OSAC 2021-S-0027 Standard Guide for Laboratory Photography

Video/Imaging Technology and Analysis Subcommittee
Digital/Multimedia Scientific Area Committee (SAC)
Organization of Scientific Area Committees (OSAC) for Forensic Science

OSAC Proposed Standard

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Prepared by
Video/Imaging Technology and Analysis Subcommittee
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The STRP panel will consist of an independent and diverse panel, including subject matter experts, human factors scientists, quality assurance personnel, and legal experts, which will be tasked with evaluating the proposed standard based on a comprehensive list of science-based criteria.

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Standard Guide for Laboratory Photography

1. Scope

1.1. This standard describes specific photography and lighting techniques for documenting evidence in a laboratory or other controlled setting. Photography may be used in the laboratory to document evidence in various stages of analysis, and to show details that may not be discernible to the human eye. These photographs serve as a permanent record of the items of evidence, any developed evidence, or enhanced features (e.g. latent fingerprints, footwear impressions, toolmarks, firearms, questioned documents).

1.2. This document is not intended to address techniques for special equipment including, but not limited to, scanners, microscope cameras, or other specialized equipment for documenting laboratory analysis of questioned documents, firearms, fire debris, etc. techniques using a scanner.

1.3. This document is not intended to supersede existing standards for the documentation of specific types of evidence.

1.4. This standard cannot replace knowledge, skills, or abilities acquired through education, training, and experience, and is to be used in conjunction with professional judgment by individuals with such discipline-specific knowledge, skills, and abilities.

1.5. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

2. Terminology

2.1. Definitions—For definitions of terms relating to this *standard*, refer to Terminologies ASTM E2916 Standard Terminology for Digital and Multimedia Evidence Examination.

3. Summary of Practice

3.1. This standard addresses proper evidence handling procedures, the usage of personal protective equipment (PPE), recommended photographic equipment,

the retention and storage of photographs, procedures for documentation photography and examination quality photography, procedures for utilizing special photographic techniques, and descriptions of commonly used lighting techniques.

4. Significance and Use

4.1. This guide is intended to increase consistency among forensic photography providers due to the evidentiary and documentary value provided by photographs.

4.2. This standard provides photography guidelines to better allow organizations to develop training programs and in-practice protocols.

4.3. This guide is not intended to address all potential examination types or conditions, nor does it supersede requirements of accrediting or certifying bodies.

5. Evidence Handling

5.1. Handle evidence according to organizational policies.

5.2. Steps shall be taken to ensure the integrity of the evidence.

5.2.1. Wear appropriate PPE around evidence to be processed for biological or trace evidence to avoid contamination.

5.2.2. Use a clean surface protector such as butcher paper or other commercial product as a barrier between the evidence and working surface.

5.2.3. Wear glove liners under examination gloves when handling evidence to be processed for latent prints. Examination gloves alone may not prevent the photographer's prints from being deposited.

5.2.4. When handling evidence that has been chemically treated, wear examination gloves rated for the chemical process.

5.2.5. Photograph only one item of evidence at a time when applicable. When photographing more than one item at a time (e.g., fracture match), take appropriate steps to prevent sample mix-up or cross contamination.

5.2.6. Repackage items before photographing new items.

5.2.7. When the possibility of cross contamination is an issue, clean the evidence examination area when changing items of evidence.

6. Safety Concerns

6.1. Wear PPE appropriate for the risk as directed in organizational guidelines and procedures.

6.1.1. Appropriate PPE may include gloves, masks, and body covers such as a gown or lab coat.

6.2. Follow universal safety precautions.

6.3. Light Sources

6.3.1. Many light sources used in laboratory photography are high intensity, become hot after a short period and can be invisible. These hazards can be harmful to exposed skin and vision.

6.3.2. Do not look directly into any light source.

6.3.3. Wear eye protection rated for hazards associated with the light source. Eye protection may be color filtered to assist viewing.

6.3.4. Cover exposed skin when working with ultraviolet light sources.

6.3.5. Maintain distance between light sources, equipment, and evidence to avoid heat damage. Avoid exposing evidence to light sources for longer than necessary.

6.3.6. Allow adequate cooling of lamps and housings before handling.

7. Suggested equipment

7.1. Equipment used must be appropriate for the type and nature of the evidence to be documented. It is at the discretion of the photographer/analyst to choose the appropriate method to record such evidence. Other equipment such as lenses, lighting equipment, tripods, and filters may be used as necessary.

7.1.1. Single Lens Reflex (SLR) Camera or Mirrorless Interchangeable Lens Camera (MILC), preferably with a full-frame sensor

7.1.2. Lenses covering normal to wide angle field of view, and macro capabilities

7.1.3. Storage media cards

7.1.4. Flash unit / lighting equipment

7.1.5. Various scales that have been previously checked against a known standard for accuracy (e.g. L-shaped, straight, ABFO no.2, NNDV no.2); millimeters recommended

7.1.6. Tripod

7.1.7. Off-camera flash sync cord, or wireless trigger

7.1.8. Spare batteries for camera, flash, and any other equipment

7.1.9. Lens cloth

7.1.10. 18% Gray card or Color reference card

7.1.11. Level

7.1.12. Alternate Light Source (ALS)

7.1.13. Articulating support

7.1.14. Copy stand

7.1.15. Polarizing filters

7.1.16. Barrier and band pass filters

7.1.17. Flash diffuser

7.1.18. Background material

7.1.19. Glass sheets of various sizes and thickness

7.2. Equipment repair, maintenance, and firmware updates shall be performed when necessary.

8. Retention and Storage of Photographs

8.1. All photographs should be retained as part of case documentation, regardless if they are captured with the photographer's primary camera or any other camera, such as a back-up camera, cell phone camera, or point-and-shoot device.

8.2. Original photographs should not be deleted. All photographs, including poor quality or unintended photographs, should remain as part of case documentation.

8.3. Photographs may be introduced as evidence. It is the responsibility of the organization to maintain all photographs so they are available for all intended purposes.

8.3.1. The organization should be aware of all local, state, and federal laws that regulate the manner, duration, and maintenance for evidentiary photographs; and should have policies in place that comply with those measures.

8.3.2. Digital photographs should be adequately maintained to prevent loss and degradation.

9. Documentation Photography

9.1. Provide photographs that will be used for the documentation of evidence.

9.1.1. Documentation photographs may be taken at various stages of analysis.

9.2. Documentation photographs may be saved using a minimally compressed image format.

9.3. Place the evidence on a new or recently cleaned distraction free background. Examples of background material are: seamless background paper, a paper roll of background material typically used in photo studios which is available from most professional photo supply stores; butcher paper, available from many office supply stores; or a neutral countertop. Avoid using floors, carpets or any other surface without a proper protective barrier.

9.4. Use even illumination, which can be accomplished by using two light sources set at approximately 45 degree angles to the evidence. Ensure the lights are of equal power and distance from the evidence.

9.5. The camera should be placed so the front of the lens or the back of the camera is perpendicular to the evidence or as close as possible to avoid distortion. For larger items of evidence, photography may require the use of a ladder or scaffolding to get to the height necessary to fit the evidence in the frame of view.

9.6. Take a photograph without a scale. Frame this photograph so there is enough room to add a scale and label without moving the evidence or camera.

9.7. A case number, item number, and scale should be included in subsequent photographs.

9.8. Photograph all sides of the evidence.

9.9. Photograph details on the evidence such as biological staining, cuts and tears, serial numbers or other identifying marks, or trace evidence adhering to the evidence.

9.9.1. Different lighting techniques (Section 12) may need to be considered to capture photographs of details.

10. Examination quality photographs

10.1. Provide photographs that have the potential to be used for comparison purposes or to calculate precise measurements.

10.1.1. Photographs in this category include, but are not limited to developed latent prints, footwear impressions, and suspected toolmarks.

10.2. The photographer should consider camera settings such as focal length, aperture, and subject-to-camera distance to minimize distortions, and control depth of field.

10.3. Use the camera's native ISO, the ISO that the camera's sensor was designed for, to ensure the best color, contrast, saturation, and minimize artifacts from noise. This is typically ISO 100, although the lowest ISO on some cameras is ISO 200.

10.4. Use a file format allowing for highest resolution and least compression available on the camera. For the benefit of a reviewer, photographs being captured in RAW may be captured with a camera setting of RAW+.jpg to benefit multi viewing methods.

10.5. Use a tripod, copy stand, or similar camera stability device.

10.6. Fill the frame with the subject.

10.7. Capture the photographs with the camera lens perpendicular to the subject.

10.8. Capture examination photographs using a scale that was checked against a known standard (millimeters recommended).

10.9. Take a photograph with a scale and label containing the case number, item number, the photographer's initials or other identifier. The label may include other information such as processing information (e.g. name of dye stain used) and other information the photographer wants to document in the photograph.

10.10. Use a scale approximately the same size as the item to be photographed to determine size and scale to life size (1:1) later. The entire width of the scale does not need to be in the photograph--only enough to determine the unit of measurement.

10.11. Position the scale on the same plane as the area of interest (e.g. the bottom of a shoe impression, adjacent to a developed print, adjacent to the head stamp on a cartridge). Use supports as needed for the scale and label.

11. Special Techniques

11.1. Chemiluminescence (e.g. luminol)

11.1.1. Capture an initial photograph of the area using normal lighting conditions.

11.1.2. Mount the camera on a tripod or other sturdy mount and compose the photograph of the area to be documented.

11.1.3. Capture a test exposure using a positive control.

11.1.3.1. A suggested setting is approximately 10 seconds at aperture f8 and ISO 400.

11.1.3.2. Set the flash to manual mode at approximately 1/64th power. Aim flash at the ceiling, or subject if ceiling is not available.

11.1.4. Compose the photograph to include the area to be treated.

11.1.5. Place scales where appropriate.

11.1.6. Spray the reagent over the area of interest.

11.1.7. Immediately darken the room. NOTE: these reactions are short and should be documented immediately after the reagent is applied.

11.1.8. Capture an initial exposure and evaluate the results and reshoot if necessary.

11.1.8.1. Adjust the flash to control background exposure.

11.1.8.2. Adjust shutter speed to control the exposure of the reaction in the photograph.

11.1.9. The area may be retreated and re-photographed with alternate settings. The reaction diminishes with each re-spray and the suspected stains may become diluted and run.

11.1.10. Be aware that consecutive long exposures may affect image quality due to noise. Consider using in camera noise reduction and pausing between exposures.

11.2. Fluorescence (e.g. ALS)

11.2.1. Capture an initial photograph of the area using normal lighting conditions.

11.2.2. Mount the camera on a tripod or other sturdy mount and compose the photograph of the area to be documented.

11.2.3. Select the appropriate wavelength and filter combination for the item being documented.

11.2.4. Remove any UV filters from the lens and attach the barrier filter.

11.2.5. Use a dim light to illuminate the scale and label or use a fluorescent scale and pen.

11.2.6. Darken the room and illuminate the area with the light source. Check focus and correct as needed.

11.2.7. Capture an initial test exposure.

11.2.8. Evaluate the results, adjust the settings, and rephotograph as necessary.

11.3. Near Infrared (NIR)

11.3.1. Use a camera designed or converted to be sensitive to NIR.

11.3.1.1. Cameras designed for IR photography are typically most sensitive in the 700-1000nm range.

11.3.1.2. Tethering the camera to a monitor, workstation or laptop may assist the photographer in previewing and reviewing photographs.

11.3.2. Use a filter designed to transmit IR radiation while blocking visible light.

11.3.2.1. IR filters have peak transmission at a specific point or range. Read filter specifications and avoid using those that transmit visible and UV light.

11.3.3. Capture an initial photograph of the area using normal lighting.

11.3.4. Mount the camera on a tripod or other sturdy mount and compose the photograph of the area to be documented.

11.3.5. Use a light source with significant output in the IR spectrum.

11.3.6. Select the appropriate filter for the item being documented.

11.3.7. Check focus and correct as needed.

11.3.7.1. A camera with live view will aid in checking focus, as IR filters block visible light.

11.3.8. Capture an initial test exposure.

11.3.9. Evaluate the results, adjust the settings, and rephotograph as necessary.

11.3.10. Cameras produce a false color image when taking IR photographs. Further processing or conversion to black and white often produces better results.

11.4. Ultraviolet (UV)

11.4.1. Use a camera designed or converted to be sensitive to UV radiation.

11.4.1.1. Cameras designed for UV photography are typically most sensitive in the 180-400nm range.

11.4.1.2. Tethering the camera to a monitor, workstation, or laptop may assist the photographer in previewing and reviewing photographs.

11.4.2. Use a lens designed for UV as the glass and plastics in many non-UV designed lenses block UV-B (180-200nm).

11.4.3. Use a filter designed to transmit UV radiation as well block IR, or an additional filter to block IR.

11.4.4. Capture an initial photograph of the area using normal lighting.

11.4.5. Mount the camera on a tripod or other sturdy mount and compose the photograph of the area to be documented.

11.4.6. Use a light source with significant output in the UV spectrum.

11.4.7. Select the appropriate filter for the item being documented.

11.4.8. Check focus and correct as needed.

11.4.9. Capture an initial test exposure.

11.4.10. Evaluate the results, adjust the settings, and rephotograph as necessary.

11.4.11. Cameras produce a false color image when taking UV photographs. Further processing or conversion to black and white often produces better results.

11.5. Close-up & macro photography

11.5.1. Use a lens designed for close focus often designated as “micro” or “macro”.

11.5.2. Use of longer focal length lenses increases the working (lens to subject) distance, which may make illuminating items easier; as well as minimizing the effects of distortion.

11.5.3. Close working distances create a shallow depth of field range

11.5.3.1. Consideration should be given to choice of aperture as smaller apertures will increase depth of field but may cause diffraction.

11.5.3.2. Be aware that slight changes to working distance will affect focus.

11.5.4. Use a tripod or other mounting device to reduce vibrations.

11.5.5. This technique can be combined with the use of focus stacking.

12. Lighting techniques

12.1. Considerations

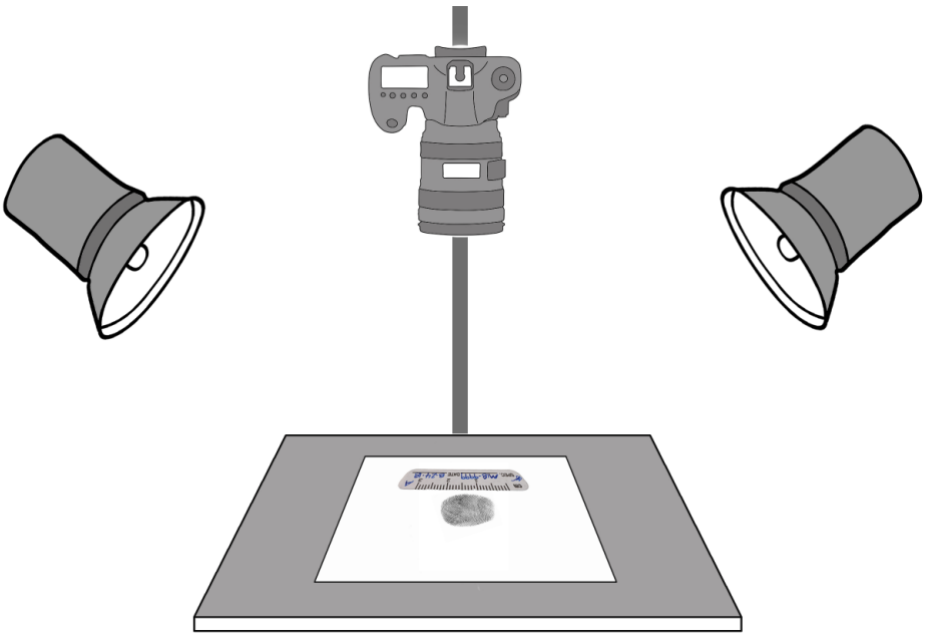
12.1.1. Various lighting techniques can aid in the documentation and visualization of evidence.

12.1.2. Evaluate the evidence to determine appropriate lighting techniques.

12.2. Direct Lighting

12.2.1. Light sources are directed towards the subject at approximately 45 degree angles, positioned at equal distances to the subject.

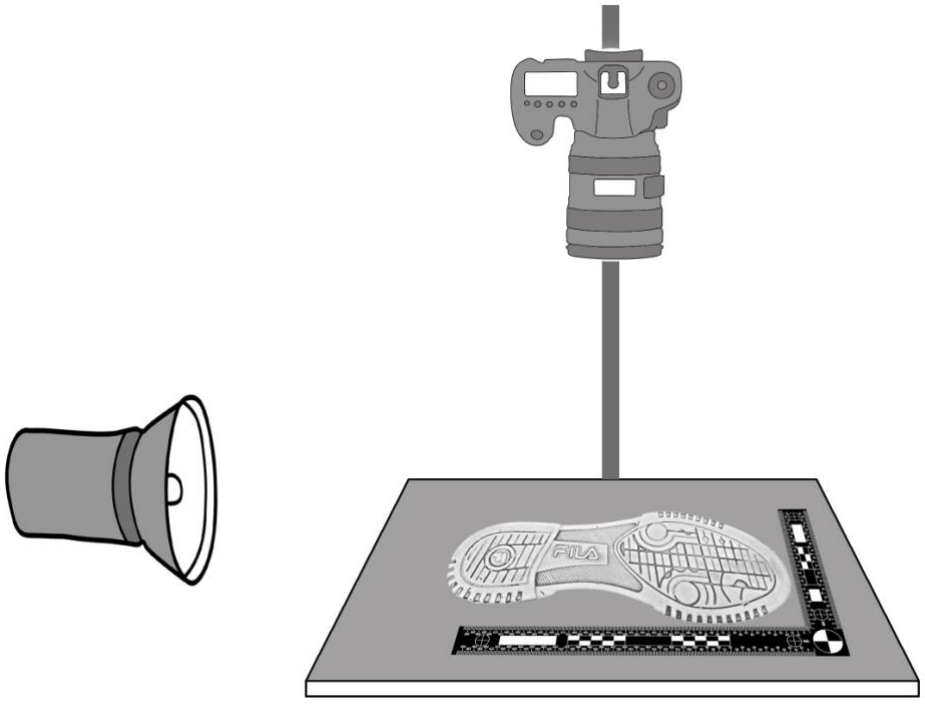
12.2.2. Ideal for general documentation photographs and some evidentiary close ups.



12.3. Oblique Lighting

12.3.1. Light source is positioned at a lower angle in an effort to cast shadows.

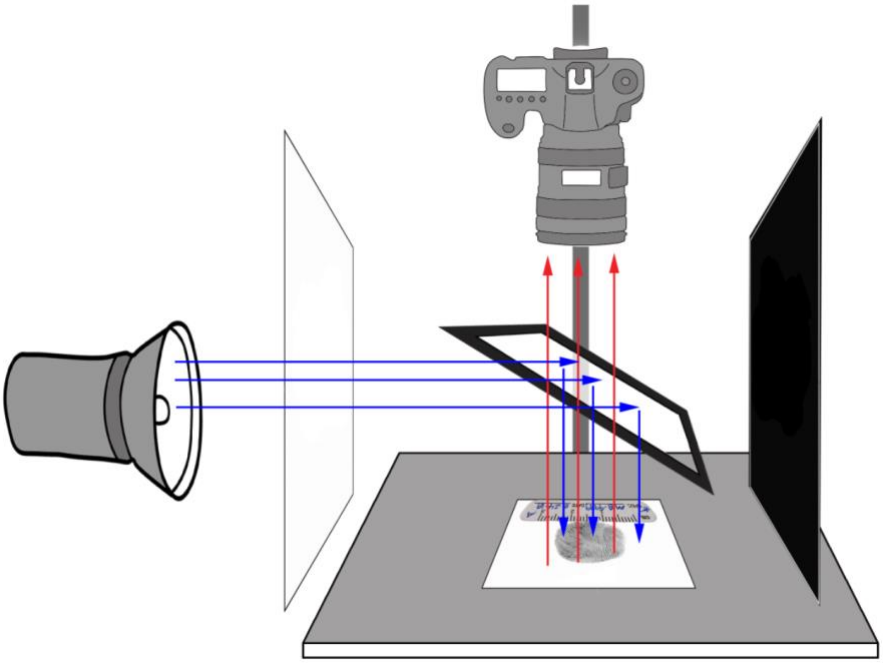
12.3.2. Ideal for impressions, indented writing, and highlighting texture.



12.4. Coaxial Lighting

12.4.1. Light source is directed parallel to the camera sensor plane and reflected through a beam splitter or thin piece of flat glass.

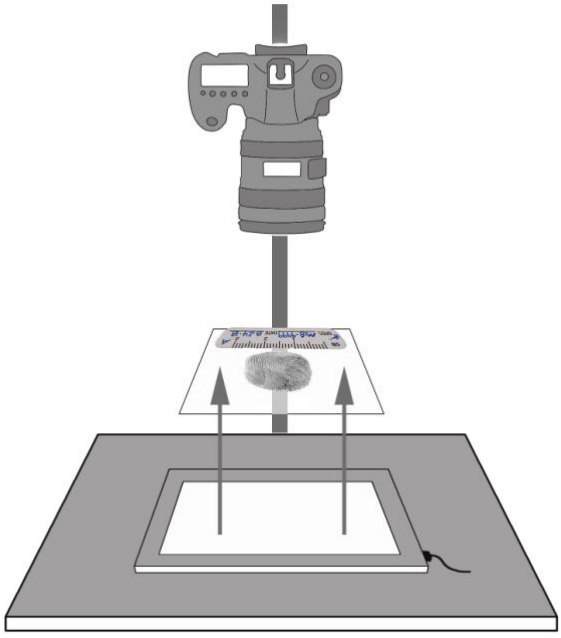
12.4.2. Ideal for capturing details on flat reflective surfaces (ie: mirrors, plastics and glossy paper items). Also works to photograph down into items where a light source may not reach.



12.5. Transmitted Lighting

12.5.1. Light source passes through a transparent or translucent subject.

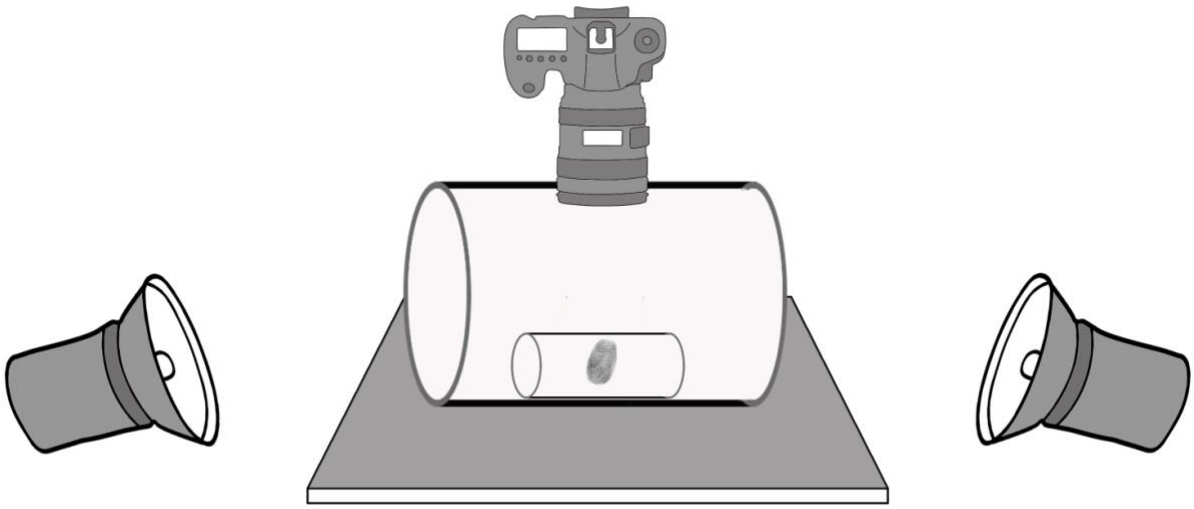
12.5.2. Ideal for transparent or translucent surfaces.



12.6. Bounce / Tented Lighting

12.6.1. Light source is directed off of a surface/reflector or through a translucent surface to evenly illuminate a subject.

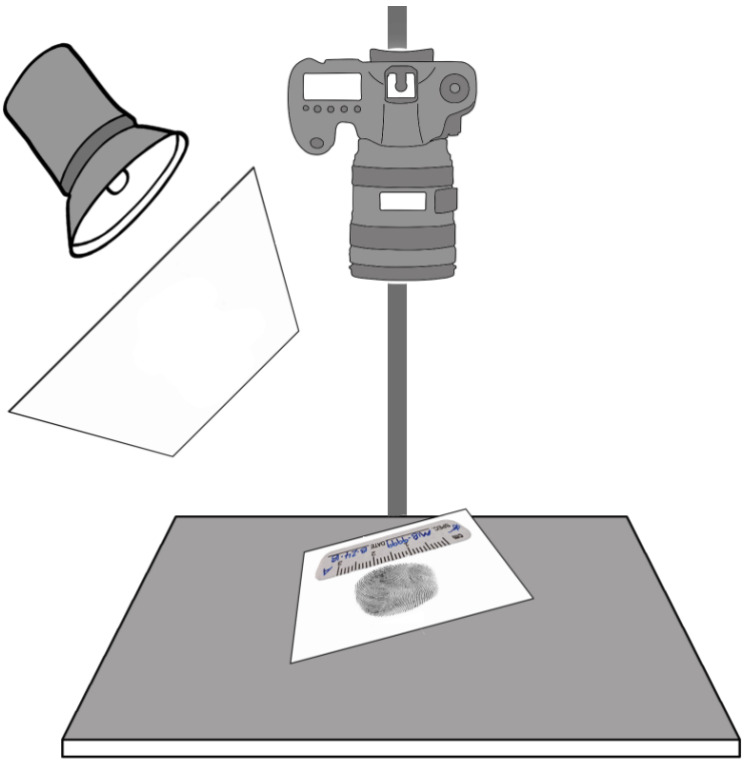
12.6.2. Ideal for concave or convex surfaces that are a challenge to light with a single light source.



12.7. Direct reflection

12.7.1. Light source is positioned to reflect directly off of the subject and into the lens.

12.7.2. Ideal for flat, reflective surfaces.



13. Keywords

13.1. Documentation photographs

13.2. Examination photographs

13.3. Chemiluminescence

13.4. Fluorescence

13.5. Ultraviolet light

13.6. Near Infrared light

13.7. Lighting techniques

13.8. Coaxial lighting

13.9. Oblique lighting

13.10. Bounce/Tented/Diffused lighting

13.11. Direct lighting

13.12. Transmitted lighting