's comments refer to special crime scene studies conducted by experts.

In the light of the known procedures that often represent a poor professional level, translation of the presented publication is worth considering in order to increase the qualifications and protection of the police officers before they enter particularly hazardous crime scenes.

*Translation Rafał Wierchosławski*