National Commission on Forensic Science
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Technical Merit Review Panel

Proposed NIST Plan for Technical Merit Evaluations

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Technical Merit of Forensic Science Methods

NIST would lead an in-depth effort to examine the technical merit of selected methods and practices in the forensic sciences, including:

- Research performed by other agencies and laboratories
- NIST research
- Studies documented in the literature

Technical Merit of Forensic Science Methods

From PCAST meeting of Sept 1, 2016:

- ❑ DNA
- ❑ Bite Marks
- ❑ Footwear
- ❑ Firearms
- ❑ Latent fingerprints

Initial NIST efforts would look at three examples selected from different areas, as we learn if the approach can be effective:

- DNA
- Firearms
- Bite Marks

Some of the Questions Associated with Technical Merit

- **What is the scientific maturity of the underlying measurement, data, comparison, analysis?**
  - What has been published?
  - What has been reproduced?
  - What has been/is the level of discourse on the topic in the research community?
- **Is the approach widely adopted by forensics professionals?**
  - Is this an emerging approach?
  - Is this an established approach?
- **Have efforts been directed at establishing the repeatability, reproducibility and accuracy of the method within an organization and across organizations?**
  - Is there a statistical basis for understanding expectations of the test method or practice?
  - Is the confidence level in the test method or practice well documented?

For each forensic test method or practice examined…

- **Seek input from a variety of experts:**
  - NIST-hosted workshop to develop criteria for evaluation prior to embarking on study of a forensic method or practice
- **Conduct a literature review:**
  - NIST librarians assist in curation of appropriate references covering the method or practice in question
  - Reference list will be publicly available as part of the study findings
- **Evaluation of literature claims:**
  - Identification of appropriate laboratory studies to test those claims

For each forensic test method or practice examined…

- **Conduct interlaboratory study(ies)**
  - ***Where possible,*** assess quality of work in operation – with de-identified participants
- **Publish findings and recommendations**
  - Possibilities include, *NIST Journal of Research, NIST Special Publication Series*, and other open access journals
- **Provide training for judges, lawyers, jurors, practitioners,…**
  - Develop training aids to convey the capabilities and limitations of studied forensic disciplines

ISO 17025 and Validation

5.4.5 Validation of methods

5.4.5.1 Validation is the confirmation by examination and the provision of objective evidence that the particular requirements **for a specific intended use** are fulfilled.

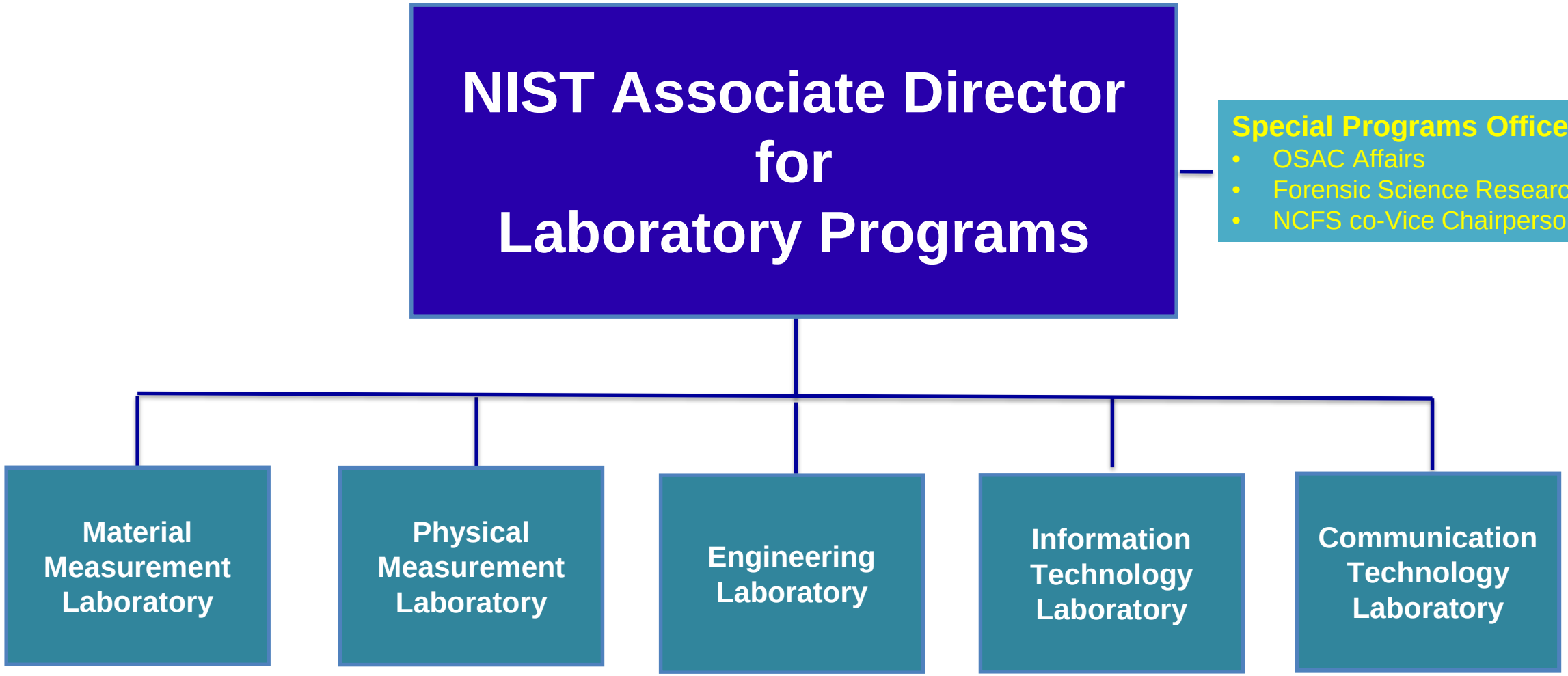
5.4.5.2 The laboratory shall validate **non-standard methods**, **laboratory-designed/developed methods**, **standard methods used outside their intended scope**, and **amplifications and modifications of standard methods** to confirm that the methods are fit for the intended use. The validation shall be as extensive as is necessary to meet the needs of the given application or field of application. The laboratory shall record the results obtained, the procedure used for the validation, and a statement as to whether the method is fit for the intended use.

ISO 17025 - Notes

NOTE 1 Validation may include procedures for sampling, handling and transportation.

NOTE 2 The techniques used for the determination of the performance of a method should be one of, or a combination of, the following:

- calibration using reference standards or reference materials;
- comparison of results achieved with other methods;
- interlaboratory comparisons;
- systematic assessment of the factors influencing the result;
- assessment of the uncertainty of the results based on scientific understanding of the theoretical principles of the method and practical experience.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Physical Measurement Laboratory
Engineering Laboratory
Information Technology Laboratory
Communication Technology Laboratory

NIST Expertise Snap Shot

Deep Technical Expertise

- Fire modeling
- Chemical analysis
- Human DNA analysis
- Fingerprint & other biometric patterns
- Digital/Multimedia
- Statistics
- Firearms & surface analysis

Expertise Gaps

- Medical legal death
- Odontology
- Anthropology
- Wildlife
- Bloodstain

Initial Model

Start by looking at three areas, to learn how to be effective in this approach

1. DNA
   - Long history at NIST
   - Substantial resident expertise
   - Strong tradition of working with other agencies
   - New challenges with complex mixtures

2. Firearms and Toolmarks
   - Strong effort in applying image analysis
   - Strong effort in statistical analysis
   - Well integrated with practitioners
   - Joint efforts currently underway with CSAFE

Initial Model

Start by looking at three areas, to learn how to be effective in this approach

3. Bite marks
   - NIST has expertise in nano indentation
   - NIST has expertise in characterization of soft materials
   - NIST would need to reach out to others
     - » American Dental Association Foundation

     (ADA research effort at NIST for 88 years)

Summary of Proposed NIST-Lab Technical Merit Efforts

- Assessment focuses on scientific maturity of select aspects of 3 forensic science methods
- Assessment will look at and contribute to technical merit of current methods, including validation where feasible
- Assessment effort will not undertake original research