

Basic Photography for Law Enforcement 24 Hour Workshop

November 14th thru November 16th, 2018



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Tri-River Police Training - MTU-16
14300 Coil Plus Drive
Plainfield, Illinois, 60544


Basic Photography

NEMRT Basic Camera
Operation Class

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What is a Camera

- A camera is a light tight box where light is exposed to a medium.



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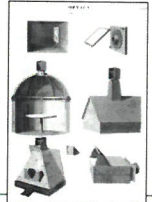
Camera Obscura

- The forerunner to the camera was the camera obscura. The camera obscura is an instrument consisting of a darkened chamber or box, into which light is admitted through a double convex lens, forming an image of external objects on a surface of paper or glass, etc., placed at the focus of the lens. The camera obscura was first invented by the Iraqi scientist Ibn al-Haytham (Alhazen) as described in his Book of Optics (1015-1021). English scientist Robert Boyle and his assistant Robert Hooke later developed a portable camera obscura in the 1660s.

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Camera Obscura


- Camera = Latin for "room"
- Obscura = Latin for "dark"



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Daguerreotype


- The Daguerreotype was the first successful photographic process, the discovery being announced on January 7th, 1839.



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Pinhole Camera

- A box designed to keep out all light except for such light as the photographer wishes to allow inside.



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Pinhole Camera Photo



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Basic Camera Operation

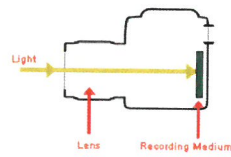
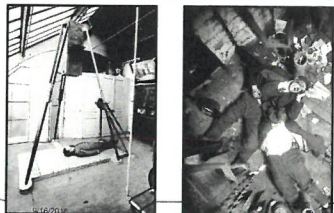


Image courtesy of www.mediacollege.com

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No Camera Complaints!



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Lens Attachment

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Filters

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Polarizing Filter

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Metering

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Metering

Matrix Metering Spot Metering

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LIGHT TO THE FILM

- FILM SPEED
- SHUTTER SPEED
- APERTURE (F-STOP)

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Understanding Exposure

- Intensity x time = exposure
 - Aperture (f-stop) "Intensity"
 - Shutter speed "time"

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Histogram Reading

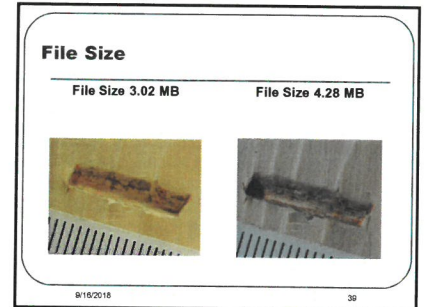
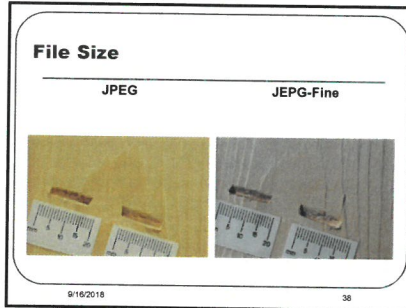
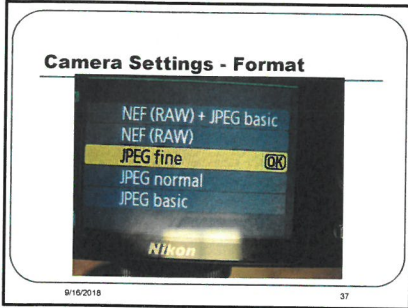
Over Exposed Correct Exposure

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Film Speed

- The film speed is indicated by a rating number (ISO) of 100, 200, 400, and 800.
- The higher the number the faster the film (ie. ISO 800).
- The more light you have the slower the film speed you use (ie. ISO 100).

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JPEG

- The name "JPEG" stands for [Joint Photographic Experts Group](#), the name of the committee that created the JPEG standard and also other standards.

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JPEG

- As the typical use of JPEG is a [lossy compression](#) method, which somewhat reduces the image fidelity, it should not be used in scenarios where the exact reproduction of the data is required (such as some scientific and medical imaging applications and certain technical [image processing](#) work).

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The four most common file formats used are:

- JPEG - Joint Photographic Experts Group, compressed format
- GIF - Graphics Interchange Format, compressed format dating back to CompuServe in the 1980's

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The four most common file formats used are:

- TIFF - Tagged Image File Format, uncompressed and compressed formats
- PNG - Portable Network Graphics, standardized compression

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JPEG

- JPEG is also not well suited to files that will undergo multiple edits, as some image quality will usually be lost each time the image is decompressed and recompressed, particularly if the image is cropped or shifted, or if encoding parameters are changed – see [digital generation loss](#) for details. To avoid this, an image that is being modified or may be modified in the future can be saved in a lossless format, with a copy exported as JPEG for distribution.

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TIFF

- Tagged Image File Format** (abbreviated **TIFF**) is a file format for storing [images](#),

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Camera Settings

Set Picture Control

- Standard
- Neutral
- Vivid
- Monochrome
- Portrait
- Landscape
- Grid
- Adjust

Nikon

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Exposure Setting

20" f/29 1/1000

15" f/29 1/1000

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Histogram Reading

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Lens

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View Point

Normal Lens

Telephoto Lens

Wide Angle lens

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Different Lens

28 mm

50 mm

70 mm

210 mm

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Perspective and Cropping

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Telephoto Lens

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What Do You See?

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Focal Length

- The focal length is a factor that is designed by the manufacturer. It is the distance between the lens and the sensor. It also depends on the size of the sensor. If the size of the sensor is small, the focal length will also be reduced by a proportional amount.

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Focal Length

- 50mm Lens → 12 inches
- Macro Lens → 2 inches

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RECIPROCITY

- This allows you to change your camera settings and still keep a correct exposure.
- A setting of ISO of 400, Shutter at 1/60th and f-stop of f-8, is the same as
- A setting of ISO 400, Shutter at 1/125th and a f-stop of f-5.6

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HOW

- A change from 1/60th to 1/125th allowed in one stop less light as the shutter was open for a shorter period of time.
- A change in the f-stop from f-8 to f-5.6 opened the aperture up larger by one stop.
- This exchange kept the exposure the same.

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EXCHANGES

- 1/500 1/250 1/125 1/60 1/30 1/15

F-2.8 f-4 f-5.6 f-8 f-11 f-16 f-22

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Insure you got the photo

- Bracketing – taking additional photos of a subject over a range of varying exposures, when unsure of the correct exposure.

1/250 1/125 1/60 1/30 1/15

F-8 f-8 f-8 f-8 f-8

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White Balance

- Adjusting the white balance basically means making sure that a part of the picture that is supposed to be neutral color does actually contain equal amounts of red, green and blue.

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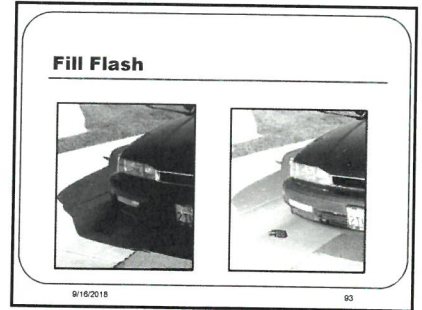
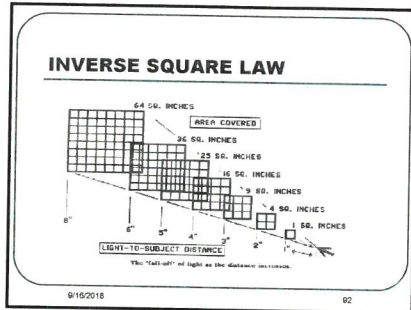
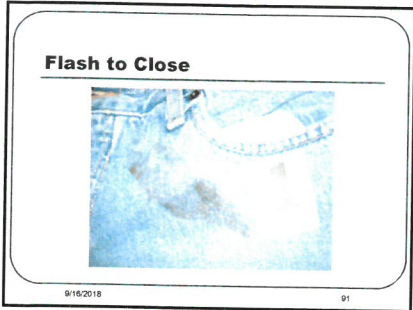
White Balance

- The more pastel colors in the scene the more important it is to get the white balance correct.

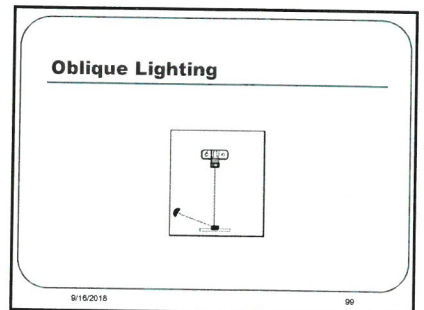
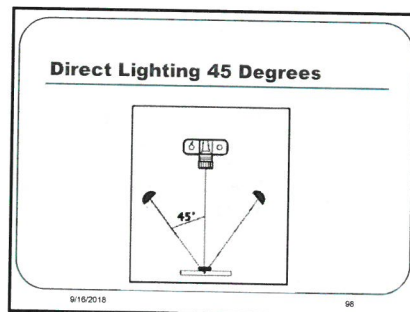
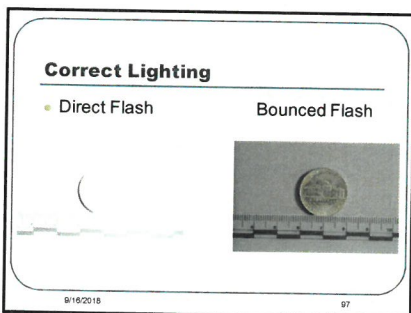
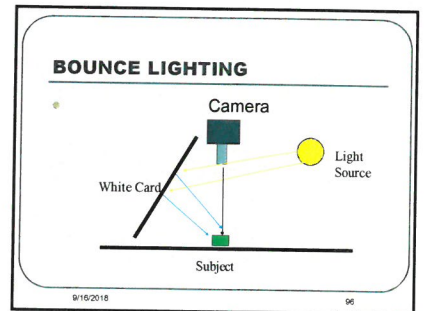
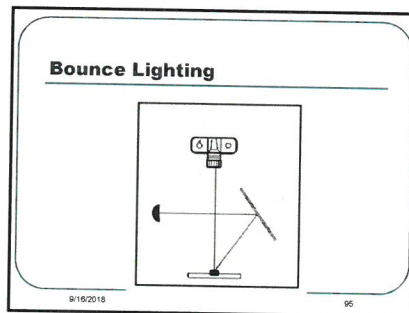
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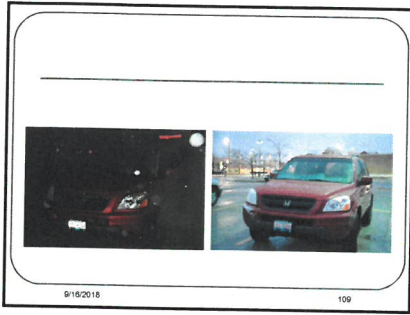
White Balance

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- THREE BASIC LIGHTING ANGLES**
- Frontal
 - 45 Degree
 - Oblique
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FILTERS WITH BLACK AND WHITE FILM

Opposing colors on the wheel will darken each other.

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Use of Filters

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Filter Use

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Tri-Pods

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META DATA

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EVIDENCE PHOTOGRAPHY

Wheeling Police Department 40 Hour
ET In-Service Training



Guidelines

- Develop a SOP, Department Policy or General Order on the use of digital imaging.
- This should include when digital imaging is used, chain of custody, image security, image enhancement, and release and availability of digital images.
- This should also include film-based and video applications as well.

Guidelines

- Preserve the original digital image. This can be done by saving it to a hard drive, or recording it to a CD.
- Digital images should be preserved in their original formats.
- If an image is enhanced the new image file created should be saved as a new file name.

Guidelines

- **DO NOT OVER WRITE AN ORIGINAL IMAGE WITH A NEW FILE:**

Guidelines

- If images are stored on a workstation for others (command staff, investigators) to view make sure they are stored as **read only files.**


PURPOSE OF PHOTOGRAPHIC EVIDENCE ★

- RECORD THE EVIDENCE
- DOCUMENT THE EVIDENCE
- PRESENT THE EVIDENCE TO OTHERS


TYPES OF PHOTOGRAPHS TAKEN ★

- ORIENTATION PHOTOS
- REFERENCE PHOTOS
- IDENTIFICATION PHOTOS

Three Photos



Orientation



Identification

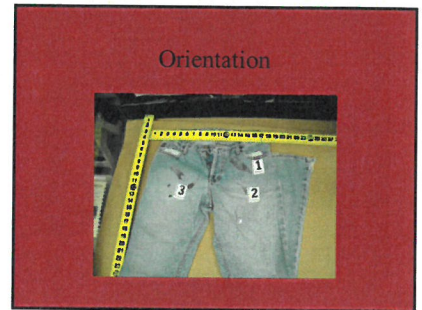
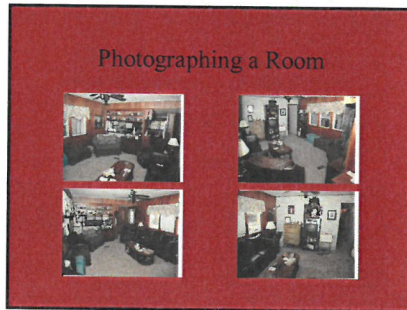
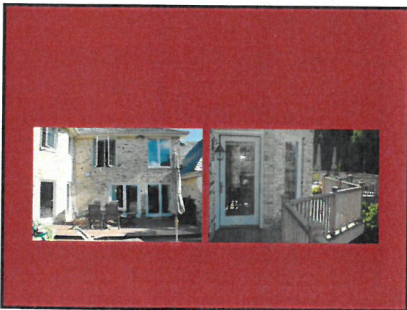
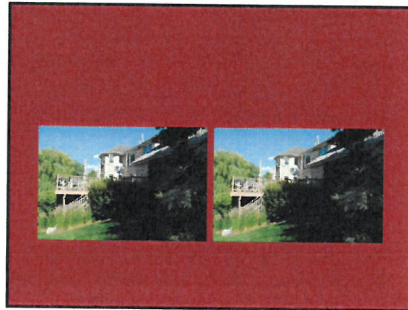
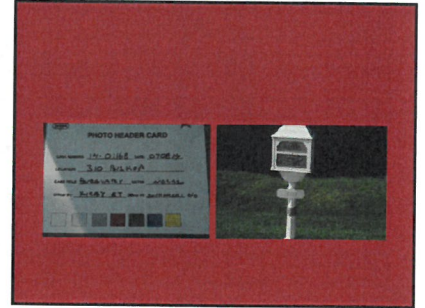


Identification



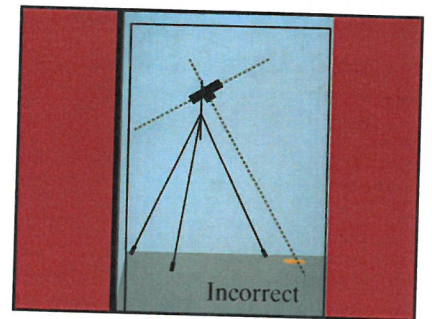
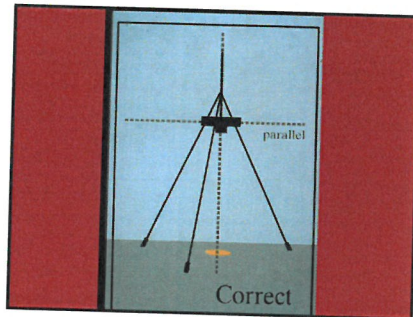
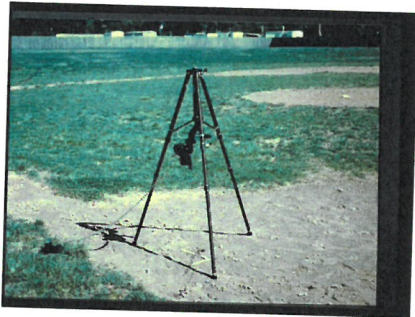
Identification







Mount camera on tripod and position directly over impression with film plane parallel to impression



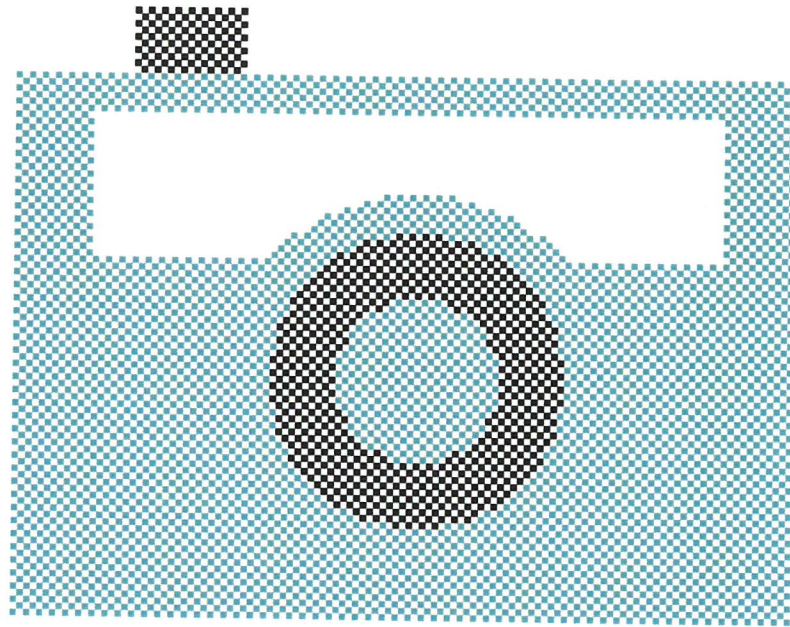
Blocking out ambient light with sun screen

Top - Photograph with ambient light and on sun screen
Bottom - Photographed with sun screen



Guidelines for Ensuring Your Digital Photographs Are Admissible

- Develop a Standard Operating Procedure (SOP), Department Policy, or General Order on the use of digital imaging. The SOP should include when digital imaging is used, chain of custody, image security, image enhancement, and release and availability of digital images. The SOP should not apply just to digital, but should also include film-based and video applications as well.
- Most importantly, preserve the original digital image. This can be done a variety of ways including saving the image file to a hard drive or recording the image file to a CD. Some agencies elect to use image security software.
- Digital images should be preserved in their original file formats. The saving of a file in some file formats subject the image to lossy compression. If lossy compression is used critical image information may be lost and artifacts introduced as a result of the compression process.
- If images are stored on a computer workstation or server, and several individuals would have access to the image files, make the files read-only for all but your evidence or photo lab staff. As an example, detectives could view any image files but they would not have rights to delete or overwrite those files.
- If an image is to be analyzed or enhanced the new image files created should be saved as new file names. The original file must not be replaced (overwritten) with a new file.

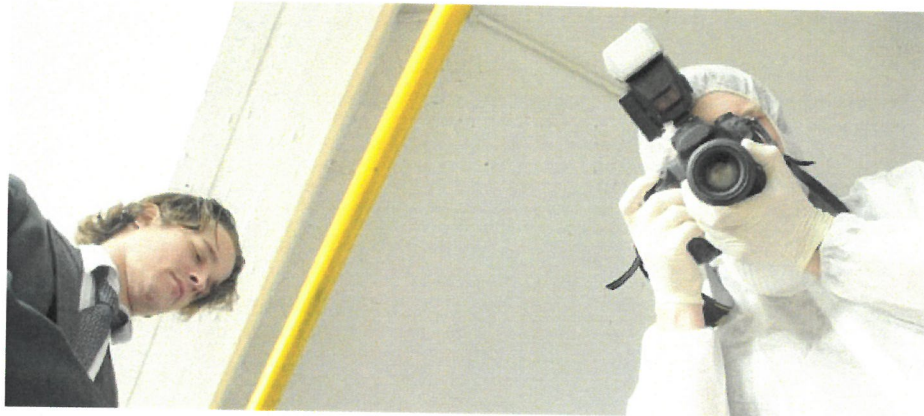


A Simplified Guide To Crime Scene Photography

Introduction

Anyone who has seen the movie **MY COUSIN VINNY** (1992) knows how a snapshot can save the day. In the film, inexperienced New York lawyer Vincent LaGuardia "Vinny" Gambini travels to a small southern town with his fiancée, Mona Lisa Vito, to represent his cousin in a murder case. Mona Lisa's incessant picture taking with a cheap pocket camera causes frustration throughout the film, but eventually produces a photograph that holds the key to the case.

Photography of everything from landscapes to historical events has preserved and illustrated history for the past 200 years. When a photograph of a forged document was presented and allowed as courtroom evidence in 1851^[1], photography as a forensic tool was born and soon became a boon to cases of identification and scene analysis. Crime scene photography became cutting edge in the 1870s and new technologies have expanded its use ever since.



In this discussion, photographs are not evidence in and of themselves, but provide visual documentation of the scene and locations of evidence within the scene. Photographs taken at a crime scene allow investigators to recreate that scene for later analysis, or for use in the courtroom. If the crime scene photography does not thoroughly and accurately document the entire scene, it could be detrimental to the investigation and potentially damaging during a criminal trial.

Principles of Crime Scene Photography

There is no prescribed length of time it takes to photographically document a crime scene. The amount of time spent depends on the size and

[1] *Luco vs U.S.*, 64 U.S (23 How.) 515, 162, L. Ed 545 (1859)

complication in the crime scene, how much there is to document and environmental factors like weather or danger to the investigative team. It can consist of thousands of photographs and hours of work.

Crime scene photography should not just focus on the obvious. The purpose of crime scene photography is to document what is there and where it is in relationship to the scene, whether it is obviously connected to the crime or not. For example, a photographer in Florida shot the inside of every cabinet and the refrigerator at a homicide scene in a home, just as a matter of procedure. It was later discovered that the victim had a receipt for a six-pack of beer, matching the beer shown in the photograph of the refrigerator. Relatives noted that the victim did not drink beer. Further investigation led the team to the convenience store where the beer was purchased and the surveillance tape showed the victim with an unknown person purchasing the beer. It turns out that the victim had picked up a hitchhiker, purchased beer for that person and come back to the house. The photograph of the refrigerator contents had created the link enabling the investigators to find the suspect.

Capturing the Scene

Photography, or “writing or drawing with light”, is defined as the process or art of producing images of objects on sensitized surfaces by the chemical action of light or of other forms of radiant energy, such as X-rays, gamma rays or cosmic rays. Fixing an image permanently has been possible since the 1820s in a variety of ways from the daguerreotype, to silver plates, to film and now digitally.

Some may consider photography more of an art than a science, but well-taken crime scene photographs can aid scientists, investigators and members of the court in their search for the truth. This makes photography a critical first responder skill. Larger agencies may have specially trained and certified crime scene photographers with high-end cameras and lighting to document crime scenes and evidence, but more often the first responder needs to do what they can with equipment assigned to them. That said, many of today’s digital point-and-shoot cameras have a variety of settings that, with some basic operator training, allow for proper documentation.

Controlling the Light

Photographers use several means to tell the camera how to capture the image including aperture, shutter speed, depth of field and white balance. Aperture refers to the size of the opening that lets light into the camera and shutter speed is how long that opening, or shutter, remains open. Depth of field is the amount of area in front of (foreground) and behind (background) an object that remains in focus. Lastly, white balance allows the camera to

record the proper temperature of light, resulting in an accurate representation of the color tones of objects in the photograph.

Brightening the Darkness

Experienced photographers often use a technique called “painting with light” to expose image details in dark or near-dark conditions. In this technique, the shutter is held open for seconds or minutes and the photographer walks through the scene adding light from sources such as a flashlight or detached camera flash.



Crime scene at night & after using the painting with light technique. (Courtesy of Scott Campbell)

However the photographer chooses to capture the image, the main reason for crime scene photography is to thoroughly document the entire scene, the evidence, and any areas of special significance to the investigation.

Why and when is crime scene photography used?

Photography should be used as part of the documentation for all physical crime scenes, including traffic collisions, burglaries, homicides, or any number of crimes against people or property. Photographs, however, can be misleading and confusing to the viewer. Therefore, crime scene photographers must ensure their work is both ethical and honest while capturing as much accurate information and detail as possible. Documenting all elements of a crime scene is a major stepping stone when trying to piece together what happened, how it happened and who did it.

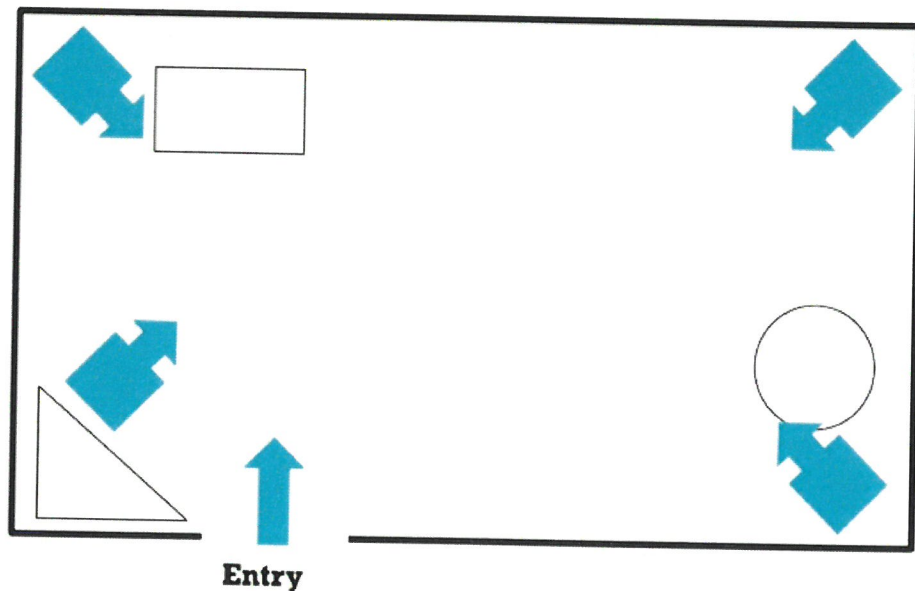
Crime scenes are typically full of activity and often unpredictable, with first responders assisting victims and investigators beginning their work. Even in

the most ideal situation, capturing photographic evidence can be challenging. An experienced photographer will know to take photos at all stages of the investigation and that it is better to have too many than not enough images.

The following steps are taken to ensure proper photographic documentation:

- 1. Secure the scene:** In all forensic investigations, the first step is to secure the crime scene.
- 2. Evaluate conditions:** Next, the photographer should evaluate the available light and weather conditions and adjust camera settings appropriately. Crime scenes can be indoors, outside or both; they can be vehicles, include multiple rooms, or any combination of locations, therefore no single camera setting will work for all crime scenes.
- 3. Shoot the scene:** The photographer should take photographs before anything is disturbed, progressively working through the scene from outside to close-up pictures. Many shots should be taken, from the entire scene, to medium shots to show the relationship of evidence to the overall scene.

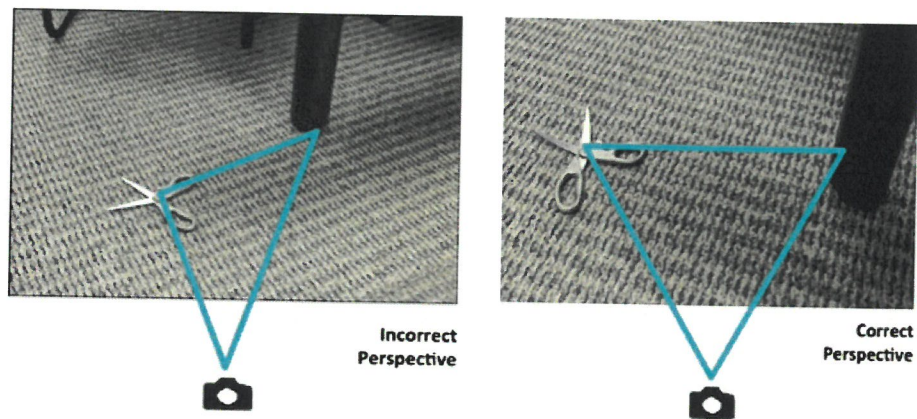
Just like a television program will show the viewer the outside of a building to establish where the characters are going, the crime scene photographer should capture the whole scene first using wide-angle shots covering the entire scene from the approach and through every area. Close-up images of evidence can be taken out of context, so establishing the scene first with wide and medium shots is critical.



In addition, photographs should be taken looking up from the scene to capture evidence or environmental factors that may be above the scene.

4. Photograph the victims: The next series of shots should include victims (if present) to show locations, injuries and condition.

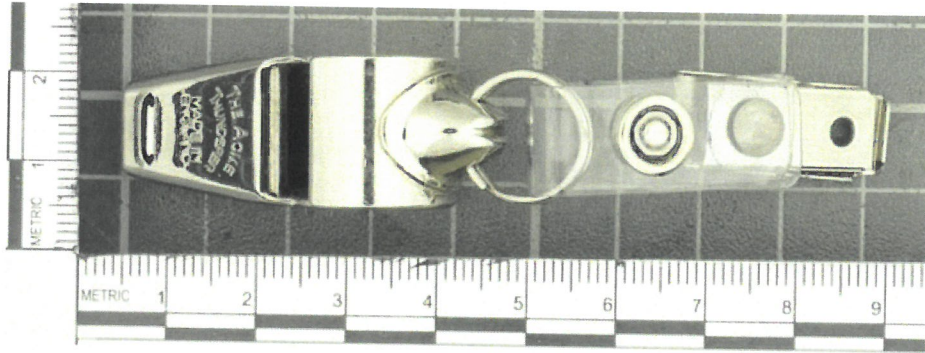
5. Photograph the evidence: Then each piece of evidence should be photographed to illustrate where it was found. This establishes the relationships of the evidence to the victim, the victim to the room and so on. These photographs should be taken from straight above or straight on at right angles, eliminating potential distance distortions. Each piece of evidence should be photographed with a scale to indicate size and without a scale.



(Courtesy of Daniel Nichols, NFSTC)

6. Evidence markers: Photographs should be taken before evidence markers are placed, then again after. These initial shots are important to prove that no one has tampered with the crime scene.

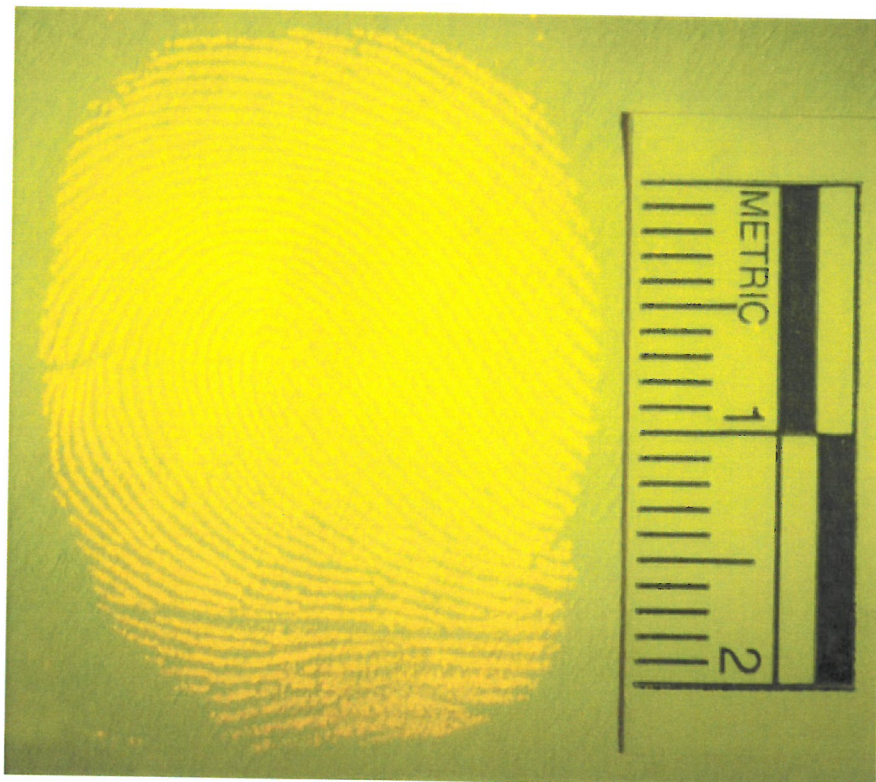
7. Re-shoot for new evidence: If investigators mark new evidence, the whole series of shots should be repeated, including all evidence shots. These photos should include the entire piece of evidence and a scale to indicate size.



(Courtesy of Becky Carter, CEP, NFSTC)

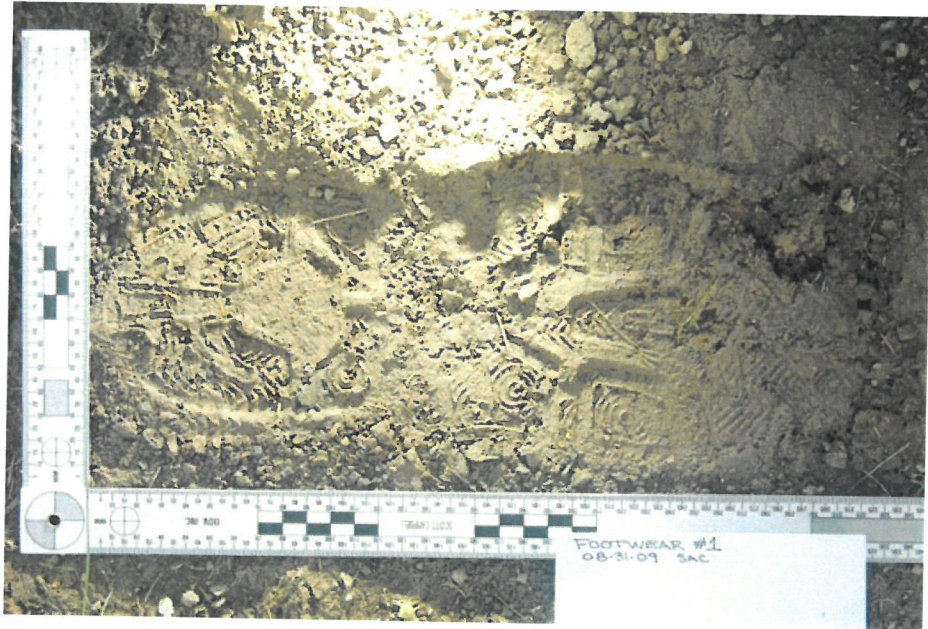
Special imaging techniques and lighting should be used to capture things like fingerprints, indentations, shoe and tire track impressions, vehicle identification numbers (VIN) and very small pieces of evidence. Techniques may include:

- **Alternate light sources (ALS)** – such as lasers, blue or green lights and colored filters that help detect processed latent fingerprints or other hidden evidence and illuminate for photographing



Green light used to illuminate a latent fingerprint. (Courtesy of Scott Campbell)

- **Oblique angle lighting** - using a flashlight, camera flash or ALS at a very low angle to cast shadows that allow an imprint or impression to be photographed



Oblique light used to add contrast to a footprint. (Courtesy of Scott Campbell)

- **Macro lenses** - can take very close-up images (1:1 or 1:2) of small items such as tool marks or trace evidence



Cartridge case details captured with macro lens. (Courtesy of Scott Campbell)

Photographs should accurately document the lighting conditions at the scene. After those photos are taken, if necessary, a photographer will add artificial light, like a flash, to compensate for a camera's limitations in capturing the visible range of light under certain conditions.

- 8. Shoot fast:** Sometimes environmental factors such as rain, snow or traffic can make conditions difficult for photography. The photographer must work quickly to capture as much visual documentation as possible from a deteriorating scene.
- 9. Photograph the victim later:** If a victim must be moved or requires treatment, the photographer can go back to document the victim's injuries. Various techniques using special lighting and colored filters can highlight injuries (bruising, scarring) and healing status.

How It's Done

Who Conducts the Photographic Analysis and Enhancements

Once working copies of all the photographs have been created, investigators can select images for analysis and enhancement. This is normally done by the photographer or, if available, within the audio/visual department in the laboratory. As with all evidence, detailed records should be kept regarding who accesses or works with the files and what techniques were used to enhance or otherwise modify the files.

The International Association for Identification (IAI) has a Certified Forensic Photographer (CFPH)

(<http://www.theiai.org/certifications/imaging/index.php>) program, established in 2001. The CFPH process is accredited by the Forensic Specialties Accreditation Board. This program requires specific training or coursework and testing that includes both written and practical assessments. Evidence Photographers International Council (EPIC) (<http://www.evidencephotographers.com/>) formerly provided specific certification for evidence photographers.

Many times, the images are taken by a member of the investigative team that is responsible for many crime scene duties that also incorporates photography. Depending on the size of the agency and support from their local laboratory, more experienced photographers may be available for major cases.

How and Where Evidence Photographs are Processed

All photographs taken are saved as originally captured, entered into evidence inventory and tracked. Selected photographs of particular evidence or parts of a scene may need additional enhancement. This can be done within the department if the appropriate software is available or may be sent to a regional specialist. The most common enhancements include cropping, brightness and contrast adjustments and color processing.

Potential photographic enhancements follow the same rules as news journalism. An image may be lightened and darkened, cropped or the color enhanced. The white balance can be adjusted, but adding or removing information is unacceptable. When submitted for courtroom use, the original photograph must be available for comparison and the technician or examiner must be able to show and describe any enhancements that were done, and why.

When images are presented, they must be clearly identified as a working and/or enhanced version. The original camera sequential numbering system should be retained to show that images are in order and none have been removed. The working images should not be renamed until identified or selected for use, and original files should not be renamed at all.

Type of Equipment Used

Investigators and technicians photographing a crime scene should have access to a good quality camera that is capable of manual override and has interchangeable lenses, off-camera flash, cable release, and a tripod mount. With these tools and a widely attainable level of training and practice, good quality photographs can be taken in a broad range of scenarios including low light, highly reflective surfaces and tight spaces.

That said, many first responders are equipped with basic, consumer-level point-and-shoot cameras. Since they may be in the best position to capture important evidence, basic knowledge of how to capture an image and use the camera they have is very important. Even with simple equipment, a first responder with introductory photography training can produce images of sufficient quality to support an investigation.

Cell phones and other personal electronic devices with integrated cameras are not recommended unless their use is an operational necessity. An example would be if a muddy shoe print is found near a crime scene but it is raining. The shoe print may disappear quickly, so if a cell phone camera is the only camera available, then it would be operationally necessary to use it.

FAQs

What are the limitations of crime scene photography?

The majority of evidence photography is now done using digital cameras and equipment. Limitations in photography are twofold: limitation of the camera in general and lack of experience or training of the photographer.

Cameras cannot produce the same view that the human eye sees; it is the photographer's use of the camera settings that can affect what can or cannot be seen in a photograph. A trained photographer will recognize difficult lighting situations and adjust the camera settings accordingly. Often, more than one photo will be taken of the same view, in order to properly expose for widely varying conditions in a single view.

The use of digital cameras allows a crime scene photographer to instantly review their photos and make changes to the camera settings if needed to capture the best possible image while still on the scene. Critical thinking skills and analysis are constantly applied during the scene documentation process. An inexperienced photographer will often forgo the review process, relying on their camera to "make the right decisions" for settings.

How is quality control and assurance performed?

To ensure the most accurate capture, processing and analysis of crime scene photographs, the management of criminal justice agencies and forensic laboratories puts in place policies and procedures that govern facilities and equipment, methods and procedures, and personnel qualifications and training. These Standard Operating Procedures (SOPs) are intended to maintain and demonstrate the integrity of the images and information captured at a crime scene and its admissibility in court. Crime scene photography SOPs ensure uniform processes are used by photographers and the information represented in the images accurately represents objects and conditions at the scene as they are found.

The Scientific Working Group on Imaging Technology (SWGIT) works to set quality guidelines for the capture, storage, processing, analysis, transmission, output and archiving of images. These guidelines provide good general practice standards for crime scene photographers and other individuals performing photography within the criminal justice system. SWGIT guidelines are available (<https://www.swgit.org/documents>).

Is there anything else about crime scene photography that would be important to the non-scientist, or any common misconceptions regarding this topic?

A common misconception is that digital images can be changed more easily than film prints and done to mislead the court. Photographs created in a darkroom from film can also be altered by a skilled photographer using a wide variety of techniques, so they are not necessarily more accurate than digital images. While digital software exists that can make drastic changes to a digital image, a comparison of the altered image with the original makes any changes obvious. This is why proper chain-of-custody procedure and workflow is necessary.

According to the SWGIT guidelines: “Documenting image enhancement steps should be sufficient to permit a comparably trained person to understand the steps taken, the techniques used, and to extract comparable information from the image.”

Similar to scientific research being documented to allow other scientists to perform the same steps and get the same results, image enhancement documentation should be specific and in order. The SWGIT guidelines include examples of documentation and draft SOPs ([https://www.swgit.org/pdf/Recommended Guidelines for Developing Standard Operating Procedures?docID=59](https://www.swgit.org/pdf/Recommended%20Guidelines%20for%20Developing%20Standard%20Operating%20Procedures?docID=59))(PDF download) for agencies to customize.

Another misconception may be reinforced by television crime dramas, and that is the idea that every crime scene unit and/or investigator has high-end camera equipment and is thoroughly trained in crime scene photography. Though many are, it should be clarified that equipment, training and procedures vary widely among agencies.

Common Terms

Terminology in photography has changed slightly since the rise of professional digital cameras to include information on digital equipment such as light sensors, as well as techniques for using computer software to enhance images. The definitions below represent common terms used in general and crime scene photography. For additional glossary terms see the SWGDE and SWGIT Digital & Multimedia Evidence Glossary ([https://www.swgit.org/pdf/SWGDE and SWGIT Digital and Multimedia Evidence Glossary?docID=60](https://www.swgit.org/pdf/SWGDE%20and%20SWGIT%20Digital%20and%20Multimedia%20Evidence%20Glossary?docID=60)) or the All Things Photography (<http://www.all-things-photography.com/digital-dictionary.html>) website.

Ambient Light - Light already existing in an indoor or outdoor setting that is not caused by any illumination supplied by the photographer.

Aperture - opening in the camera that lets in the light.

Aspect Ratio - The ratio of width to height in photographic prints; a ratio of 2:3 in 35 mm pictures produces photographs most commonly measuring 3.5 × 5 inches or 4 × 6 inches.

Camera Angles - Various positions of the camera (high, medium, or low; and left, right, or straight on) with respect to the subject, each giving a different viewpoint, perspective or visual effect.

Capture - The process of recording data, such as an image, video sequence, or audio stream.

Color Correction - To correct or enhance the colors within an image.

Contrast - The difference in darkness or density between one tone or another.

Cropping - Removing portions of an image that are outside the area of interest.

Depth of Field - The area between the nearest and farthest points from the camera that are acceptably sharp in the focused image.

Evidence Quality Photos - Images of sufficient size and quality to allow comparison and examination by a qualified forensic expert.

Exposure - The quantity of light allowed to act on photographic material; a product of the intensity (controlled by the lens opening) and the duration (controlled by the shutter speed) of light striking the film or sensor.

F-stop - Lens setting number indicating the size of the aperture that allows light into the camera. It is an inversely proportionate number, so that f/1.8 indicates a larger opening than f/5.6.

Filter - A colored piece of glass or other transparent material used over the lens to emphasize, eliminate, or change the color or density of the entire scene or certain areas within a scene.

ISO Speed - The sensitivity of a given film or sensor to light, indicated by a number such as ISO 200. The higher the number, the more sensitive or faster the film or sensor.

Lens Speed - The largest lens opening at which a lens can be set. A fast lens transmits more light and has a larger opening than a slow lens. For example,

f/1.8 would set a larger opening than f/5.6 and would, therefore, be a faster lens.

Raw File - The data captured by a digital camera sensor before it is converted into an image file by software, either inside the camera or on a stand-alone computer.

Resolution - In a digital photograph, the number of pixels which make up the image.

Scale - The relative size of an object as compared to other objects in general proximity. Also refers to a measuring device or set of marks to indicate object size in a photograph.

Shutter - Blades, a curtain, plate, or some other movable cover in a camera that controls the time during which light reaches the film.

Working Copy - A copy or duplicate of a recording or data that can be used for subsequent processing and/or analysis.

Additional Resources

You can learn more about this topic at the websites and publications listed below.

Resources

Evidence Photographers International Council (EPIC)
<http://www.evidencephotographers.com/>

Scientific Working Group on Imaging Technology (SWGIT)
<http://www.swgit.org>

Professional Photographers Association (PPA) <http://www.ppa.com>

Stanford University Depth of Field
(<http://graphics.stanford.edu/courses/cs178-10/applets/dof.html>)

Stanford University Variables That Affect Exposure
(<http://graphics.stanford.edu/courses/cs178-11/applets/exposure.html>)

Crime Scene Resources Crime Scene and Evidence Photography
(<http://www.crime-scene-investigator.net/csi-photo.html>)

References

Robinson, E. **CRIME SCENE PHOTOGRAPHY, SECOND EDITION**, Elsevier Academic Press, Burlington, MA (2010).

Law Enforcement & Emergency Services Video Association (LEVA)(accessed June 27, 2012). <http://www.leva.org>

National Center for Audio & Video Forensics (NCAVF) (accessed June 27, 2012). <http://www.ncavf.com>

DSLR Camera Simulator CameraSim, SLR Photography Demystified. (accessed June 27, 2012) <http://camerasim.com/camera-simulator/>

Levoy, Marc; Adams, Andrew; Dektar, Katie; Willett, Nora. Variables that Affect Exposure, 2011. Flash applets on some technical aspects of photography (Stanford University CS 179 - Digital Photography). (accessed June 27, 2012) <http://graphics.stanford.edu/courses/cs178-11/applets/exposure.html>

McHugh, Sean. Understanding Depth of Field. Cambridge in Color. (accessed June 27, 2012) <http://www.cambridgeincolour.com/tutorials/depth-of-field.htm> (accessed June 27, 2012)

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Forensic Evidence Admissibility and Expert Witnesses

How or why some scientific evidence or expert witnesses are allowed to be presented in court and some are not can be confusing to the casual observer or a layperson reading about a case in the media. However, there is significant precedent that guides the way these decisions are made. Our discussion here will briefly outline the three major sources that currently guide evidence and testimony admissibility.

The *Frye* Standard – Scientific Evidence and the Principle of General Acceptance

In 1923, in *Frye v. United States*^[1], the District of Columbia Court rejected the scientific validity of the lie detector (polygraph) because the technology did not have significant general acceptance at that time. The court gave a guideline for determining the admissibility of scientific examinations:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while the courts will go a long way in admitting experimental testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

Essentially, to apply the “*Frye* Standard” a court had to decide if the procedure, technique or principles in question were generally accepted by a meaningful proportion of the relevant scientific community. This standard prevailed in the federal courts and some states for many years.

Federal Rules of Evidence, Rule 702

In 1975, more than a half-century after *Frye* was decided, the Federal Rules of Evidence were adopted for litigation in federal courts. They included rules on expert testimony. Their alternative to the *Frye* Standard came to be used more broadly because it did not strictly require general acceptance and was seen to be more flexible.

[1] 293 Fed. 1013 (1923)

The first version of Federal Rule of Evidence 702 provided that a witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- a. the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- b. the testimony is based on sufficient facts or data;
- c. the testimony is the product of reliable principles and methods; and
- d. the expert has reliably applied the principles and methods to the facts of the case.

While the states are allowed to adopt their own rules, most have adopted or modified the Federal rules, including those covering expert testimony.

In a 1993 case, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, the United States Supreme Court held that the Federal Rules of Evidence, and in particular Fed. R. Evid. 702, superseded *Frye's* "general acceptance" test.

The *Daubert* Standard – Court Acceptance of Expert Testimony

In *Daubert* and later cases^[2], the Court explained that the federal standard includes general acceptance, but also looks at the science and its application. Trial judges are the final arbiter or "gatekeeper" on admissibility of evidence and acceptance of a witness as an expert within their own courtrooms.

In deciding if the science and the expert in question should be permitted, the judge should consider:

- What is the basic theory and has it been tested?
- Are there standards controlling the technique?
- Has the theory or technique been subjected to peer review and publication?
- What is the known or potential error rate?
- Is there general acceptance of the theory?
- Has the expert adequately accounted for alternative explanations?
- Has the expert unjustifiably extrapolated from an accepted premise to an unfounded conclusion?

The *Daubert* Court also observed that concerns over shaky evidence could be handled through vigorous cross-examination, presentation of contrary evidence and careful instruction on the burden of proof.

[2] The "Daubert Trilogy" of cases is: **DAUBERT v. MERRELL DOW PHARMACEUTICALS, GENERAL ELECTRIC CO. v. JOINER** and **KUMHO TIRE CO. v. CARMICHAEL**.

In many states, scientific expert testimony is now subject to this *Daubert* standard. But some states still use a modification of the *Frye* standard.

Who can serve as an expert forensic science witness at court?

Over the years, evidence presented at trial has grown increasingly difficult for the average juror to understand. By calling on an expert witness who can discuss complex evidence or testing in an easy-to-understand manner, trial lawyers can better present their cases and jurors can be better equipped to weigh the evidence. But this brings up additional difficult questions. How does the court define whether a person is an expert? What qualifications must they meet to provide their opinion in a court of law?

These questions, too, are addressed in **Fed. R. Evid. 702**. It only allows experts “qualified ... by knowledge, skill, experience, training, or education.” To be considered a true expert in any field generally requires a significant level of training and experience. The various forensic disciplines follow different training plans, but most include in-house training, assessments and practical exams, and continuing education. Oral presentation practice, including moot court experience (simulated courtroom proceeding), is very helpful in preparing examiners for questioning in a trial.

Normally, the individual that issued the laboratory report would serve as the expert at court. By issuing a report, that individual takes responsibility for the analysis. This person could be a supervisor or technical leader, but doesn't necessarily need to be the one who did the analysis. The opposition may also call in experts to refute this testimony, and both witnesses are subject to the standard in use by that court (*Frye*, *Daubert*, Fed. R. Evid 702) regarding their expertise.

Each court can accept any person as an expert, and there have been instances where individuals who lack proper training and background have been declared experts. When necessary, the opponent can question potential witnesses in an attempt to show that they do not have applicable expertise and are not qualified to testify on the topic. The admissibility decision is left to the judge.

Additional Resources

Publications:

Saferstein, Richard. **CRIMINALISTICS: AN INTRODUCTION TO FORENSIC SCIENCE**, Pearson Education, Inc., Upper Saddle River, NJ (2007).

McClure, David. Report: Focus Group on Scientific and Forensic Evidence in the Courtroom (online), 2007,

<https://www.ncjrs.gov/pdffiles1/nij/grants/220692.pdf> (accessed July 19, 2012)

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Los Angeles County Sheriff's Department
Scientific Services Bureau

Digital Camera Quick Reference Guide



DIGITAL CAMERA QUICK REFERENCE GUIDE

GENERAL CRIME SCENE PHOTOGRAPHY

Camera Exposure: Manual "M" Mode

JPEG: Large Fine

ISO: 400; use 100 for bright sun

Preferred Aperture: f/8 to f/16

Shutter Speed: As appropriate for meter reading (*avoid <1/30 sec handheld*)

Lens Stabilizer: On

Lens: Zoom 24-105mm

Focus: Automatic or manual focus as appropriate for scene and lighting

Flash: E TTL mode (use flash to fill shadows during the day)

Technique: Overall, Midrange and Close-ups



NIGHT TIME AVAILABLE LIGHT PHOTOGRAPHY

Camera Exposure: Manual "M" Mode

JPEG: Large Fine

ISO: 400 (or higher if necessary – ex. 800 to 6400)

Aperture: f/8 (use as a starting point)

Shutter Speed: 5 seconds (use as a starting point) **USE TRIPOD**

Lens Stabilizer: On

Lens: Zoom 24-105mm

Focus: Automatic or manual focus (*if needed, use a flashlight to focus*)

Support: Place camera on tripod and attach cable release

Flash: No flash (optional: use fill flash on E TTL mode for nearby shadows or to counteract bright lights facing toward the lens)

Technique: overall and midrange



DIGITAL CAMERA QUICK REFERENCE GUIDE

2D SHOE IMPRESSIONS

Camera Exposure: Manual "M" Mode

RAW + JPEG RAW Fine

ISO: 100

Aperture: f/16

Shutter Speed: 1/125th

Lens Stabilizer: On

Lens: Zoom 40-70mm (*50mm is ideal*)

Focus: Manual focus (*if needed, use a flashlight to focus*)

Place camera on tripod along with sandbag for stabilization; attach cable release

Flash: ETTL mode using off-camera flash cord

Technique: Ensure camera is parallel and square with impression; utilize an L-scale; flash held at oblique angle on all four sides about 3-5 feet away

If surface is too reflective for flash, turn off flash and use AV mode at f/16



Footprint and Shoe Impression



DIGITAL CAMERA QUICK REFERENCE GUIDE

2D LATENT/PATENT IMPRESSIONS

Camera Exposure: Manual "M" Mode

RAW + JPEG RAW Fine

ISO: 100

Aperture: f/16

Shutter Speed: 1/125th

Lens Stabilizer: On

Lens: Macro fixed 50mm

Focus: Manual focus (if needed, use a flashlight to focus)

Place camera on tripod and attach cable release

Flash: ETTL mode using off-camera flash cord

Technique: Ensure camera is parallel and square with impression; utilize a sticker scale; flash held at oblique angle on all four sides about 3-5 feet away

If surface is too reflective for flash, turn off flash and use AV mode at f/16



3D SHOE AND TIRE TRACK IMPRESSIONS

Camera Exposure: Manual "M" Mode

RAW + JPEG RAW Fine

ISO: 100

Aperture: f/16

Shutter Speed: 1/125th

Lens Stabilizer: On

Lens: Zoom 40-70mm (50mm is ideal)

Flash: Manual mode using off-camera flash cord; if flash is too strong, use ETTL

Focus: Manual focus on bottom of impression (if needed, use a flashlight to focus)

Place camera on tripod along with sandbag for stabilization; attach cable release

Technique: ensure camera is parallel and square with impression; utilize an L-scale; flash held at ankle, calf, knee heights on all four sides about 3-5 feet away



DIGITAL CAMERA QUICK REFERENCE GUIDE

PAINTING WITH LIGHT INSUFFICIENT LIGHT OR LARGE AREA

Camera Exposure: Bulb “B” Mode

JPEG: Large Fine

ISO: 400

Aperture: f/8 (for more depth of field – f/11)

Shutter Speed: Shutter open until flash or flashlight sequence is completed

Lens Stabilizer: On

Focus: Manual focus (if needed, use a flashlight to focus)

Place camera on tripod and attach cable release

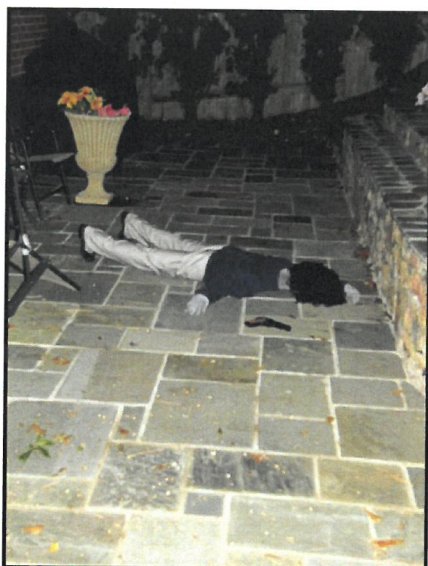
Flash: Manual “M” 1/1 (flash will be off camera)



With camera composed, focused, and pointed toward subject area, depress cable release and lock it in “open” position. With flash in hand, quickly walk and manually flash an equal pattern around subject area (outside camera’s angle of view). Ensure to flash parallel to the deck toward desired areas to be lit. Return to camera and release the lock on cable release to take photo. **Note: A flashlight can also be used to paint.**

The “painting with light” technique, allows you to light and image a large area using a single electronic strobe light, a spotlight, or—in some cases—even a good flashlight. To accomplish this, the photographer moves the light throughout the scene, exposing one part at a time, while the camera lens and shutter remains open the entire time.

Painting with Light



(Courtesy Evidence Technology Magazine)

DIGITAL CAMERA QUICK REFERENCE GUIDE

ALTERNATE LIGHT SOURCE (ALS) PHOTOGRAPHY OF SEMINAL FLUID

Camera Exposure: Aperture Value "AV" Mode

JPEG: Large Fine

ISO: 400

Aperture: f/11 or f/16

Shutter Speed: Camera will automatically select

Lens Stabilizer: On

Lens: Zoom

Focus: Automatic or manual focus

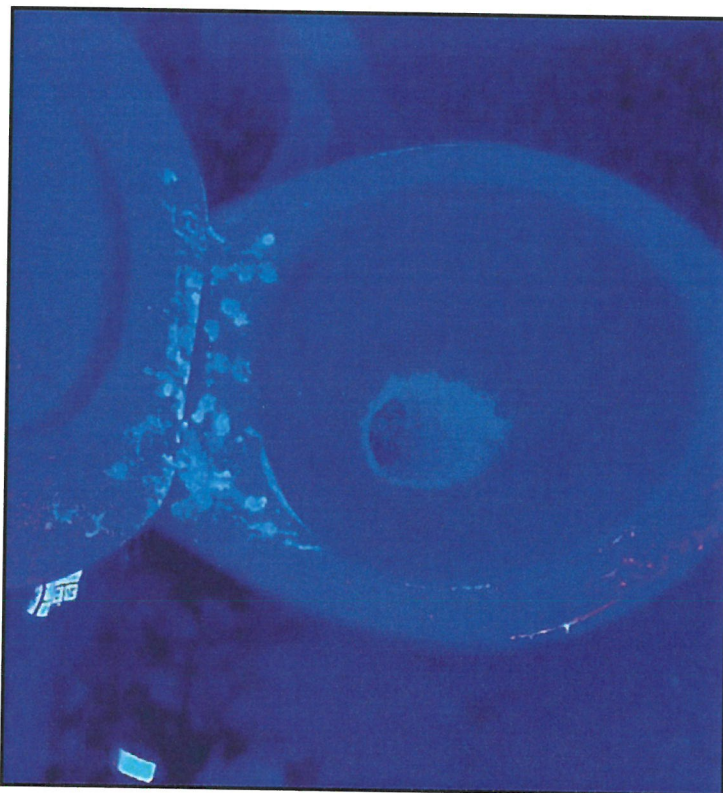
Flash: no flash

Place camera on tripod and attach cable release

Technique: Remove lens shade. A criminalist will have the filter and the ALS unit. Place orange barrier filter in front of lens, without touching the lens to the filter. *Low ambient light is preferred.* Depending on the ALS intensity, the exposure may be from one to several seconds. Make several exposures, making sure that the focus remains sharp.



Seminal Fluid Under Ultraviolet Light



DIGITAL CAMERA QUICK REFERENCE GUIDE

LUMINOL PHOTOGRAPHY

Camera Exposure: Bulb "B" Mode

JPEG: Large Fine

ISO: 1600

Aperture: f/8 (for more depth of field use f/11)

Shutter Speed: 15 seconds (if using f/11, begin at 30 seconds)

Lens Stabilizer: On

Lens: Zoom

Focus: Manual focus (if needed, use a flashlight to focus)

Place camera on tripod and attach cable release

Flash: no flash

Technique: With the room lights on, take a control photo of the blood-stained area with EV markers in place. With the lights off, take a photograph (15 seconds) of the same bloodstained area. Review the captured image for correct exposure and adjust as needed. Take another photo and bounce a flash or flashlight onto the ceiling (allows you to see background).



Luminol Photography



Without Luminol



With Luminol

DIGITAL CAMERA QUICK REFERENCE GUIDE

AERIAL PHOTOGRAPHY



Camera Exposure: Time Value “TV” Mode

JPEG: Large Fine

ISO: 400 (use higher ISO 800 or higher if light level is low)

Aperture: camera will automatically select

Shutter Speed: 1/500th

Lens Stabilizer: **Off**

Lens: Zoom

Focus: Automatic

Flash: no flash

Technique: Overall, Midrange, Close-ups

Do not touch camera to aircraft as this will add vibration!

REFERENCE INFORMATION

Produced by: LASD Photo/Digital Unit, 323-260-8570, photo@lasd.org

Situational Awareness is the ability to identify, process, and comprehend the critical elements of information about what is happening to the team with regards to the mission. **More simply,** it's knowing what is going on around you.



DEPTH OF FIELD, SHUTTER SPEED and ISO CHART

