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Fracture Match Workshop

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Fracture Match/Case Examples

Keyence Presentation

Practical Exercises/Mock Scenarios



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- Fracture Match
 - Realignment of two or more objects to prove that they at one time formed a single object.
 - Can be a positive form of identification.
- Match
 - A corresponding pair.
- Unique
 - Being the only one of its kind.



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- Fracture Match –
 - Very powerful associative examination in Forensic examinations.
- Types of materials fracture match examinations can be useful in:
 - Glass (breaking and entering)
 - Metal (forced entry with a tool)
 - Wood (assault with baseball bat)
 - Plastic materials (to include wrappers, bags, etc)
 - Paint (hit and run)
 - Tape (binding)



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Criteria for a fracture match exam:

- Item(s) must be broken and detached
- Items must be capable of being physically realigned
 - Maybe a piece is missing...can it be found?
- Do they fit together as a “lock and key”
 - Surface markings may exist on the item that align
 - Along an edge to edge boarder
 - Like a jigsaw puzzle
- Are the pieces unique?
 - Can they be interchanged with similar pieces elsewhere?



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- The Examiner vs. lay person
 - The examiner uses scientific method to support *common sense*.
 - What differentiates a skilled examiner from the casual observer?
 - Experience
 - Recognition
 - Distinguish between class and individual characteristics



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- Error rate studies:
 - FBI: Duct tape end matches
 - Christensen and Sylvester
 - Positive association rate (correct match) was .925
 - Non-association rate (overlooked match) was .075
 - Negative association rate (incorrect match) was .001
 - Bradley, Gauntt, Mehlretter, Lowe and Wright
 - A validation Study for Vinyl Electrical Tape End Matches.



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- Purpose of conducting a fracture match exam
 - Comparisons
 - Making an identification or exclusion...Could it have originated from the source submitted for comparison?
 - Classifications
 - A classification is not an identification...What is it? Organization into groups/categories. Similar in class characteristics only.



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Examination

- Methods of survey
 - Separation of layered objects
 - Objects that have undergone dislocation/displacement/distorted. Examples – paint, adhesive materials.
 - 3 Dimensional separations
 - A three dimensional fit, utilizing all available surfaces (depth).
 - 2 Dimensional separations
 - Two dimensional planar edge.



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Examination

- Tools/Instrumentation
 - Macroscopic Exam
 - Microscopic Exam
 - Stereoscope
 - PLM
 - SEM
 - Camera/Documentation



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- Class Characteristics

- Characteristics that make items similar at best – color, shape, pattern.
- Measurable features of a specimen which indicate a restricted group source; they result from design factors, and therefore determined prior to manufacture.
 - Characteristics that are general in nature
 - Repetitive patterns



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- Individual Characteristics (makes them unique)
 - Required for positive identification (features of evidence associated with a unique source).
 - Physics behind the random force(s) used to **break or tear** an item are not reproducible = individual characteristic; unless that force is a controlled force.
(torque/momentum/force, acceleration/speed)
 - Imperfections or irregularities produced accidentally during manufacture or caused by use, abuse, corrosion, rust or damage to an object; they are unique to that object and distinguish it from all other similar objects – also called accidental characteristics.
 - Accidental surface markings.
 - Serial number unique to an item...break may occur across serial number



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- Case Examples
 - Condom Wrapper
 - Body wrapped in plastic
 - Duct tape
 - Wood (2 cases – 2X4, branch)
 - Clothing (t-shirt)
 - Barrett (SEM)
 - Glass (SEM)



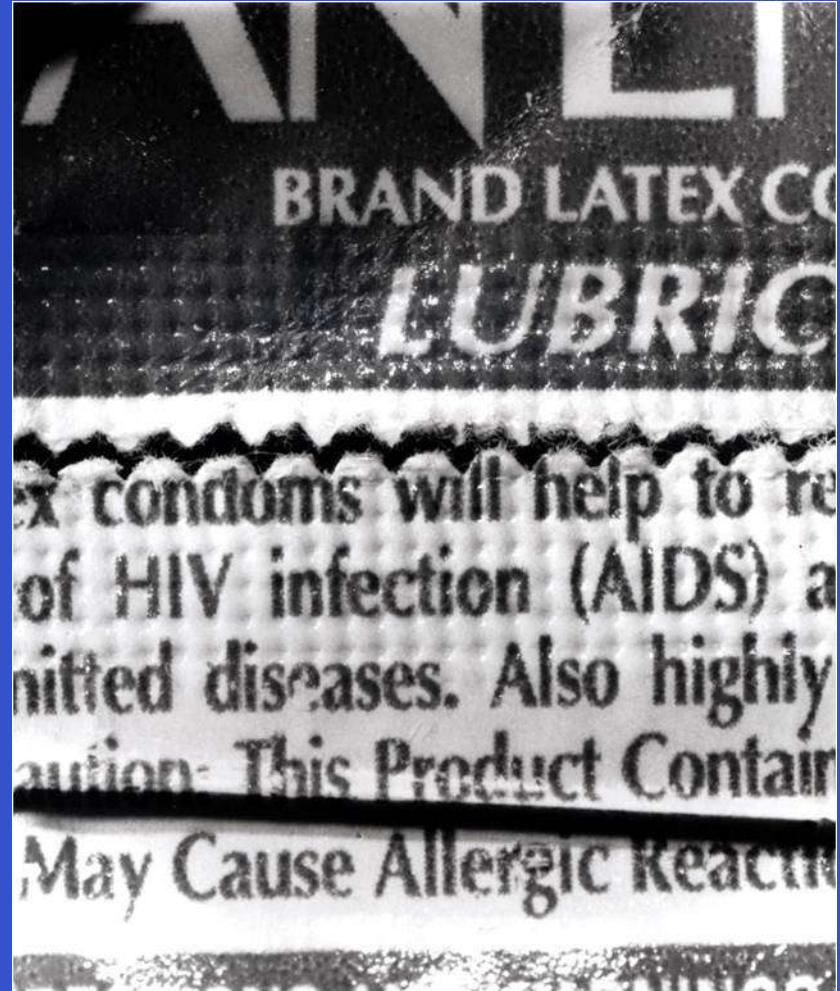
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- Condom Wrapper Case
 - Victim sexually assaulted; suspect throws used condom wrappers out the window of victims room. A piece of wrapper was recovered from the nightstand of the victims room (scene). Other condoms were recovered from the suspect (room).



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- Husband kills wife and wraps her body up in plastic and dumps her body over a bridge, suspect was apprehended at the scene.





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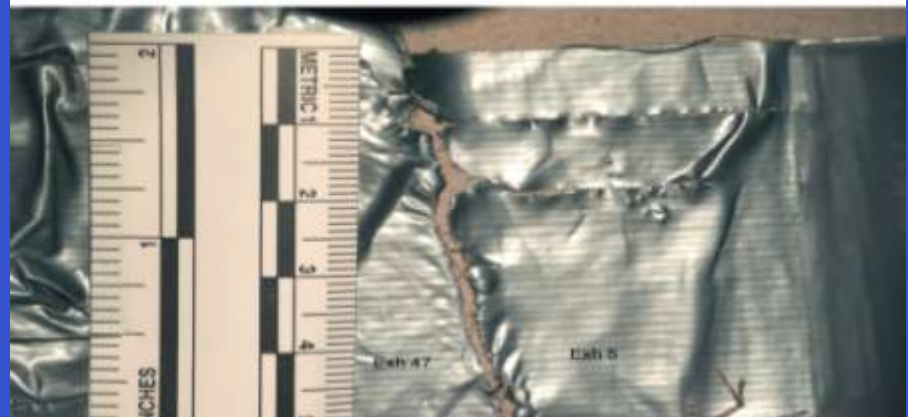
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- Mom drives to secluded area with her children, she gives older daughter toys to play with outside of car. While child is playing outside mother poisons younger daughter with carbon monoxide by attaching hose to tailpipe of vehicle using duct tape. The mother then does the same with the older daughter. After the children are deceased the mother stabs herself and is found with a plastic bag around her head.

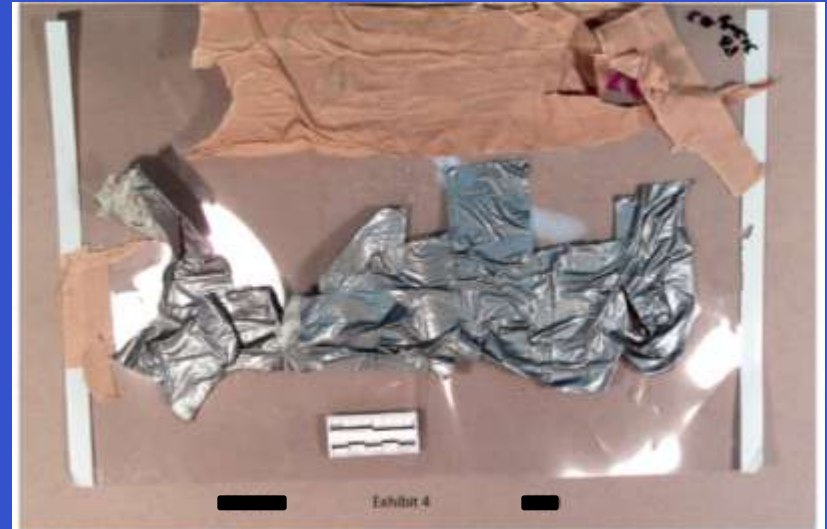


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- Suspect was stealing from tractor trailers and would use 4X4's to prop up the trailer. When the suspect was apprehended 4X4's were recovered from his truck.
- Suspect used a chain saw to cut the ends of the 4X4's.



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- Suspect dumps a body in the woods, and a smaller portion of a branch is caught in the door or the suspects vehicle. The larger portion of the branch was recovered in the wooded area where the body was recovered.



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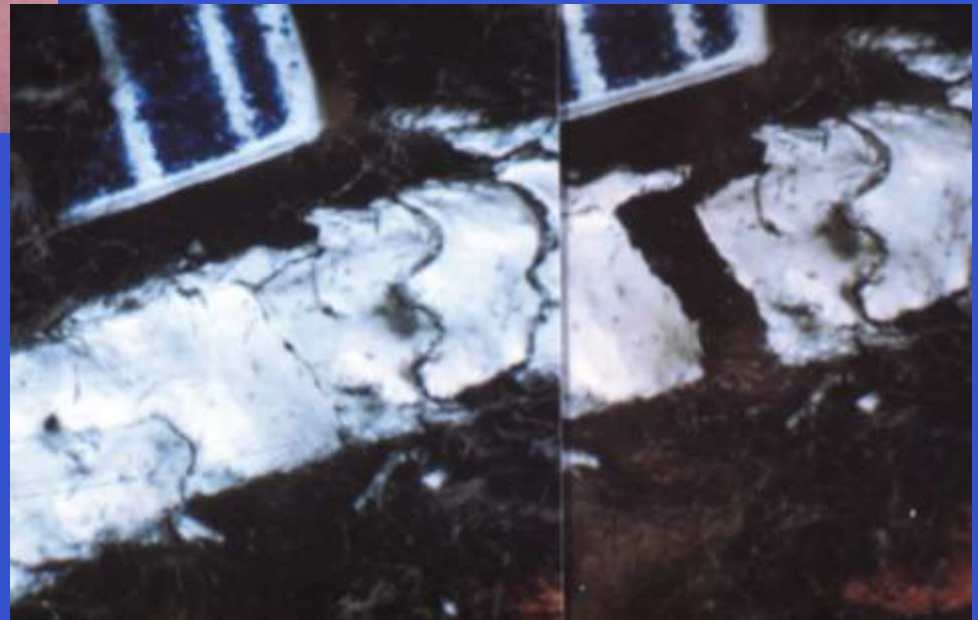
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- Suspect used strips of t-shirt to bind the victim in a sexual assault and kidnapping. Suspect then drove her around and dropped her off. He was apprehended, the top portion of the shirt was in the trunk of his car.



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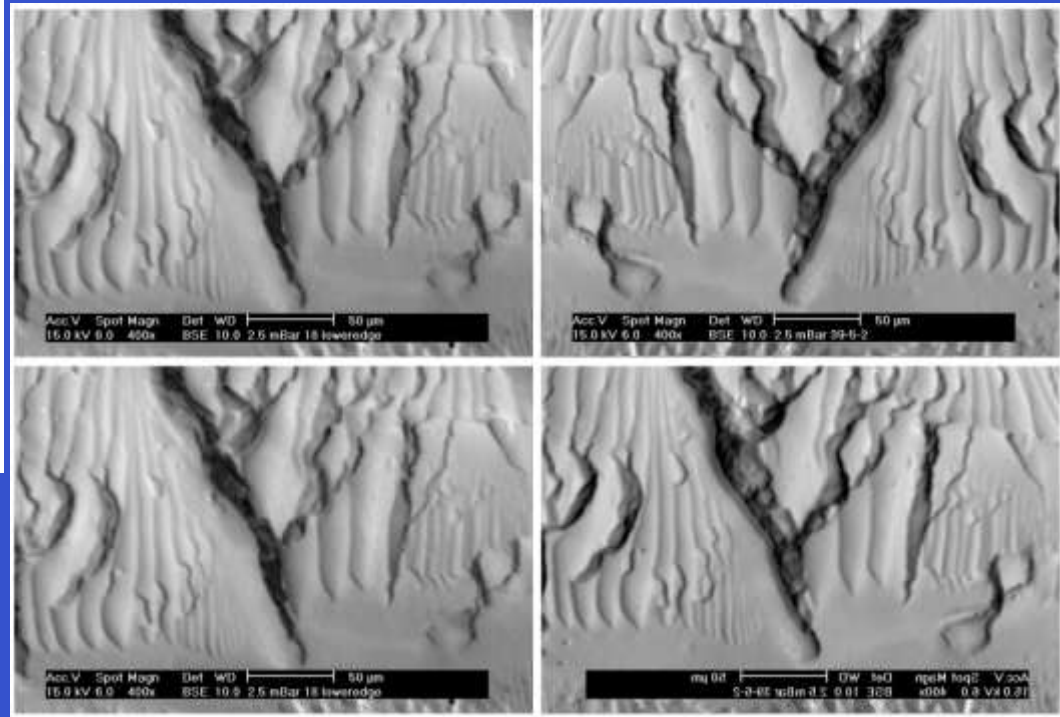
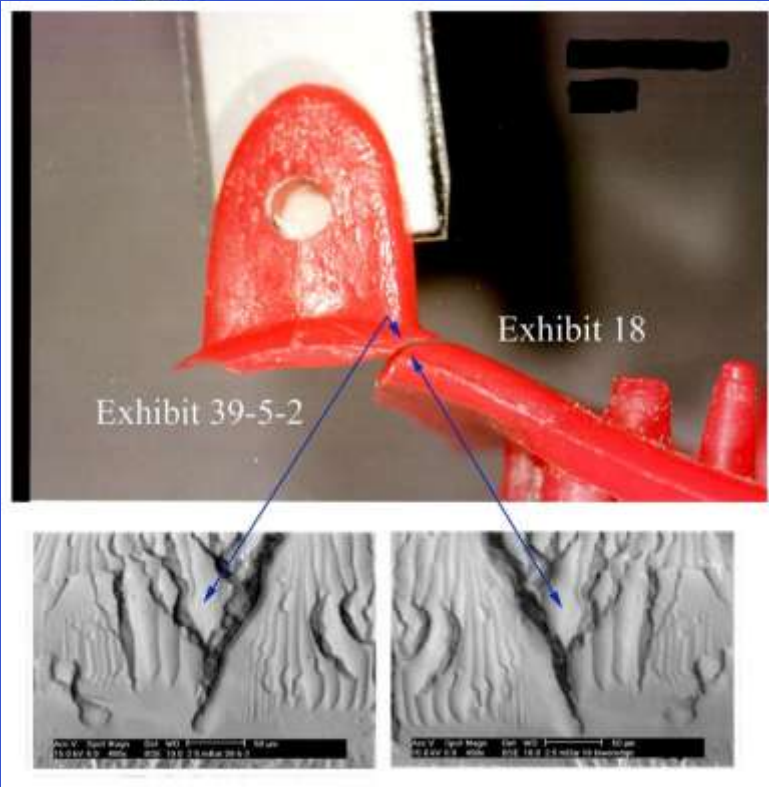
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- Suspect raped and killed a little girl in a basement (basement storage area). He possibly threw her against the wall, head contusions were observed. He tried to cover the blood with flour, he put her inside sack, put her in his humvee and dumped her in the snow. There was other forensic evidence as well (fibers, tire track, flour particle transfers). Fracture left some really nice marks on the surfaces for SEM imaging. Use microscopic characteristic to see what you can't see macroscopically.



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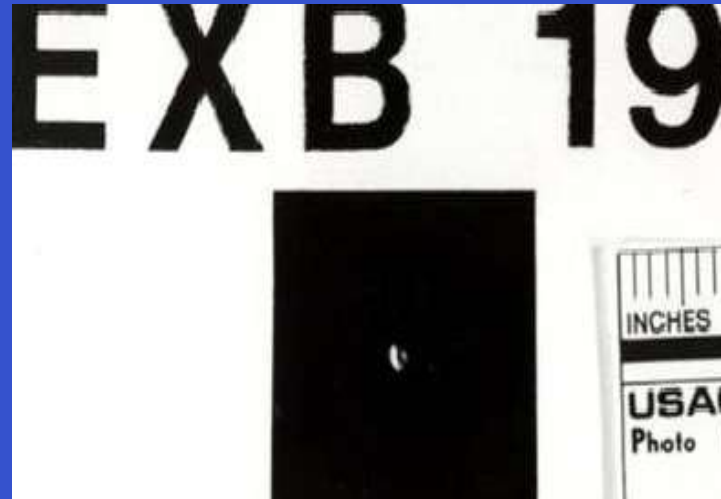
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- Woman estranged from husband. She collaborated with her current boyfriend to help kill husband for insurance money. Bottles were used to knock husband out, then later hit him with barbells to kill him. They drove him to a different location and left him in a car (dead). Wife and BF cleaned up house, they vacuumed up little piece of glass which was found in the submitted vacuum bag. This showed they attempted to clean up the scene and bottles were broken in the house...the white paint residue in the lettering and the shaped is what tipped off the examiner. Lined up fracture marks on pieces of glass and on the bottle utilized SEM to image which captured detail.



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EXB 3-1

EXB 3-2



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Office tapes - Serrated Cut Ends -viewed under stereo microscope

