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Document #4

Guideline for the Articulation of the Decision-Making Process for the Individualization in Friction Ridge Examination (Latent/Tenprint) DRAFT FOR COMMENT

1. Preamble

- 1.1. This document offers directions for articulating the decisions leading to individualization conclusions, which result from the examination of friction ridge evidence. This document takes into consideration the current status of professional practices, legal decisions, and scientific research.
- 1.2. The intention is to bridge long-standing historical explanations, current criticisms of these practices, and a growing body of scientific and institutional support for constructive alternatives.
- 1.3. This document presents a series of statements, in sequence, linked to one another. Together these provide an explanation and articulation of the foundation for current friction ridge individualization practice. An expanded section giving further explanation follows each statement. They are intended to be sequential and to build upon one another to present a coherent explanation of the examination process. They are not meant to stand-alone. Supporting references are provided and competent examiners should be aware of this material. The references cited are meant to be representative, not all-inclusive.
- 1.4. The level of presentation of the statements and explanations is one that can be made by any qualified friction ridge examiner to non-practitioners (i.e., attorneys, jurors, or judges).

2. Overview of Statements and Explanations

- 2.1. Friction ridge skin bears a complex, unique, and persistent morphological structure.
- 2.2. An impression of the features of friction ridge skin may result when a surface is touched.
- 2.3. During analysis of a friction ridge impression, an examiner can detect features that would be expected to be present in another impression from the same area of friction ridge skin.
- 2.4. The features detected during the analysis phase are then compared between two impressions. An examiner judges whether correspondence exists between these features.
- 2.5. As an examiner finds increasingly more features in agreement between two impressions, it becomes less likely that the set of features being used for comparison would be present in an impression from another source.

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35 2.6. As more features are found in agreement during a particular comparison, an examiner's confidence
36 increases towards a level where a conclusion of individualization is possible. Prior to forming this
37 conclusion, an examiner considers both the accumulation of corresponding features and the likelihood
38 of observing these features in an impression from another source.

39 2.7. The examiner makes a decision to reach a conclusion of individualization.

40 2.8. The examiner must communicate the individualization conclusion in writing. This conclusion may be
41 communicated later through oral testimony. The target audiences for these communications may vary
42 by agency or situation.

43 3. Scientific Context for Current Practices in Friction Ridge Examination

44 3.1. Traditionally (for over 100 years) conclusions of individualizations were expressed differently – as an
45 absolute identification. That is, that *this person did in fact*, make this impression, to the exclusion of all
46 others in the world. As the practices of forensic science and of friction ridge examination have evolved,
47 it is now recognized that our conclusions are more appropriately conveyed as the support that our
48 findings have for pairs of competing hypotheses.

49 3.2. Methods that *measure* the quality and quantity of details in friction ridge impressions are a continuing
50 focus of scientific research.

51 4. Unique and Persistent Morphological Structures on Friction Ridge Skin

52 4.1. Statement

53 Friction ridge skin bears a complex, unique, and persistent morphological structure.

54 4.2. Further Explanation

55 Research, long standing practice, and extensive practical application support the premise that the
56 details present in the structure of friction ridge skin are unique to each individual. These also have
57 shown that barring injury or disease, the essential features of this detail remain unchanged (except for
58 growth) over the life of any individual. These aspects of friction ridge skin (uniqueness and persistence)
59 are generally acknowledged and are part of what make impressions from friction ridge skin such a
60 useful means to identify people. These premises are not points of contention.

61 4.3. Support for Statement and Explanation

62 4.3.1. Studies of individuality, persistence, and morphology: Babler (1979), Cummins and Midlo
63 (1943), Hale (1952), Holt (1968), Lin, Liu et al. (1982), Maceo (2011), Montagna and Parakkal
64 (1974), Okajima (1967), Okajima (1970), Okajima (1975), Srihari, Srinivasan et al. (2008),
65 Wilder and Wentworth (1932), Wertheim (2011), Wertheim and Maceo (2002), Wilder and
66 Wilder (1904).

67 4.3.2. Historical use for personal identification: Barnes (2011), Henry (1900), and Komarinski (2005).

68 4.3.3. Scientific studies of friction ridge specificity : Champod and Margot (1997), Chang and Srihari
69 (2008), Egli (2009), Egli, Champod et al. (2007), Langenburg (2011), Langenburg (2012),
70 Neumann, Champod et al. (2006), Neumann, Champod et al. (2007), Neumann, Evett et al.
71 (2011), Neumann, Evett et al. (2012), Pankanti, Prabhakar et al. (2002), Stoney and Thornton
72 (1986), and Stoney and Thornton (1987).

73 4.3.4. How a rule or law is generated in science: Langenburg (2011), Peirce (1877), and Peirce,
74 Houser et al. (1992).

75 4.3.5. These premises are not points of contention: Cole (2009).

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78 **5. Transfer of Friction Ridge Features to Impressions**

79 **5.1. Statement**

80 An impression of the features of friction ridge skin may result when a surface is touched.

81 **5.2. Further Explanation**

82 Contact with a surface may result in an impression of the friction ridge skin. The resulting impression is
83 not a perfect recording of the skin itself, as it is subject to distortions and environmental effects. Each
84 impression from the same area of friction skin will reproduce a sub-set of the skin's discriminating
85 features that will vary in appearance from other impressions from the same source skin.

86 **5.3. Support for Statement and Explanation**

87 Ashbaugh (1999), Maceo (2009), Vanderkolk (2009), and Vanderkolk (2011)

88 **6. Features Expected in Other Impressions from the Same Source**

89 **6.1. Statement**

90 During analysis of a friction ridge impression, an examiner can detect features that would be expected
91 to be present in another impression from the same area of friction ridge skin.

92 **6.2. Further Explanation**

93 Examiners trained to competency have demonstrated an ability to accurately detect reliable
94 discriminating features such as ridge events, creases, and scars in friction skin impressions. Their
95 ability has been demonstrated to surpass that of those who are untrained (i.e., novices). Even in highly
96 distorted impressions, examiners are capable of accurately detecting these features. The focus is not
97 only on the quantity of features available, but also on the clarity of the features. Examiner confidence in
98 the reliability of the features increases with clarity.

99 **6.3. Support for Statement and Explanation**

100 **6.3.1.** Busey and Parada (2010), Langenburg (2004), Langenburg (2012), Vanderkolk (2009),
101 Vanderkolk (2011)

102 **6.3.2.** SWGFAST (2011) Standards for Examining Friction Ridge Impressions and Resulting
103 Conclusions

104 **7. Features are Compared and Judgments on Correspondence are Made**

105 **7.1. Statement**

106 The features detected during the analysis phase are then compared between two impressions. An
107 examiner judges whether correspondence exists between these features.

108 **7.2. Further Explanation**

109 A side-by-side comparison is conducted between two impressions to determine if the features detected
110 in the analysis phase are in correspondence. Correspondence is judged with respect to the features
111 themselves and their relationship to one another among the ridge paths. The correspondence is not
112 exact, but is determined taking into account tolerances that are influenced by distortions and other
113 environmental effects.

114 **7.3. Support for Statement and Explanation**

115 **7.3.1.** Ashbaugh (1999), NIST (2012), and Vanderkolk (2011)

116 **7.3.2.** SWGFAST (2011) Standards for Examining Friction Ridge Impressions and Resulting
117 Conclusions

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119 **8. Increasing Agreement is Less Likely to Occur in Impressions from Other Sources**

120 **8.1. Statement**

121 As an examiner finds more features in agreement between two impressions, it becomes less likely that
122 the set of features being used for comparison would be present in an impression from another source.

123 **8.2. Further Explanation**

124 **8.2.1.** As the number of features in agreement increases, an examiner’s confidence also increases
125 that this set of features will not be found in friction ridge skin from another individual. In other
126 words, the expectation of finding these features (by random chance or coincidence) in friction
127 ridge skin from another individual becomes more remote as corresponding features
128 accumulate. The quantity of features is important, but so is their clarity and specificity.

129 **8.2.2.** Specificity of features differs because of their shape, type, spatial relationship, and location
130 within the general pattern. Currently specificity is assessed based on the examiner’s training
131 and experience. Research continues to gather data supporting these assessments.

132 **8.3. Support for Statement and Explanation**

133 **8.3.1.** Ashbaugh (1999), Champod (1995), Champod (1996), Champod and Margot (1997), Dass,
134 Zhu et al. (2005), Egli, Champod et al. (2007), Gutiérrez, Galera et al. (2007), Jain, Prabhakar
135 et al. (2002), Chen and Jain (2009), Kryszczuk, Drygajlo et al. (2004), Lin, Liu et al. (1982),
136 Neumann, Champod et al. (2006), Neumann, Champod et al. (2007), Neumann, Evett et al.
137 (2012), Osterburg, Parthasarathy et al. (1977), Pankanti, Prabhakar et al. (2002), Roddy and
138 Stosz (1999), Sclove (1979), Sclove (1980), Seweryn (2005), Stoney and Thornton (1986),
139 Stoney and Thornton (1987), and Stosz and Alyea (1994).

140 **8.3.2.** SWGFAST (2011) Standards for Examining Friction Ridge Impressions and Resulting
141 Conclusions

142 **9. Two Competing Hypotheses are Considered and an Examiner’s Level of Confidence is Approached**

143 **9.1. Statement**

144 As more features are found in agreement during a particular comparison, an examiner’s confidence
145 increases towards a level where a conclusion of individualization is possible. Prior to forming this
146 conclusion, an examiner considers both the accumulation of corresponding features and the likelihood
147 of observing these features in an impression from another source.

148 **9.2. Further Explanation**

149 **9.2.1.** This part of the comparison is a balance between (1) the degree of correspondence between
150 features shared by the two impressions and (2) the likelihood that those features would be
151 observed in an impression from another source. To approach individualization, the magnitude
152 of the balance needs to be such that the degree of correspondence is high and the likelihood
153 that these features would be observed in another source is low. That is, taking into account any
154 dissimilarities, the features in agreement must be both sufficiently clear and within tolerance,
155 and sufficiently discriminating.

156 **9.2.2.** When the two conditions above are satisfied, the examiner begins to approach the decision
157 threshold beyond which individualization can be concluded.

158 **9.2.3.** More formally, these two conditions are represented by two competing hypotheses. The first
159 hypothesis is that the observed features in the unknown impression came from the same
160 source as the impression being compared; the other hypothesis is that the unknown
161 impression came from some other source. The degree of the correspondence of features
162 (including both similarities and dissimilarities) allows the examiner to evaluate his/her findings
163 under the first hypothesis. The specificity of the features allows the examiner to evaluate

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164 his/her findings under the second hypothesis. The framework of Analysis, Comparison, and
 165 Evaluation (ACE) offers a mechanism for performing these evaluations. The weight of the
 166 evidence will to some degree support one hypothesis or the other. For an individualization
 167 conclusion, the support for the hypothesis of a common source would be overwhelming.

168 **9.3. Support for Statement and Explanation**

169 Champod (2009), Evett (1987), Evett and Buckleton (1989), Fienberg and Finkelstein, (1996),
 170 Finkelstein and Fairley (1970), Lindley (1977), Wertheim (2000).

171 **10. The Examiner Makes a Decision**

172 **10.1. Statement**

173 The examiner makes a decision to reach a conclusion of individualization.

174 **10.2. Further Explanation**

175 Individualization is the decision by an examiner that there are sufficient features in agreement to
 176 conclude that two areas of friction ridge impressions originated from the same source. Individualization
 177 of an impression to one source is the decision that the likelihood the impression was made by another
 178 (different) source is so remote that it is considered as a practical impossibility. The decision is
 179 supported by demonstrable data and the application of Analysis, Comparison, Evaluation, and
 180 Verification (ACE-V) per the standards (SWGFAST, 2011).

181 **10.3. Support for Statement and Explanation**

182 **10.3.1.** Risk is low: Gutowski (2006), Langenburg (2009), Langenburg, Champod et al. (2010), Ulery,
 183 Hicklin et al. (2011), and Tangen, Thompson et al. (2011)

184 **10.3.2.** Decision-making in forensic identification: Biedermann, Bozza et al. (2008)

185 **10.3.3.** SWGFAST (2011) Standards for Examining Friction Ridge Impressions and Resulting
 186 Conclusions

187 **11. The Examiner Reports the Decision**

188 **11.1. Statement**

189 The examiner must communicate the individualization conclusion in writing. This conclusion may be
 190 communicated later through oral testimony. The target audiences for these communications may vary
 191 by agency or situation.

192 **11.2. Further Explanation**

193 **11.2.1.** The use of SWGFAST terminology is recommended when reporting a conclusion. The
 194 SWGFAST document provides the community with standard definitions for currently accepted
 195 conclusions.

196 **11.2.2.** While articulating these conclusions, specific words and phrases have been deemed
 197 inappropriate or misleading and should be avoided. These phrases include:

198 **11.2.2.1.** Exclusion of all others

199 **11.2.2.2.** 100% certain/absolute, certainty/absolute fact

200 **11.2.2.3.** Zero error rate/infallible method

201 **11.2.3.** These concepts should rather be expressed as the conclusion of the examiner, based upon
 202 data observed and interpreted through the examiner's training and experience. The examiner
 203 has a level of personal confidence associated with the accuracy and reliability of his
 204 conclusion; however, the accuracy and precision of this personal level of confidence cannot

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205 currently be measured and reported. For this reason, certainty should not be reported
 206 numerically or in absolute terms.

207 **11.2.4.** SWGFAST recognizes that reporting and testimony protocols differ among agencies; however,
 208 minimum reporting requirements as outlined in SWGFAST documents must be included.

209 **11.3.** Support for Statement and Explanation

210 **11.3.1.** SWGFAST (2011) Standards for Examining Friction Ridge Impressions and Resulting
 211 Conclusions

212 **11.3.2.** SWGFAST (2012) Standard for Reporting Friction Ridge Examinations

213 **11.3.3.** Garrett (2009), National Research Council (2009), NIST (2012), The Fingerprint Inquiry (2011)

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369 **13. Revision Table**

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Version	Effective Start	Effective End	Posted	Archived	Change
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