NATIONAL COMMISSION ON FORENSIC SCIENCE

NIST National Institute of Standards and Technology U.S. Department of Commerce

Views of the Commission:
Technical Merit Evaluation of Forensic Science Methods and Practices

Subcommittee
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Views of the Commission

Forensic data, results, interpretations, and conclusions have life-changing consequences for individuals and society. It is vital that the analytical data be generated through reliable methods and practices built upon valid core scientific principles and methodology. In the American juridical system, the judge is responsible for determining admissibility of scientific evidence; however, advances relevant to forensic science analysis, from data generation to interpretation, are dynamic. Consequently, legal precedent can be issued even when scientific developments may have exposed foundational weaknesses in the forensic science test method[1] or practice.[2] Advances in science and technology must be impartially evaluated and communicated in a way that allows courts to make sound decisions regarding admissibility of forensic evidence. This document develops and endorses the principle that the underlying science used in adjudications in our criminal justice system be subject to independent[3] scientific evaluation.

[1] A "test method" is defined as "a definitive procedure that produces a test result." ASTM.org, "ASTM International/Definitions and Sample Standards," p.1. Available at http://www.astm.org/toolkit/images/ASTM%20Information/Sample_Standards_English/Sample_Standards_with_Cover_Sheet.pdf (last accessed, May 25, 2016). (Hereafter, ASTM Definitions).

[2] A "practice is defined as "a definitive set of instructions for performing one or more specific operations that does not produce a test result." ASTM Definitions, p.1.

[3] For the purposes of this document, "independent" refers to a body that is fair, impartial, and without conflict of interest in the results of the evaluation. An entity's independence does not imply that this work will be conducted without the contribution of individuals who are knowledgeable of a specific discipline. It is expected that an independent scientific body will be able to retain the relevant experts to advise the independent body as to the real life forensic application of the science.

The Organization of Scientific Area Committees (OSAC) is making significant and laudable progress in establishing documentary standards.[4] It is critical that the forensic science community, the Commission, and the criminal justice system have confidence in the validity of the science underlying these standards.

Therefore, it is the view of the National Commission on Forensic Science that:

> 1) All forensic science methodologies should be evaluated by an independent scientific body to characterize their capabilities and limitations in order to accurately and reliably answer a specific and clearly-defined forensic question. The independent scientific body should evaluate how forensic science test methods and practices meet the standards of technical merit as defined in the OSAC Technical Merit Worksheet.[5]
> 2) The National Institute of Standards and Technology (NIST) should assume the role of independent scientific evaluator within the justice system for this purpose.
> 3) Additional resources should be made available to support this new capacity.

Overview and Background

The publication of the 2009 National Academy of Sciences (NAS) report, ‘‘Strengthening Forensic Science in the United States: A Path Forward,” has catalyzed a change in the forensic science community. Since then, the Department of Justice (DOJ) and NIST intensified their investments in foundational and applied research in forensic science. These developments signal an evolution in the expectations for forensic evidence. While training and experience are a critical component of a forensic scientist’s expertise, the underlying foundation of the discipline and associated testimony must be supported by sound research that meets the standards of forensic practitioners, academic researchers, measurement scientists, and statisticians. The report also found "substantial evidence indicating that the level of scientific development and evaluation varies substantially among the forensic science disciplines” and “[a]body of research is required to establish the limits and measures of performance and to address the impact of sources of variability and potential bias.” Therefore there is a clear and compelling need to address the technical merit of forensic science and forensic medicine practices.

“Technical Merit” as used in this document refers to the process that ensures the accuracy, capabilities, and limitations of forensic science tests. The data and research that need to be gathered to support technical merit include, but are not limited to, clearly defined terminology, quality control, uncertainty, limitations, validation, fitness-for-purpose, and general acceptance in both the forensic and the general scientific communities.[6] The “validation” component of technical merit should not be confused with tests of Accommodation and Environmental Conditions (sometimes

[4] “For simplicity, this report focuses on documentary standards, which are written agreements containing technical specifications or other precise criteria that may contain rules, guidelines, or definitions of characteristics.” Brietenberg, M.A. (August 2009). *The ABC’s of Standards Activities* (NISTIR 7614), p. 5. Retrieved from NIST, available at http://gsi.nist.gov/global/docs/pubs/NISTIR_7614.pdf (last accessed, May 30, 2016).

[5] For the purposes of this document, technical merit is defined as “studies and data that establish the basis for a particular claim in terms of a technique’s accuracy, capabilities, and limitations.”

[6] NIST.gov, “OSAC Technical Merit Worksheet,” available at https://workspace.forensicosac.org/kws/public/download.php/4551/4%20-%20OSAC%20QIC%20Form-01%20Technical%20Merit%20Worksheet%20Form%20V4.pdf (last accessed May 31, 2016).

called "Internal Validations") designed to adhere to ISO 17025 Clause 5.3.[7] These tests do not take the place of more comprehensive technical merit studies described herein. Technical merit differs from internal validation conducted by individual forensic science service providers and forensic medicine service providers in that it comes first and includes but is not limited to the acquisition of data on specificity, sensitivity, testing on case-type samples, evaluation in population studies, and the influence of features, conditions, and limitations of a test method or practice for a specific use on forensic and/or casework reference samples. Data pertaining to reliability (precision, accuracy, stability, reproducibility, repeatability) also contribute to the understanding of the capabilities and limitations of a test method or practice. Internal validation is defined by the FBI QAS as "the accumulation of test data within the laboratory to demonstrate that established methods and procedures perform as expected in the laboratory."

Evaluations of all aspects of technical merit must be respected by all stakeholders if these evaluations are to be utilized by the legal and scientific communities. The Commission believes that NIST has, or has access to, the resources needed to fairly and impartially evaluate the merit of the science underlying forensic procedures and practice. Further, the Memorandum of Understanding Between the Department of Justice and the National Institute of Standards and Technology in Support of the National Commission on Forensic Science outlines two important roles for NIST: "a) conduct research supporting the development and dissemination of methods, standards, and technical guidance for forensic science measurements, and b) test and validate select existing forensic science practices and standards as appropriate." NIST has a long and distinguished history as an internationally recognized and trusted scientific, technical, and metrological laboratory. The Commission believes that evaluations by NIST, supported by this pedigree, can bridge the gap between technical merit and decisions regarding admissibility. In recommending that NIST assume the role of independent scientific evaluator within the criminal justice system for technical merit forensic science disciplines, the Commission encourages universities, scientific agencies, and other research entities, such as Statistical and Applied Mathematical Sciences Institute (SAMSI), to conduct research supporting the technical merit of forensic science disciplines. While NIST may have a centralized evaluative role, the Commission envisions that the data and research NIST will evaluate will be generated by the robust and diverse scientific research community as well as by NIST. The resulting resource documents will be continually updated as the state of the science develops. Centralizing the evaluative role will facilitate the development of a knowledge base at NIST that will build over time.

The Commission acknowledges the deep commitment and hard work of members of the OSAC Subcommittees and their involvement in developing documentary standards and guidance with Scientific Working Groups (SWGs) and standards development organizations such as ASTM. The OSAC Registries of Standards and Guidelines are intended to ensure that a "standard or guideline that is posted on either Registry demonstrates that the methods it contains have been *assessed to be valid* by forensic practitioners, academic researchers, measurement scientists, and statisticians through a consensus development process that allows participation and comment from all relevant stakeholders." Completion of a technical merit evaluation, of which validity is a component, should precede the evaluation of documentary standards to be placed on the Organization of Scientific Area Committees (OSAC) Registry of Approved Standards.

[7] "The laboratory shall ensure that the environmental conditions do not invalidate the results or adversely affect the required quality of any measurement."

While requiring an evaluation of technical merit may delay the population of the OSAC Registries, it should not impact a court's decision on whether to admit a forensic science test method or practice unless and until NIST issues its evaluation. Moreover, because ninety-seven percent of federal convictions and ninety-four percent of state convictions are the result of guilty pleas,[8] a judicial determination of admissibility will not be essential to the resolution of the vast majority of criminal cases in the United States.

For some OSAC Subcommittees, this commitment would minimally impact their documentary standards setting program as independent scientific evaluations of technical merit for well-established scientific disciplines may already exist or are achievable in the interim pending a NIST evaluation. For other OSAC Subcommittees, documentary standards setting should focus on activities such as evidence collection, preservation, processing, and documentation, for which standard terminology, classifications, guides, practices, or specifications[9] can be created while additional research is conducted for test methods or practices for which a more extensive evaluation of technical merit is needed.

It is the view of the NCFS that an institutional entity assigned a permanent independent scientific evaluation function would facilitate the gathering of scientific research, knowledge and expertise over time, creating a service resource for forensic science, technology research, and user communities. Development of a trusted and impartial process of evaluating technical merit of forensic practices and the presentation of data will ensure that all decisions rendered by the justice system are based on sound and current science.

[8] Dept. of Justice, Bureau of Justice Statistics, Sourcebook of Criminal Justice Statistics Online, Table 5.22.2009, http://www.albany.edu/sourcebook/pdf/t5222009.pdf

[9] See ASTM Definitions, p.1.