

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need: Probability of Randomly Acquired Characteristics

Describe the need:

Investigate the statistical probabilities of randomly acquired characteristics (RACs) occurring in the same position and orientation on different outsoles and/or tires. Quantitative results should include data originating from both high-quality exemplars and crime-scene impressions.

Keyword(s): RACs, probability, frequency, chance co-occurrence, position, shape, geometry

Submitting subcommittee(s): Footwear & Tire **Date Approved:** February 23, 2021

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

- J. A. Speir, N. Richetelli, M. Fagert, M. Hite, and W. J. Bodziak. (2016) "Quantifying randomly acquired characteristics on outsoles in terms of shape and position," Forensic Science International, Vol. 266, pp. 399–411.
- Cassidy, M. (1995). Footwear Identification. Published by Lightning Powder Company, Inc. in cooperation with the Royal Canadian Mounted Police. ISBN 0-9622305-8-8, pp. 1-176.
- Stone, R. (2006). Footwear Examinations: Mathematical Probabilities of Theoretical Individual Characteristics. Journal of Forensic Identification. Vol. 56, No. 4. pp. 577-599.
- Wilson, H. (2012). Comparison of the Individual Characteristics in the Outsoles of Thirty-Nine Pairs of Adidas Supernova Classic Shoes. Journal of Forensic Identification. Vol. 62, No. 3, pp. 194-203.

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

No.

5. In what ways would the research results improve current laboratory capabilities?

The day-to-day operations of the laboratory are not expected to change as a function of this research. However, the reporting structure, possible strength of conclusions, and analyst training may change over time to incorporate research findings. Downstream digital and web-based applications for data analysis (of crime scene samples) are also foreseeable, but these would be long-term outcomes beyond the scope of this initiative.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

The basis of source identification in forensic footwear and tire comparison is a function of the perceived limits in chance co-occurrence of RACs. However, the discrimination potential ascribed to a single or combination of RACs is believed to vary as a function of RAC size, shape, quality, clarity and complexity. This research will serve to evaluate the leading hypothesis and quantitatively define the certainty to which a RAC (or RACs) can support source identification.

7. In what ways would the research results improve services to the criminal justice system?

The potential for chance co-occurrence of randomly acquired characteristics directly impacts the degree of confidence to which a conclusion of source identification can be made. If this confidence can be described quantitatively, and/or illustrated using research examples, the trier of fact will have additional information and illustrations on which to evaluate the weight of evidence offered in criminal proceedings that include footwear and tire impression evidence.

8. Status assessment (I, II, III, or IV):

II

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.