Footwear Impression

Evidence

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Goal of Footwear Identification
Class Characteristics:

- Characteristics that repeat during the manufacturing process and are shared by one or more shoes. These include: size, design/pattern and mold characteristics.

- Class characteristics reduce the number of shoes from every shoe in the world to a group of similar shoes.
Differences in Patterns
Individual Characteristics

- Unique, accidental, random damage on the outsole that is the result of its use and wear.

- These nicks and scratches are in the outsole accidentally and in a completely random shape, orientation and position.
Accidental/Random Damage
Theory of Footwear Impression Evidence Examination and Identification

- A new shoe has no damage on its outsole
- As a shoe is worn, the outsole undergoes wear
- As a shoe is worn, the outsole acquires random damage
Theory of Footwear Impression Evidence Examination and Identification

- When the outsole of a shoe comes into contact with a receptive surface, that outsole can leave an impression on that surface.

- That impression is a representation of that sole and the characteristics of and on that sole.

- That impression, called the “unknown” or “crime scene impression” can be located and collected.
Theory of Footwear Impression Evidence Examination and Identification

- The unknown impression can be compared to the sole of a shoe, called the “known”

- The unknown impression can be compared to a test impression of the sole of a shoe called the “known test impression”

- Given sufficient quantity and quality of the unknown impression, differences and similarities can be observed between the unknown impression and the known shoe and known shoe impression
Different Designs and Different Wear
Techniques

- Crime scene impression collection techniques:
  - Photography
  - Electrostatic Dust Lifting
  - Powder and Adhesive Lifting
  - Gelatin Lifters
  - Casting (for three-dimensional impressions)
Examination Methodology

● As described by Huber (1972) in “The Philosophy of Identification” and Cassidy (1980) in “Footwear Identification”:

● “ACE-V”
● “Analysis”
● “Comparison”
● “Evaluation”
● “Verification”
Analysis

- Of the Crime Scene (unknown) Impression
- How much of the impression is there? “Quantity”
- How clear is the impression? “Quality”
- Interference?
  - Is there substrate interference?
  - Does the material making up the impression interfere?
  - Does the development technique interfere?
  - Is there evidence of distortion in the impression?
Analysis

- Of the Known Footwear
  - Is the pattern/design similar or different from the crime scene impression?
  - Is there contamination in the outsole?
  - Is there any wear or accidental/random damage on the outsole?
  - If the pattern is similar to the crime scene impression pattern, then a test impression of the known shoe is made.
Analysis

- Of the Test Impression made from the Known shoe

- How are the characteristics in the outsole of the footwear represented in the test impression?

- How do the characteristics in the outsole of the footwear repeat from one test impression to another?
Comparison

- Characteristics observed in the crime scene (unknown) impression are compared to the characteristics observed in the known shoe

- Side-by-Side comparison

- Characteristics observed in the crime scene (unknown) impression are compared to the characteristics observed in the test impression of the known shoe

- Side-by-Side comparison
  - Superimposition comparison
Comparison

- Crime Scene Impression
- Footwear Comparison
- Test Impression
- Known Shoe
Evaluation

- Information gathered during the analysis and comparison phases is evaluated.

- Are the characteristics observed class or accidental/random?

- Are the characteristics observed common (small, uniform circle) or are they unusual (oddly shaped cuts, tears, damage)

- What are the similarities?

- What are the differences?

- Are there any UNEXPLAINABLE DIFFERENCES observed?
Evaluation

● What is the significance of the information that is gathered?

● Knowledge of the significance of what is observed comes from training and experience.

● Footwear manufacturing and how that affects the outsole appearance

● Classes in footwear examination

● Many footwear comparisons
Class or Accidental Characteristics?
Same Wear and Same Accidental Characteristics=Identification
Verification

- Confirmation of an examiner's conclusion by another qualified examiner

- 100% of all identifications are verified by another qualified examiner

- Peer-review and quality control
Footwear Impression Evidence

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Have the Theories and Techniques Been Tested?
Testing

- Cassidy (1980)
  - Three different research projects starting in 1969

1. The possibility of accidental characteristics reoccurring in the same place on other shoes and the incidence of general wear being repeated

2. The number of accidental characteristics required for identification purposes

3. Duration of accidental characteristics
Testing

● Conclusions of Cassidy’s study

● Wear duplication:
  ○ The more a shoe is worn, the less likely the general wear will be duplicated
  ○ General wear should not be used as a basis for identification
  ○ The value of wear becomes more significant the more the shoe is worn
  ○ Minor discrepancies in wear should not prohibit an identification
Similar Wear
Different Accidental Characteristics
Testing

- Conclusions of Cassidy’s study (continued)

- Duplication of Accidental Characteristics:
  - Finding moderate or significant characteristics on newer shoes was difficult
  - Duplication of the position of a single characteristic does occur however infrequently
  - Duplication of the positions of multiple characteristics does not occur and identifications are possible
Testing

- Conclusions of Cassidy’s study (continued)

- The number of Accidental Characteristics required for identification purposes:
  - The poorer the crime scene impression the greater the number of characteristics are needed to be in agreement to form an opinion of identification
  - “Highly individual characteristics may only require a few for an opinion to be formed”
Testing

- Conclusions of Cassidy’s study (continued)
Testing

- Conclusions of Cassidy’s study (continued)

Not Very Unique

Very Unique
Testing

- Conclusions of Cassidy’s study (continued)

- Duration of Accidental Characteristics:
  - Depends on the material the outsole is made of
    - Leather
    - Rubber
    - Synthetic materials
Testing

- Cassidy’s study is available and has been performed by many footwear examiners in training.
- In class and training exercises-everyone comes to the same conclusion.
- Proficiency tests-test the conclusions of multiple examiners.
- Verification-tests the conclusion of the examiner in each case.
Do The Techniques Employed Have a Known Error Rate?
Error Rates

- The error rate of the ACE-V methodology is 0.
- The validity of any scientific technique is evidenced by the **repeatability** of the results.
- All conclusions are verified.
  - Course work/training
  - Internal competency tests
  - External proficiency tests
Error Rates

- Any “error” that occurs is individual examiner error caused by the failure to follow ACE-V
- Detected in verification
- Minimized through proper training
- Monitored through proficiency testing
- **Evidence is always available to be examined by another qualified examiner**
Quality Control/Quality Assurance

● Accreditation through ASCLD-LAB

● American Society of Crime Laboratory Directors-Laboratory Accreditation Board
  ○ Lab must prescribe to quality standards set by an outside governing agency
  ○ Lab practices are subjected to outside scrutiny
  ○ Requires yearly proficiency testing

● The Maine State Police Crime Laboratory is accredited through ASCLD-LAB
  ○ All latent print examiners in the Latent Print Section of the lab take yearly proficiency tests in footwear impression evidence
Universally Accepted Standards Governing the Application of the Theories and Techniques
Universally Accepted Standards Governing the Application of the Techniques and Theories

- International Association for Identification (IAI)

- The goal of IAI is to share knowledge and information in forensic identification

- Publishes a peer reviewed journal “The Journal of Forensic Identification”

- World’s oldest and largest forensic organization

- IAI membership today is comprised of over 5600 individuals from 70 nations and 13 forensic disciplines

- Multiple Regional Divisions of the IAI
Universally Accepted Standards Governing the Application of the Techniques and Theories

● Standard Used During the Examination: The Known Test Impressions

● Known test impressions are the standards by which all the other impressions are compared

● A proper set of test impressions records all the outsole features of the known shoe
  ○ Size
  ○ Design/pattern
  ○ Wear
  ○ Random/Accidental characteristics
Universally Accepted Standards Governing the Application of the Techniques and Theories

● Standard Methodology: “ACE-V”

● “ACE” is a scientific and systematic means of gathering information

● ACE takes into account size, shape, orientation and position in relation to other characteristics
Widespread Acceptance of the Theories and Techniques Employed
Widespread Acceptance of the Techniques and Theories

- Published, Taught, Lectured
- Techniques (development and recovery)
- Ability to individualize a footwear impression to an article of footwear
- ACE-V examination methodology
Widespread Acceptance of Footwear Impression Evidence

- Richardson case – Scotland – 1786

- Routinely accepted in courts throughout US, Canada and Europe

- Accepted in US courts as early as the 1930’s

- Accepted in Daubert hearings
Peer Review and Publication of the Theories and Techniques
At least five text books have been written dealing exclusively with Footwear Impression Evidence:

Peer Review and Publication

- Some books that include Footwear Impression Evidence


- Kiely, Terrence “Forensic Evidence: Science and the Criminal Law” CRC Press. 2001
Peer Review and Publication

- Articles on Footwear Impression Evidence have been published in numerous peer-reviewed journals all over the world

- Journal of Forensic Identification (US)
- Identification Canada
- Journal of Forensic Science (US)
- Science and Justice (UK)
- Kriminalistik (Germany)
- Report of the National Institute of Police Science (Japan)
- Journal of the Indian Academy of Forensic Sciences
- La Police Scientifique (France)
- Information Bulletin for Shoeprint/Toolmark Examiners (European)
Peer Review and Publication

- Presentations on Footwear Impression Evidence have been given in numerous forensic science conferences
  - International Association for Identification
  - Regional Divisions of the IAI
  - American Academy of Forensic Science
  - Canadian Identification Society
  - FBI International Symposium on Footwear and Tiretread Evidence
  - International Association of Forensic Science
  - European Shoeprint/Toolmark Association
  - European Meeting of Forensic Science
Peer Review and Publication

- A footwear certification program is available through the IAI.

- Laboratory accreditation is available through the American Society of Crime Laboratory Directors-Laboratory Accreditation Board (ASCLD-LAB).
  - All or many of the conclusions of footwear examiners in accredited labs are subject to peer review.
  - Maine State Police Crime Lab is an ASCLD-LAB accredited laboratory.
  - All conclusions of the footwear examiners in the Maine State Police Crime Lab are verified by another qualified examiner.
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