Digital Photography for the Fire Investigator

Slide 1

Digital Photography and the Fire Investigator

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FIRE INVESTIGATOR DISTANCE LEARNING PROJECT

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1

Slide 4

Instructor

John Twomey
Forensic Photographer
United States Secret Service

John's career in law enforcement photography began in 1992 when he entered the "Forensic Photography Preceptorship Program" at the Dade County Medical Examiner's Department. John taught forensic photography to law enforcement and medical personnel from all over the world at the Dade County Medical Examiner's "International Forensic Photography Workshop." In addition, he was an active member of the Florida Division of the IAI and the South Florida Forensic Association. John taught at the "International Forensic Photography Workshop" on subjects including reflective photography of latent fingerprints, ultraviolet photography of bite marks and blood spatter photography.

John is currently working as lead Forensic Photographer with the United States Secret Service. He has taught crime scene photography to the Secret Service's Uniformed Division Crime Scene Search Unit, agents from the Bureau of Alcohol, Tobacco and Firearms, and has lectured at the National Native American Law Enforcement Association's annual conference.

4

Slide 5

Forensic Photography

United States Secret Service
Forensic Services Division

5

Digital Photography for the Fire Investigator

Why take photos?

- Document evidence
- Document damage to property
- Document injuries/death to victims
- Supplement your notes and/or report
- Refresh your memory for court

6

Why take photos?

- Used for further review later
  - Can be important if someone was not there but needs to understand what happened
- Presentation in court
  - Good photographs make you look more professional
  - Good photographs help the jury understand what happened
- Administration of justice

7

Crime Scene Photography

- Identifiers
  - An identifying photograph should be taken at the beginning of a scene telling vital information such as:
    - Date and time
    - Case Number
    - Investigator
    - Location

8

Digital Photography for the Fire Investigator

Crime Scene Photography

- Identifiers
  - Photograph some point of reference in the scene that will assist later in identifying where the scene was located
    - Street signs
    - Addresses on houses
    - Any other permanent point of reference

9

10

Crime Scene Photography

- Overall photographs
  - Overall photographs should be taken depicting an entire area of the scene as it was when you arrived. If the scene is too big take a series of overlapping photographs
  - Photographs should be taken from four sides of the scene if possible
  - Try to exclude other officers/persons from photos
  - Use numbered or lettered markers to show where important areas are in the scene

11

Digital Photography for the Fire Investigator

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15

Crime Scene Photography

- Medium shot
  - Shot of a particular area of interest taken with a normal lens(50mm if possible) that shows all items of interest.
  - These shots will be used to help show where close-up items of evidence are located relative to the rest of the scene

16

17

Crime Scene Photography

- Close Up
  - After taking your medium shot move in close with a macro lens and photograph small items of detail. Include a scale whenever possible.
  - When using a scale be sure to photograph perpendicular to the scale so it can be reproduced accurately if needed

18

19

Crime Scene Photography

- Always photograph all areas of the scene, regardless of whether they may not seem to be important to the scene
- Details may emerge later which make these photographs important
- Film and/or hard drive space is cheap so take as many as you need

20

Digital Photography for the Fire Investigator

Crime Scene Photography

- Work methodically so that photos are shot in a logical sequence
- Make sure all necessary photographs are taken before doing destructive photographs
  - Moving objects to get better shots
  - Specialized techniques that may destroy evidence

21

Crime Scene Photography

- Using Flash
  - When to use an electronic on-camera flash
    - Indoor and/or backlit photographs
    - Outdoor fill flash for shadowed areas
    - Night photography

22

Crime Scene Photography

- Using flash
  - Indoor
    - Always use a flash indoors for proper lighting if not using a tripod
  - Backlighting
    - The camera reads background light and will not fire the flash
    - Many automatic cameras will not fire the flash in this situation so you should have a camera that allows you to tell it when to fire the flash

23

24

25

Crime Scene Photography

- Using flash
  - In most cases automatic or TTL flash will work
  - Some cases will require you to compensate by adding or subtracting power from the flash
    - Areas of heavy burn may require + compensation on the flash in order to get more power
      – Black absorbs a lot of light

26

Crime Scene Photography

- Fill Flash
  - Filling in shadowed areas of a photograph using flash
    - Can make lighting more even when you have bright sunlight or other light sources

27

28

29

Crime Scene Photography

- Night photography
  - With Flash
    - Flash falloff
      - The flash only goes a short distance so a large scene will be under lit

30

31

32

Crime Scene Photography

- Night photography
  - With Flash
    - Multiple flashes or "painting with light"
      - Adds more light if the scene is too large to be lit by a single flash
      - Works well in areas where there are no streetlights or other light sources

33

34

Crime Scene Photography

- Night photography
  - Without Flash
    - Time exposure
      - Opening the shutter for a long period of time and allowing other light sources such as street lights to illuminate your scene
      - Requires a sturdy tripod
      - Allows jury to see the scene with natural lighting

35

36

Equipment Considerations

- What do you need in a camera kit?
  - Powerful external flash that's made to work with your camera
    - Flash sync cord
  - Multiple lenses
    - Good zoom lens and macro lens at least
  - Tripod
  - Cable release for shooting on tripod
  - Accessories
    - Batteries, rulers, film/digital media
  - Oh yeah, a good camera

37

Equipment Considerations

- Lenses
  - High quality optics are important
  - Zoom lens that covers a wide range
    - Wide angle
    - Normal view
    - Telephoto
  - Macro lens capable of 1:1 focusing
  - Wide aperture for lowlight shooting
    - F 2.8 lens if possible

38

Equipment Considerations

- Flashes
  - Powerful electronic flash
  - Sync Cord for off-camera operation
  - Infrared sensor for lowlight focusing
  - Swivel head for bounce or close-up work
  - TTL capability with camera
    - Through-the-lens metering
      - The camera and flash communicate to give proper exposure

39

Equipment Considerations

- Camera
  - A rugged professional camera, whether film or digital
    - Strong durable body
    - Interchangeable lenses
    - Ability to set camera automatically and manually
    - Hot shoe and flash sync
      - Allows external flash and off-camera operation
    - Various focus options
    - Lowlight focusing

40

Equipment Considerations

- Practice shooting with your equipment prior to shooting a crime scene
- Check all camera settings prior to shooting a crime scene
- Ensure that equipment is working properly
- Select proper film/digital ISO for the situation you are photographing
  - Low light - Higher ISO
  - Bright Sunlight - Lower ISO

41

Digital Photography for the Fire Investigator

In the Courtroom

- Photographs must accurately depict the scene to be admissible in court
  - Good Composition and lighting
  - Accurate color
  - Distances cannot be distorted
  - Accurate focus

42

In the Courtroom

- Photographs cannot be prejudicial
  - No unnecessary blood or gore
  - Must be relevant to the case being presented

43

In the Courtroom

- When presenting photographs in court the crime scene photographer must be able to tell the court the following items:
  - When were the photographs taken
  - The sequence in which they were taken
  - The orientation and/or location of the items in the photographs

44

In the Courtroom

- Are digital photographs admissible in court?
  - It differs by jurisdiction
  - Many courts now accept digital images
    - There are no known instances of photographs being inadmissible solely due to the fact that they were taken with a digital camera
  - Check with your state/district attorney

45

In the Courtroom

- Important Cases Involving Digital Photography
  - Almond v. The State
    - "We are aware of no authority, and appellant cites none, for the proposition that the procedure for admitting pictures should be any different when they were taken by a digital camera."

46

In the Courtroom

- Important Cases Involving Digital Photography
  - State of Washington vs. Eric Hayden
  - State of Florida vs. Victor Reyes
    - In both cases digitally enhanced fingerprints were subjected to a Frye hearing and in both cases the fingerprints were admitted at trial
    - Reyes case ended up in acquittal however not due to the enhancement of the fingerprint evidence

47

In the Courtroom

- Image Authentication
  - Proposed law in Wisconsin noted that there is no case law excluding photographs solely on the basis that they were taken with a digital camera, however it was suggested that some type of image authentication be implemented
  - Image Authentication can simply be a procedure in place to ensure that the original photograph is that which is presented in court

48

In the Courtroom

- Image Authentication
  - Software is available that claims it can ensure that one image is identical to another
    - Most look at the file structure and use algorithms to verify that no changes have been made
    - Like any software, if someone wants to defeat it they probably can
    - Is it necessary or will other procedures suffice?

49

In the Courtroom

- Image Authentication
  - Original image should be preserved for the court and steps be taken to ensure that the practitioner can show that the presented image is the original
    - SOP's, Chain of Custody procedures, and Witness testimony
    - History or written notes to document advanced enhancement techniques
  - SWGIT is currently discussing the issue of Image Authentication in order to better understand what software is available and how it works

50

Digital Photography for the Fire Investigator

Digital Photography

- What captures the light?
  - CCD or CMOS Sensor
    - Captures light and turns it into and electronic signal
    - Sensor is made up of thousands of pixels(picture elements)
    - Generally, the more pixels the better the image
    - How many pixels do you need?
      - 6, 10, 12, 14, 22 megapixels
      - Depends on what you are photographing and what your expected output is
      - Does a first responder need the same camera that an investigator needs?

51

Digital Photography

- What captures the light?
  - The image sensor can only capture grayscale image
  - Most sensors are covered in a grid of colored filters in order to make a color picture

52

Digital Photography

- Equipment Considerations
  - Camera
    - Why would you buy a low quality digital camera?
      - Cost
      - "Looks good on the monitor"
      - Ease of use
    - Professionals should use professional equipment
      - Cost may be prohibitive but can be easily justified

53

Digital Photography

- Equipment Considerations
  - Consumer Camera
    - Small CCD size
    - Poor quality CCD
    - Poor optics
    - Slow picture taking and writing to memory
    - Few Features
    - Relatively inexpensive

54

Digital Photography

- Equipment Considerations
  - Pro-sumer Camera
    - Larger CCD size
    - Good optics
    - Faster picture taking and writing to memory
    - Extra features
    - Not-so-rugged plastic body
    - Ability to shoot uncompressed formats
    - More expensive

55

Digital Photography

- Equipment Considerations
  - Professional Camera
    - Large CCD size, high pixel count
    - High quality interchangeable lenses
    - Very fast picture taking and writing to memory
    - External flash
    - Rugged durable body
    - Ability to shoot uncompressed formats
    - Expensive

56

Digital Photography

- Equipment Considerations
  - Lenses
    - Typically the sensor size of a digital camera is smaller than 35mm film, therefore the effective focal length of the lens changes
    - When using removable lens, the aspect ratio changes
      - Multiply lens focal length by approximately 1.5 to get effective focal length
      - 50mm lens becomes 75, 200mm becomes 300, etc.
      - Good for zoom lenses, bad for wide angle

57

Digital Photography

- Equipment Considerations
  - Accessories for camera
    - Batteries
      - The more you look at the monitor, the quicker you burn the batteries
    - Media
      - Higher mega-pixel cameras take up more drive space

58

Digital Photography

- Equipment Considerations
  - Accessories for the laptop/desktop computer
    - RAM
    - Disk drives
    - USB and/or fire wire ports
    - Card readers
    - Large hard drive
    - CD/DVD writer
    - Adaptors for various media cards

59

Digital Photography for the Fire Investigator

Digital Photography

- Equipment Considerations
  - Common types of printers
    - Inkjet
    - Dye sublimation
    - Laser
    - Photo quality

60

Digital Photography

- Equipment Considerations
  - Print resolution
    - Inkjet printers can print at any resolution, though the higher the better
    - Other types of printers need a specific resolution, usually around 300 pixels per inch

61

Digital Photography

- Equipment Considerations
  - Print resolution
    - Resolution needed to print at different sizes without resampling or interpolating the photo
      - 4x6 @ 300 ppi = Approximately 2 megapixels
      - 5x7 @ 300 ppi = Approximately 4 megapixels
      - 8x10 @ 300 ppi = Approximately 7 megapixels
      - 4x6 @ 150 ppi = Approximately .5 megapixels
      - 5x7 @ 150 ppi = Approximately .75 megapixels
      - 8x10 @ 150 ppi = Approximately 2 megapixels
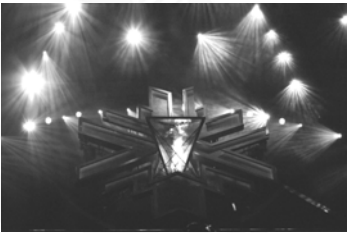
62

Digital Photography

- Digital Noise
  - The collection of electrons at the pixel sites creates colored pixels in the dark areas of the photograph
  - Noise is caused by:
    - Low light or underexposed photographs
    - Long exposure times
    - Heat
    - High ISO settings

63

Digital Photography

- Digital Noise

64

Digital Photography

- Digital Noise

65

Digital Photography

- Digital Noise
  - Shoot at the lowest possible ISO
    - Daylight - 100 to 200 ISO
    - Night - 400 - 800
  - If shooting timed exposures try to keep the exposure time to a minimum
  - Don't expose camera to heat
  - Noise reduction software is available as a last resort

66

Digital Photography

- The most common file formats are:
  - JPEG(lossy compression)
  - MPEG(video compression)
  - TIFF(Uncompressed)
  - TIFF LZW(Loss less compression)
  - BMP(Bitmap)
  - Raw
    - Native to some professional digital cameras
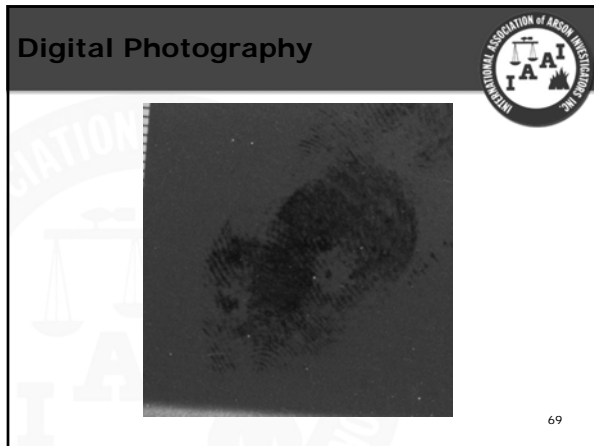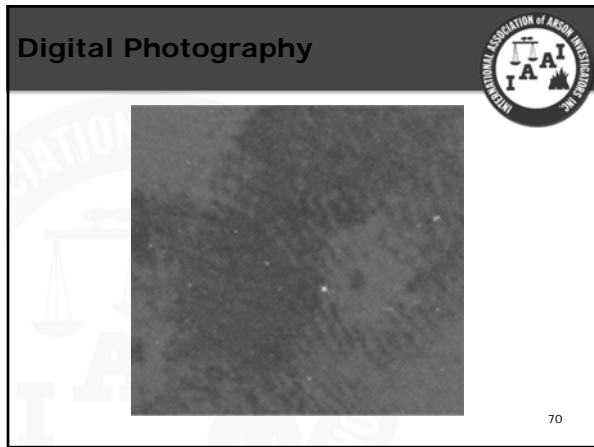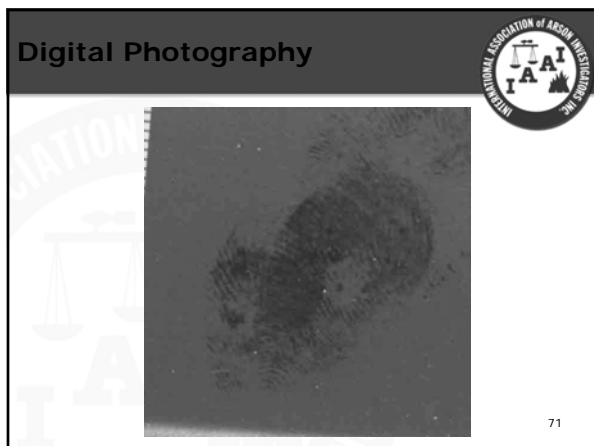
67

Digital Photography

- Image Compression
  - For forensic uses compression should not be used as it throws away original information from the image
  - Compression makes the image smaller by eliminating some of the original information in the photograph
  - Saves hard drive space but image quality can suffer

68

Digital Photography for the Fire Investigator

Digital Photography

69

Digital Photography

70

Digital Photography

71

Digital Photography for the Fire Investigator

Digital Photography

72

Digital Photography

- File formats
  - JPEG
    - Use lowest compression and highest resolution
    - Allow you to shoot more photos on a card
    - Slight loss of image quality, depending on amount of compression
  - TIFF
    - Uncompressed file takes up a lot of drive space
      – 6 megapixel camera will yield 18mb color image
    - Highest quality, no image degradation
  - Raw
    - Takes up less space than TIFF, more than JPEG
    - Needs proprietary software from manufacturer
    - High quality image
    - Software allows you to make basic changes to image after capture
    - Must be converted to other formats for printing or distributing

73

Digital Photography

- Storage considerations
  - Large hard drive in the computer
  - Large memory cards for the cameras
  - CD or DVD or other for backing up files
  - Larger solutions such as RAID devices

74

Digital Photography

- Enhancement vs. Manipulation
  - Are you improving image quality or altering the image?
  - Care must be taken and operating procedures followed when making adjustments to an image
  - Maintain original image
  - If advanced techniques are used document procedures and resave enhanced image
  - Software may save edit history for you either as an external file or as metadata in the image file
  - Practitioners should be trained in proper techniques
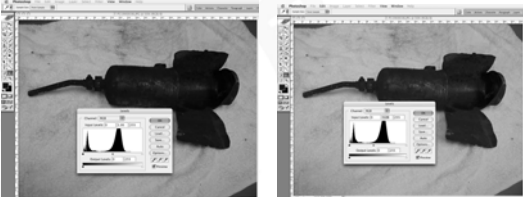
75

Digital Photography

- Basic Image Enhancement
  - Techniques used to improve image quality
    - Brightness and Contrast Adjustments, including dodging and burning
    - Resizing
    - Cropping
    - Positive to negative inversion
    - Image Rotation/inversion
    - Conversion to grayscale
    - White Balance
    - Color Balancing/Correction
    - Sharpening and Blurring

76

Digital Photography

- Image Enhancement
  - Contrast and Brightness adjustments
    - Making an image lighter/darker or adjusting contrast to improve the appearance of the image
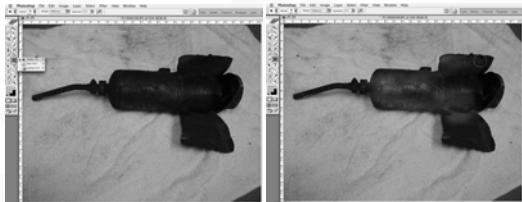

77

Digital Photography for the Fire Investigator

Digital Photography

- Image Enhancement
  - Dodging and burning of an image is used to selectively brighten or darken certain areas of the photograph

78

Digital Photography

- Image Enhancement
  - Resizing
    - Changing the actual pixel count of an image(Interpolation)
      - Upsampling is adding pixels where none previously existed
      - Downsampling is removing pixels to make image smaller
    - Care must be taken when increasing the size as image will start to look pixelized when too many pixels are added
    - Is done automatically a lot of times when printing a digital image
  - Cropping
    - Removing parts of the photograph
    - This should only be done when printing
      - The original image should not be cropped and resaved

79

Digital Photography

- Image Enhancement
  - White Balance/Color Balancing
    - Adjusting color in an image for accurate color
    - Adjusting for different lighting conditions
  - Sharpening
    - Basic sharpening of an image to improve print quality
    - Amount of sharpening should depend on the image resolution and output
    - Over-sharpening will result in halos around edges and pixelization
    - View the image at 100% for accurate preview of sharpness

80

Digital Photography

- Image Enhancement
  - Sharpening
    - Image on right is over-sharpened

81

Digital Photography

- Image Enhancement
  - Techniques that should be avoided for forensic imaging
    - Selective adjustments to certain areas of a photo
      – May introduce artifacts
    - Spotting, Erasing, Rubberstamping, Cloning, etc
      – Anything that deletes details in an image or cuts out parts of the image

82

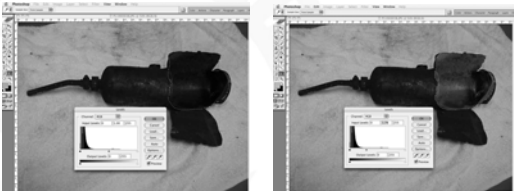## Digital Photography

- Image Enhancement
  - Techniques that should be avoided for forensic imaging
    - Selective adjustments to certain areas of a photo

83

Digital Photography

- Image Enhancement
  - Techniques that should be avoided for forensic imaging
    - Spotting, Erasing, Rubberstamping, Cloning, etc.

84

Digital Photography

- What software to use
  - Image Editing/Printing
    - The most expensive solution is sometimes not necessary
    - Get one that does what you need, such as basic editing, layout and printing
  - CD/DVD writing
  - Data Recovery
    - Retrieves deleted images from storage media
  - Digital Asset Management
    - Archiving and Storing
  - All applicable software that comes with the various cameras, printers, etc,
  - Specialized software
    - Noise reduction, sharpening, etc.

85

Digital Photography

- Pros
  - View images immediately on scene
  - No processing or sending out to a lab
  - Color balance to any type of lighting condition
  - Send files quickly to anywhere by email
  - Ability to make corrections and enhancements
  - Money can be saved over time
  - Digital image cannot be fogged or degrade over time like film
  - Copies can be made without any degradation

86

Digital Photography

- Cons
  - Expensive up-front cost
  - Images can be deleted accidentally
  - Lower image quality with less expensive cameras
  - Printing can be slow
  - Long term archiving solutions
    - Unknown how long CD/DVD's last
    - Hardware and software changing so fast things become obsolete quickly

87

Digital Photography

- Standard Operating Procedures
  - Set standards that all practitioners can follow
  - Make procedures repeatable
  - Protect, archive and handle images as you would film
    - However be sure to back up whatever archival media you select
    - Also make sure to have plans for images from major crimes that need to be stored long term
  - Make sure practitioners are properly trained on equipment and procedures
  - All equipment should be properly maintained and calibrated for consistency

88

Digital Photography

- Standard Operating Procedures
  - Always work and save images in an uncompressed or least compressed format if possible and use highest camera resolution
  - Copy originals to a read-only media such as CD-R as soon as possible
  - Save images in their native file format
  - If possible use a camera that records EXIF data
    - Embedded data from camera such as date, time, etc
    - Make sure you have the correct date and time in the camera

89

Digital Photography

- Standard Operating Procedures
  - Working on images in the computer
    - Be specific about what techniques are ok to use and what are not
    - Be specific about what should be documented using notes or software history

90

Digital Photography

- Standard Operating Procedures
  - Working on images in the computer
    - Copy original image and work on copy
    - Save the changes made to copy as a new file
    - Backup images to another storage media
      - Duplicate CD or to hard drive/tape backup

91

Digital Photography

- How can digital photographs benefit you at a crime scene?
  - Make sure you have the shot
  - Change color balance and ISO without changing film
  - Shoot without changing film repeatedly
  - Download and print or transmit if necessary
  - Shoot many more photographs without incurring added processing and printing costs

92

Digital Photography for the Fire Investigator

Digital Photography

- Considerations
  - Digital chip has sensitivity similar to slide film
    - Less latitude means its easier to be over or underexposed
      - Shoot another shot if you are not sure about exposure
      - Its better to be slightly underexposed than overexposed
        » Once there is white in the image you cannot get any more detail
      - However if you are too underexposed you will lose detail and introduce noise

93

Digital Photography

- Considerations
  - The digital chip is exposed on many professional digital cameras
    - Dust can get into the camera when changing lenses and get on the chip
      - This causes black spots on your images
    - There are ways to clean chip but it is risky because you can damage or scratch the chip
    - Be careful when changing lenses at scenes
    - Use a blower brush if necessary to blow dust out of the inside
    - Use a specially designed swab or other device to clean chip, however be extremely careful

94

QUESTIONS FOR THE INSTRUCTOR

95

Digital Photography for the Fire Investigator

Certificate of Completion and Testing

To take the test for this program and receive a certificate of completion, select the TEST button on your screen

When you finish the test you will be instructed on how to print your certificate of completion for this program

96

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THANK YOU

Watch for new programs on CFITrainer.net

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