

## TRACE EVIDENCE

### DESCRIPTION OF SESSION

This session provides participants with an understanding of trace evidence and how it is used to connect people, places, and things in a criminal investigation.

### CATEGORIES

- Exploring: Law Enforcement
- U.S. Department of Education: Law, Public Safety, Corrections & Security
- U.S. Department of Education: Government & Public Administration

### OBJECTIVES

By the end of this session, participants will be able to:

- Define trace evidence.
- Explain Locard's exchange principle as it pertains to trace evidence.
- List common types of trace evidence.
- Collect and package trace evidence.
- Identify the types of microscopes used in the examination of trace evidence.
- Explain the basic principles behind light microscopy.
- Perform tape lifting as a means of recovering trace evidence from a garment.
- Examine trace evidence to determine its identity and source.

### SUPPLIES

- (1) computer with internet access
- For each participant:
  - (1) sheet of 8½-by-11-inch white paper
  - (1) dissecting kit/forceps and probe
  - Hairs and fibers
  - (1) roll of evidence tape or any other type of tape available
  - A shirt that the participant has worn but not laundered, packed in a clean plastic bag
  - (1) roll of clear packing tape
  - (1) pair of scissors
  - (2) 8 ½" X 11" clear acetate sheets
  - (1) black Sharpie marker
  - (1) stereo microscope or hand lens
  - **Trace Evidence** activity sheet (PDF)
  - (1) computer or other device with internet access

### PREPARATION

Arrange ahead of time for each participant to bring in a shirt he or she has worn but not laundered. The shirt should be placed in a clean plastic bag after it has been worn.

See Activity 5 for suggestions of places where participants could visit and make arrangements as needed.

## WEBSITES

- MicroscopyU: [www.microscopyu.com](http://www.microscopyu.com)—Contains abundant information on all types of microscopy.
- “Every Clue Counts – Forensics Inconceivable Without Microscopy” (Science Lab): [www.leica-microsystems.com/science-lab/forensics/every-clue-counts-forensics-inconceivable-without-microscopy/](http://www.leica-microsystems.com/science-lab/forensics/every-clue-counts-forensics-inconceivable-without-microscopy/)—Overview of forensic microscopy with good images.
- “Microscopes” (Maz Science): [www.youtube.com/watch?v=6vZZeWqbmU8](http://www.youtube.com/watch?v=6vZZeWqbmU8)—Explains different types of microscopes.
- “Introduction to Locard’s Exchange Principle (Sara Asmann): [www.youtube.com/watch?v=PA9S43epX-g](http://www.youtube.com/watch?v=PA9S43epX-g)—Explains Locard’s exchange principle
- “Forensics: Trace Evidence Part 1” (Albert Kausch): [www.youtube.com/watch?v=3vUBa6-FIEo](http://www.youtube.com/watch?v=3vUBa6-FIEo)—Part 1 of trace evidence overview.
- “Forensics: Trace Evidence Part 2” (Albert Kausch): [www.youtube.com/watch?v=Ylo16KARz7M](http://www.youtube.com/watch?v=Ylo16KARz7M)—Part 2 of trace evidence overview.

## VIDEOS

**Reminder:** Any time you use an outside source, be sure you follow the content owner’s or website’s permission requirements and guidelines.

These videos were chosen because they illustrate important aspects of the forensic science discipline being studied in this session. **Note:** Some of the content in the case studies is geared toward a mature audience. Advisors should review these videos before showing them to ensure that they are age appropriate for the post.

- *Forensic Files: Speck of Evidence* (FilmRise): [www.youtube.com/watch?v=Vwi0V5tbSuM&index=42&list=PLypFMG4Pn4RB8L3BTY3G4ZGhrXEcm6UsO](http://www.youtube.com/watch?v=Vwi0V5tbSuM&index=42&list=PLypFMG4Pn4RB8L3BTY3G4ZGhrXEcm6UsO)—Case study No. 1.
- *Forensic Files: Paintball* (FilmRise): [www.youtube.com/watch?v=yicTN2N9BEU&index=164&list=PLypFMG4Pn4RB8L3BTY3G4ZGhrXEcm6UsO](http://www.youtube.com/watch?v=yicTN2N9BEU&index=164&list=PLypFMG4Pn4RB8L3BTY3G4ZGhrXEcm6UsO)—Case study No. 2.
- *Forensic Files: Material Witness* (FilmRise): [www.youtube.com/watch?v=ppGWy2kCKjg&list=PLypFMG4Pn4RB8L3BTY3G4ZGhrXEcm6UsO&index=270](http://www.youtube.com/watch?v=ppGWy2kCKjg&list=PLypFMG4Pn4RB8L3BTY3G4ZGhrXEcm6UsO&index=270)—Case study No. 3.

**ADVISOR NOTE:** Make sure you add time in your activities for viewing and discussing videos with the Explorers. These videos are currently not built into the session plan so you will need to choose those that best complement your activities and plans for this topic.

**ADVISOR NOTE:** Text in italics should be read aloud to participants. As you engage your post in activities each week, please include comments, discussions, and feedback to the group relating to **Character, Leadership, and Ethics**. These are important attributes that make a difference in the success of youth in the workplace and in life.

## **ACTIVITIES**

### **Introduction**

Say to Explorers: *In forensic science, trace evidence is used to demonstrate that people or objects have come into contact with or close proximity to each other. This type of evidence, also known as associative evidence, typically can't be examined by the unaided eye. Trace evidence requires microscopic examination. Microscopes common to most forensic laboratories consist of stereomicroscopes, compound microscopes, polarizing light microscopes, comparison microscopes, and scanning electron microscopes. Different types of trace evidence will require different types of microscopes and different types of microscopic techniques. Some typical types of trace evidence are hairs, fibers, paint, glass, soil, and building materials.*

To provide more background to the Explorers, you may wish to show some of the videos listed under “Websites” (or other similar videos).

After Explorers have conducted Activities 1-4, debrief as a large group.

### **Activity 1**

#### **Collecting Trace Evidence**

Show Explorers the following video: “How to Collect Hair & Fiber Evidence at a Crime Scene” (National Forensic Academy)—[www.youtube.com/watch?v=cfWsgS0ID-s](http://www.youtube.com/watch?v=cfWsgS0ID-s). Then have Explorers follow this procedure:

- Using an 8½-by-11-inch piece of white paper, make a druggist fold.
- Using a pair of forceps, collect and package hairs or fibers.
- Properly seal the druggist fold with evidence tape or any other type of tape available.

### **Activity 2**

#### **Trace Evidence Recovery Through Tape Lifting**

Have each Explorer do the following:

- Take the shirt he or she has worn but not laundered out of the bag and lay the shirt front side up on a clean table.

- Cut a 6-inch piece of clear packing tape, and repeatedly press it onto the front and back of the right sleeve until the entire surface of the sleeve has been in contact with the adhesive side of the tape.
- Lay the tape, adhesive side down, onto the piece of acetate and label it “right sleeve.”
- Repeat the procedure separately for the left sleeve, for the front of the shirt, and for the back of the shirt, laying each piece of packing tape onto the acetate and labeling accordingly.

### Activity 3

#### Microscopic Examination of Trace Evidence

Have each Explorer do the following:

- Take the piece of acetate made in Activity 2 and cut it into strips along the edges of tape lifts so that there are four strips (right sleeve, left sleeve, front, and back).
- Using a stereoscope or hand lens, carefully examine the material adhering to the tape lift. **DO NOT SEPARATE THE TAPE FROM THE ACETATE.**
- Circle and number each piece or cluster of trace evidence as you discover it.
- Document your findings on the **Trace Evidence** activity sheet.

### Activity 4

#### Case Studies

Show one or more of the *Forensic Files* episodes listed under “Videos” to the Explorers and discuss how collection and examination of trace evidence helped in the investigation.

### Activity 5

#### Visit or Research

- If possible, arrange for a visit to a local, county, or state crime laboratory with an emphasis on the trace evidence section.
- Have Explorers research the Wayne Williams case.

#### ADVISOR NOTE

Some sample questions are below. They are designed to help the participants apply what they have learned to their own interests. You are welcome to use these questions or develop your own questions that relate to your post or specific focus area.

#### REFLECTION

- *What is Locard’s exchange principle and why is it important in the examination of trace evidence?*
- *Identify and explain at least three type of microscopes that are used in the examination of trace evidence.*
- *Describe a method for recovering trace evidence from a garment.*

- *Explain how the frequency of occurrence of a particular type of trace evidence would affect its evidentiary value.*
- *Discuss your findings from Activity 3.*

### **ADVISOR AND OFFICER REVIEW**

After the meeting, address the following:

- Identify what was successful about the meeting.
- Identify what needed improvement.
- Schedule an officer and Advisor planning meeting to prepare for the next post meeting or activity.

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### Trace Evidence

**Directions:** For each tape lift, provide a written description, a material identification if possible, and a potential source of the material.

#### Right Sleeve

Item No.	Written Description	Identification	Source

#### Left Sleeve

Item No.	Written Description	Identification	Source

**Front of Shirt**

<b>Item No.</b>	<b>Written Description</b>	<b>Identification</b>	<b>Source</b>

**Back of Shirt**

<b>Item No.</b>	<b>Written Description</b>	<b>Identification</b>	<b>Source</b>