Scientific & Technical Review Panel Final Report for OSAC 2022-S-0030 Standard for Methodology in Bloodstain Pattern Analysis

Organization of Scientific Area Committees (OSAC) for Forensic Science

STRP Final Report
OSAC 2022-S-0030
Standard for Methodology in Bloodstain Pattern Analysis

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Report Summary:

The Scientific and Technical Review Panel (STRP) for "Standard for Methodology in Bloodstain Pattern Analysis" is an independent panel appointed by the National Institute of Standards and Technology (NIST). A STRP is established with a range of experts to consider how well a standard meets the needs of the forensic science, law enforcement, and legal communities, and to recommend improvements to the standards under review. The STRP appreciates the efforts of Nicole Blackwell, Bloodstain Pattern Analysis Subcommittee member, while serving as the subcommittee liaison to this STRP during the review process.

The STRP began its review process with a kickoff meeting on April 11, 2022, and concluded with this STRP final report. The panel reviewed the draft standard and prepared comments for the [Bloodstain Pattern Analysis Subcommittee](#).

Report Components:

The STRP reviewed this draft standard against OSAC's *STRP Instructions for Review* which include the following content areas: scientific and technical merit, human factors, quality assurance, scope and purpose, terminology, method description and reporting results. The details below contain a brief description of each reviewed content area and the STRP's assessment of how that content was addressed in the Draft OSAC Proposed Standard.

1. **Scientific and Technical Merit:** OSAC-approved standards must have strong scientific foundations so that the methods practitioners employ are scientifically valid, and the resulting claims are trustworthy. In addition, standards for methods or interpretation of results must include the expression and communication of the uncertainties in measurements or other results.

   1.1 Consensus View
   The STRP noted that the proposed standard delineates a standard methodology

when conducting a bloodstain pattern analysis. It covers the process to be followed when examining bloodstains and bloodstain patterns to determine the importance of their presence or absence, and the importance of those determinations in regard to the scope or reason for the examination. This standard provides a sound scientific methodology, which will result in reliable and verifiable results thereby instilling confidence among our stakeholders.

1.2 Minority View
The Consensus View is an overly optimistic view that does not acknowledge the limited scope of the standard.

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1.3 Additional Comment Received After Voting
With regard to the bibliography, an STRP member believes it is important to add the following references that relate to the accuracy of bloodstain pattern analysis (BPA) and its susceptibility to bias, and therefore help explain what motivated the document and why it makes the recommendations that it does:

1. R. Austin Hicklin, Kevin R. Winer, Paul E. Kish, Connie L. Parks, William Chapman, Kensley Dunagan, Nicole Richetelli, EricG. Epstein, Madeline A. Ausdemore and Thomas A. Busey, Accuracy and Reproducibility of Conclusions by Forensic Bloodstain Pattern Analysts, Forensic Science International, (2021). doi:https://doi.org/10.1016/j.forsciint.2021.110856.

2. M.C. Taylor, T.L. Laber, P.E. Kish, G. Owens, N.K.P. Osborne, The Reliability of Pattern Classification in Bloodstain Pattern Analysis, Part 1: Bloodstain Patterns on Rigid Non-absorbent Surfaces, J. Forensic Sci. 61 (2016) 922–927. https://doi.org/10.1111/1556-4029.13091.

3. M.C. Taylor, T.L. Laber, P.E. Kish, G. Owens, N.K.P. Osborne, The Reliability of Pattern Classification in Bloodstain Pattern Analysis - PART 2: Bloodstain Patterns on Fabric Surfaces, J. Forensic Sci. 61 (2016) 1461–1466. https://doi.org/10.1111/1556-4029.13191.

2. **Human Factors:** All forensic science methods rely on human performance in acquiring, examining, reporting, and testifying to the results. In the examination phase, some standards rely heavily on human judgment, whereas others rely more on properly maintained and calibrated instruments and statistical analysis of data.

2.1. Consensus View
The STRP believes this proposed standard effectively addresses issues pertaining

to human factors. This standard properly incorporateslinear sequential unmasking – expanded (LSU-E) in an attempt to minimize the effects of cognitive bias. The STRP believes LSU-E should be mentioned and discussed in the Scope section of this standard and should be defined in the Terms and Definitions section.

2.2. Minority View – None.

3. **Quality Assurance:** Quality assurance covers a broad range of topics. For example, a method must include quality assurance procedures to ensure that sufficiently similar results will be obtained when the methodology is properly followed by different users in different facilities.

3.1. Consensus View
The STRP recognizes that this proposed standard is not a specific procedure or method in bloodstain pattern analysis, but rather a methodological framework by

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which the bloodstain pattern analysis is supported. As such, traditional quality assurance procedures would not be included. However, the STRP notes that the proposed standard does include measures that guide the analyst toward a quality work product if the methodology is employed properly.

3.2. Minority View – None.

4. **Scope and Purpose:** Standards should have a short statement of their scope and purpose. They should list the topics that they address and the related topics that they do not address. Requirements, recommendations, or statements of what is permitted or prohibited do not belong in this section.

4.1 Consensus View (6/9)
The STRP believes there is room to clarify the scope as it pertains to the use of the term "methodology". The STRP recommends clarifying the distinction between 'methodology' from 'methods' in the scope section. Referencing examples of methods that are not included in this document, e.g., a bloodstain pattern classification method, may help clarify that the scope does not include technical details of these methods. Consideration should be given to changing the title to more clearly align the scope and purpose.

4.2 Minority Views
View 1 (3/9)
One, the term "methodology" is ambiguous, it is not explicitly recommended by OSAC, and it may induce a reader to believe that the proposed standard describes many of the principles and procedures required in BPA that the standard does not address. The STRP therefore recommends "methodological framework in bloodstain pattern analysis." (The STRP recommends the same change in the

standard's title.)

Two, and relatedly, the standard is intended to delineate best practices in methodological framework—particularly in the sequencing of materials considered by a blood trace analyst—in order to minimize the effects of cognitive bias; the standard implements what has been termed "linear sequential unmasking–expanded." The STRP recommends that this be on the forefront in the standard's articulated Scope. The STRP also recommends explicitly summarizing the concept of "linear sequential unmasking–expanded" in a manner understandable to a layperson, legal scholar, or other ultimate user of the proposed standard. A suitable definition might be that found on page 3 of source [1]: "Always begin with the actual data/evidence—and only that data/evidence— before considering any other contextual information, be it explicit or implicit, reference materials, or any other contextual or meta-information."

Three, again relatedly, the STRP recommends removing Section 5.6 of the standard because it goes beyond the above-described scope.

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[1] I. E. Dror and J. Kukucka, "Linear Sequential Unmasking-Expanded (LSU-E): A general approach for improving decision making as well as minimizing noise and bias," *Forensic Sci Int Synerg,* vol. 3, p. 100161, 2021.

View 2 (5/9)

The STRP recommends removing the content in Section 5.6.1 of the proposed standard because it goes beyond the above-described scope. The content of 5.6.2 should remain in the proposed standard.

4.3 Additional Comments Received After Voting

The problem with calling this document a "standard for methodology" is that readers will think it specifies in detail how BPA should be performed--i.e., that it provides a "standard method." But this document does not set forth a "standard method." According to the Instructions for STRPs, a standard method must be "sufficiently complete, standardized, and capable of producing repeatable, reproducible, and accurate results for the uses described in the standard." Furthermore, "[t]here must be sufficient evidence of the reliability of the method or procedure—that it produces consistent results across instruments, examiners and laboratories when used to analyze items like those encountered in casework." This document meets neither of those requirements, hence it is misleading to imply that it is a "standard method" for BPA.

Although it is not a "standard method", this is nevertheless a valuable document because it sets forth thoughtful guidelines on steps that analysts can take to

reduce the potential for bias and improve the reliability of BPA. The suggestions in this document primarily relate to the sequence in which various analytic steps should be performed, without specifying how those steps should be performed. Laying out this sequence of steps will be helpful in guiding professional practice. It may also provide guidance for the eventual development of a true "standard method" for the field. This document should have a title that describes what it actually does, as the current title claims too much.

An STRP member thinks the subcommittee needs to exercise caution in making this a "linear sequential unmasking" document. While steps have been incorporated to address contextual bias through said unmasking, it is not what this document is about. Furthermore, the STRP member cautions the use of the suggested definition of "linear sequential unmasking" as considering only data/evidence before considering other contextual information. While this unmasking can be more easily achieved when performing an examination remotely through photographs alone, it is virtually impossible when attending a crime scene in person. Bloodstain pattern analysts work in context…they have to…and at a crime scene, in particular, there may be contextual information that is unavoidable. Follow-up bias safeguards are put in place during the technical

review process of the written report where the reviewer is limited to the information necessary for the BPA and can truly sequentially unmask during the review process. (This is addressed in a separate OSAC document on Technical Review).

5. **Terminology:** Standards should define terms that have specialized meanings. Only rarely should they give a highly restricted or specialized meaning to a term in common use among the general public.

5.1 Consensus View (7/9)

The STRP also recommends explicitly summarizing the concept of "linear sequential unmasking–expanded" in a manner understandable to a layperson, legal scholar, or other ultimate user of the proposed standard. A suitable definition might be that found on page 3 of source [1]: "Always begin with the actual data/evidence—and only that data/evidence—before considering any other contextual information, be it explicit or implicit, reference materials, or any other contextual or meta-information." See also 4.2 View 1 end of paragraph 2.

[1] I. E. Dror and J. Kukucka, "Linear Sequential Unmasking-Expanded (LSU-E): A general approach for improving decision making as well as minimizing noise and bias," *Forensic Sci Int Synerg,* vol. 3, p. 100161, 2021.

5.2 Minority Views

View 1 (4/9)

The STRP recommends defining "methodology" to assist the reader in understanding the difference between "methodology" and "method".

View 2 (5/9)

Give consideration to contextual information only when it is task-relevant [one member suggested to add this sentence to the end LSU-E's definition provided in the Consensus View].

5.3 Additional Comments Received After Voting

An STRP member believes that this standard should use the definition of "cognitive bias" that was unanimously recommended by the Human Factors Task Group. This definition is as follows:

"Cognitive bias – The class of effects by which an individual's preexisting beliefs, expectations, motives, and situational context may influence their collection, perception, or interpretation of information, or their resulting judgments, decisions, or confidence."

The source of the proposed language is Spellman, B.; Eldridge, H.; Bieber, P. "Challenges to reasoning in forensic science decisions." Forensic Sci International: Synergy 2022 (in press, https://doi.org/10.1016/j.fsisyn.2021.100200). The revised

definition has been accepted for inclusion in ASTM E30 (WK77530) Standard Practice for Core Forensic Responsibilities Training.

6. **Method Description:** There is no rule as to the necessary level of detail in the description of the method. Some parts of the method may be performed in alternative ways without affecting the quality and consistency of the results. Standards should focus on standardizing steps that must be performed consistently across organizations to ensure equivalent results. Alternatively, standards can define specific performance criteria that are required to be demonstrated and met rather than specifying the exact way a task must be done. For example, it may be enough to specify the lower limit for detecting a substance without specifying the equipment or method for achieving this limit of detection.

6.1. Consensus View

The STRP considers that the proposed standard meets the Method Description requirement. This opinion is based on the standard clearly defining six overall standardized and chronologically ordered steps to perform a bloodstain pattern analysis. Each of these six steps also include sub-steps and additional information that provide detailed direction to provide the development of interpretations supported by data from the analysis. Examples are provided

throughout the steps, which help reduce ambiguity and guide the reader. The content and order of the proposed standard methodology to limit task-irrelevant information (e.g., Requirements, Section 5.0, specifically including Section 5.4) and the content pertaining to considering alternate hypotheses (e.g., Sections 5.5 and 5.6.2) are critically important for the standardization of BPA and minimizing bias.

6.2. Minority View – None.

7. **Reporting Results:** Methods must not only be well described, scientifically sound, and comprehensive but also lead to reported results that are within the scope of the standard, appropriately caveated, and not overreaching.

7.1. Consensus View (6/9)
7.2 Minority View 1 would be acceptable if the whole section 5.6.1 is removed while the content of 5.6.2 remains. [See also Consensus View 6.1 "5.6.2" is "critically important"]

7.2. Minority Views
View 1 (3/9)
Reporting results is outside the scope of this document, therefore not applicable.

View 2 (1/9)
Minority View 1 would be acceptable if the whole section 5.6 is removed. [See also 4.2 Minority View 1 "the STRP recommends removing Section 5.6 of the standard because it goes beyond the above-described scope"]

7.3. Additional Comments Received After Voting

An STRP member recommends removing any reference to the Report Writing Document in 5.6.2 (e.g., Referred to as the Case Conclusion Section of the Report Writing Document). An STRP member is uncertain that it does refer to that section of the Report Writing document. Furthermore, if that document should ever change its wording in the future, it would require a change to this document.