

Standards for Friction Ridge Identifications

Approaching an Articulation of Threshold Reliability Criteria for Forensic Identification

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Abstract: Standards are vital in every endeavor. They provide a clear expectation of what is required, promote consistency, and provide a reliable way to measure the results. Everyone has his or her own individual standard: what they consider right, normal, acceptable, productive, or necessary. However, professional standards must meet far more rigorous criteria for acceptability. In scientific endeavors, there are two types of standards required; a standard to determine when sufficient information exists to arrive at a conclusion, and standard principles used to arrive at the conclusion. Both of these standards are drawn from reliable research that supports the use of the standards. Every aspect must be clearly defined to ensure consistency among users. Unfortunately, a quantifiable standard for what constitutes a valid and reliable conclusion is not always feasible. When this occurs, a philosophical standard may suffice. The recommendations in this paper are not new ideas, rather an attempt to provide a clearer articulation of the standards examiners currently use. For professionals in every field, such a standardization process is not a luxury, it is an essential.

Introduction

On February 18, 2009, after a two year study, the National Academies of Science (NAS) released a report on the state of forensics in the United States. This report titled "Strengthening forensic Science in the United States: A Path Forward" quickly became known as the NAS or NRC (National Research Council) report [1]. One element recognized in the report was the lack of a numerical threshold to establish an identification in the United States. The absence of a numerical standard has led some to state that conclusions are at the sole discretion of the practitioner. If this were true then conclusions would not be as consistent and reliable as they are. Perhaps an objective standard does exist but needs clearer articulation.

Current Articulation of the Standard

An informal survey of ten identification units in the United States revealed a wide range of explanations for what constitutes an identification. Some agencies state they require consistency between the characteristics, minus any discrepancies or unexplained dissimilarities. Some agencies state they look for more matching details than they've ever seen in a non-match. Several agencies follow the "Standard for Conclusions" given by the Scientific Working Group for Friction Ridge Analysis, Study and Technology (SWGFAST) [2]. Other agencies implement a minimum numeric standard. Minimum numeric standards generally range from 8-12 Galton points to effect an identification. Point counting may produce accurate results, but it is not considered a valid method since there is no support for using any specific number of characteristics.

Numerous examiners state that conclusions are up to the examiner based on their training and experience. This is a weak and easy response in lieu of explaining the complex clarity-quantity relationship in friction ridge comparisons. Many analysts are unable to articulate a concept that has not been articulated effectively to them. The 'based on my training and experience' answer has recently come under fire [3]. Not only is this highly subjective but the results cannot be regulated to ensure a minimum accepted level.

Of course, a person must have training and knowledge to understand how to arrive at scientifically verifiable conclusions. Practitioners must understand the principles used, different methods for arriving at conclusions, visual clues indicating distortion, as well as biological uniqueness. The knowledge, skills and abilities of the practitioner can aid in arriving at a conclusion but does not add weight to the conclusion.

The lack of a uniform and consistent standard will continue to be an issue until the articulation is improved. Once clear standards are stated, analysts should be able to arrive at conclusions that can be judged against the standards.

Basic Scientific Protocols

Given that friction ridge comparisons are considered a forensic science, shown by the NAS report including it in their research of forensic sciences [1], friction ridge conclusions should hold up to the standard that the sciences require. Scientific conclusions are known for being a dependable source of reliable knowledge since they are conclusions that can be *justified through the data*.

The specific justifications supporting a conclusion must rest on the detailed information within the comparison itself. These events should be objective in nature and not dependent on the person doing the analysis, their training or their experience. An analyst should be able to demonstrate the specific information that led them to a conclusion instead of stating that the conclusion is based on the fact that they have been educated and have been doing comparisons for many years [3]. As an example, in the early 1900's Einstein developed his theories on relativity. Einstein's knowledge and abilities exceeded those of others; therefore it took over 14 years for others to test his beliefs. It was only after Einstein's ideas were tested by others that his beliefs were accepted as scientific conclusions [4]. The particular information that leads an analyst to a conclusion should be demonstrable and reviewable. Having justification behind a conclusion does not imply a conclusion is correct; it simply means it is well-supported. Conversely, the absence of justification does not indicate a conclusion is incorrect. It simply indicates that the conclusion does not adhere to scientific guidelines. One general tenant of science is that credible conclusions are those which have supporting information that can be tested and scrutinized for the soundness of their logic and design [5, 6].

The weight of a conclusion is based on the objectivity of the data being used, the dependability of the principles relied on, the thoroughness when applying these principles, and the soundness of the method used to help arrive at the conclusion, as well as the conclusion itself. These features ensure that conclusions are not based on feelings, experience, or any number of random environmental influences. The judges who articulated the Daubert opinion for the admissibility of scientific evidence seemed to have understood these concepts when they stated, "Faced with a proffer of expert scientific testimony, then, the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the Trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid..." [7].

The most complex part of a standard is determining the amount of evidence needed to establish a well-founded conclusion. Scientific conclusions require sufficient evidence behind them to hold up to the scrutiny of others [5]. Another way to state this is with the term 'general acceptance', but general acceptance alone is not enough to generate scrutiny-withstanding conclusions. General acceptance is only good in conjunction with the evidence requirement that supports a scientific conclusion.

Scientific conclusions are determinations based on careful observations, dependable principles, and good reasoning [8]. This approach may be criticized as being subjective. Critical thinking may be subjective

yet still be considered scientific. Science accounts for individual biases (inherent subjectivity) by requiring the process of arriving at a conclusion and the conclusion itself be one which can be corroborated by other qualified people (inter-subjectively tested) [9]. Inter-subjective testing can be done by having impartial experts analyze a situation. Each analysis is individually subjective. However, this inter-subjective testing diminishes individual biases in lieu of a group conclusion. Tested conclusions resulting in reproducible conclusions makes the subjectivity as objective as possible. It is also important to point out that scientific conclusions are not considered to be absolute proof [6, 10]; they are considered to be inductions, deductions or abductions.

Specific Scientific Protocols

The criterion to arrive at a scientific conclusion with regard to identification should minimally consider four elements: the data, the method, the principles used within the method, and a threshold of acceptability. A standard also must be specific enough to ensure a readily accessible understanding by those qualified through their training and experience.

Data:

To ensure quality results in a conclusion, the data used to arrive at that conclusion should be objective (clearly apparent). When the data is subjective (only apparent to some), it decreases the likelihood that the characteristic actually exists and thereby lowers the weight of that characteristic.

Method:

The method or process used to arrive at a conclusion should be accepted as a valid means to arrive at conclusions. Guessing may provide someone with a correct conclusion. However, it is not considered a valid scientific method. It should be noted that hypothesis testing must contemplate different possibilities, which could be construed as guessing, but this type of “guess work”, if you will, is carefully controlled to include rigorous testing along with trying to disprove any supposition. The constellation method (only looking at the relationship between characteristics but not considering other data, such as intervening ridges) is also not considered valid by most practitioners. This method could be valid if used to establish a ‘class characteristic’ but it should not be used to individualize. A more disciplined method will yield more dependable results. ACE [11] and ACE-V [12] can be considered valid methods if they are being used in conjunction with accepted scientific protocols [13]. There is ongoing debate on whether or not ACE-V is a method at all since it is not specific enough to determine results. The ACE-V method is more of an outline for systematic logical thinking, as basic hypothesis testing is for logical deduction. Using the term ACE-V without understanding its scientific underpinnings or the appropriate principles within ACE-V makes it highly unlikely that someone would be able to use it in accordance with scientific guidelines.

Principles:

Principles used to arrive at conclusions need to be validated. Various principles may be accepted by practitioners when in fact; they can be shown to be false. The One Dissimilarity Doctrine is an example of this. Some practitioners use this principle yet many instances have been shown where the doctrine fails [14, 15, 16, 17]. In addition to the examples that can be found, science advocates *thorough testing* and not simply allowing one event to be a deciding factor. Verification is an accepted step within ACE-V. Even though verification has been accepted, some practitioners have suggested that it has been accepted prematurely. This criticism is seldom due to the lack of confidence in the verification process, but rather to differing understandings of this process itself (confirmation, an independent analysis, or reviewing the justification as well as the conclusion). Because these differing verification procedures may be applied in various ways, this part of the ACE-V process becomes more questionable. Some valid principles are:

- Class characteristics include pattern type or ridge flow. These are not considered identifying characteristics.

- Pattern types alone should not be used to arrive at a conclusion of either exclusion or identification. Some sort of testing needs to be done prior to arriving at a scientific conclusion [18].
- Individualizing characteristics should be evaluated in conjunction with the intervening ridges and their spatial relationship to each other.
- Due to the flexibility of the skin, the dimensions of images or the distance between events are not identifying characteristics.
- ACE, as described by Huber, is a scientific method [11], so all principles apply.
 - Analysts should not ignore data that does not fit a conclusion [19] (characteristics, pressure, smearing, etc.). All information should be considered and weighed appropriately.
 - Analysts should attempt to falsify their tentative conclusion and not try to confirm it (i.e. they should be attempting to prove themselves wrong or searching for other plausible conclusions as opposed to only looking for information that is consistent with a particular conclusion) [20].
 - ACE [11] / ACE-V [12] can be a circular process. Science promotes reanalyzing data to gain more accurate and more comprehensive information [6].
 - Conclusions arrived at are tentative based on available data [5, 6], not conclusive facts.
 - The One Dissimilarity Doctrine [16] and the One Discrepancy Rule [15] does not apply due to the fact that everything needs to be put into context. One factor cannot be given ultimate power otherwise the testing requirement of science is ignored [6, 19].

New and improved principles and methodologies will surely be implemented in the future and should be studied and validated prior to examiners using and depending on them. Blind verification may not be considered a new concept in the friction ridge discipline but there is very little published material showing when and how it should be used, and how valuable it is under different circumstances. Scientifically speaking, prior to using any principle, research needs to be done to support the use of that principle.

A Threshold of Acceptability – Workable Sufficiency Criterion:

Workable sufficiency is the part of a standard that denotes how much investigation and analysis is needed prior to arriving that will stand the test of time [19]. The justification behind a conclusion must be compelling enough to satisfy others, not merely a few others but to the point of general consensus by other reasonable individuals (such as a jury of one’s peers) [19]. The justification may include stating the data used, the principles used, and the logic supporting the conclusion so others can determine if the conclusion has merit. Science and scientists consider justification that is corroborated by the majority as being more objective because it is dependent on the data and not dependent on the practitioner. Elements that are only observed by the individual are considered to be more subjective and given less weight.

Conclusion

A standard criterion for non-numeric scientific sufficiency could be stated as:

The standard for arriving at a conclusion is to have, and be able to provide, compelling justification to satisfy others (to the point of general consensus). The justification should include objective data, a valid method to arrive at the conclusion, the use of valid principles, and accepted logic or reasoning behind all thoughts. It should be understood that conclusions are not conclusive proof but scientific determinations that follow a rigid logical progression and suffice where no other conclusion can be reasonably arrived at.

Some will notice that this standard lacks any mention of discrepancies or dissimilarities. This is intentional due to the fact that a holistic analysis of all information needs to be considered and weighed appropriately. As stated, one piece of information should never be given ultimate weight. Conclusions must follow from the cumulative weight of the evidence available.

This standard also disregards training and experience in so far as factual and methodological criteria are concerned. Training and experience are helpful in arriving at a conclusion but are not factors in whether or not a conclusion lives up to desired requirements. Scientific conclusions are those that can be justified by the data, and not those that are based on the person arriving at the conclusion. An example of this can be seen with the late 1800's scientific determination of how the landscape of Yosemite was formed. A well known geologist, Josiah Whitney, head of the California Geological Survey, tried to discredit the conclusions of John Muir as being those of an amateur. Whitney speculated that the landscape was caused by a catastrophic event while Muir hypothesized the landscape was created by glaciers. Due to his credentials, Whitney touted his own conclusions as having more weight when in fact Muir's conclusions held up under testing, while Whitney's did not [21].

There are a wide variety of issues concerning friction ridge comparisons.

- Increased number of court challenges
- Practitioners confidence in their ability to succeed in court challenges
- Overstating the weight of conclusions [22]
- Limitations on expert's testimony [23]
- Differing testimony
- Differing interpretations of basic principles and definitions
- Increased reporting of errors
- Determining error rates
- Inability to easily resolve differing opinions or errors

Most of these issues may be addressed individually. However, one issue appears to be consistent among all these concerns; the need to articulate a clear, concise standard for what constitutes a reliable conclusion. A clear articulation of the standard would assist practitioners in meeting the standard, perhaps diminishing errors, and help others judge if a conclusion lives up to a standard. The information given is not new. It is merely an attempt at articulating the current standard in a more comprehensive manner. An inclusive standard may never be achieved. Nevertheless, it is important to continually improve the standards currently used.

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